



**PROJECT MANUAL
FOR
THE CONSTRUCTION OF**

*2020 Street Bundle – Sector III
CSP 7857*

Gerard Hudspeth
Mayor

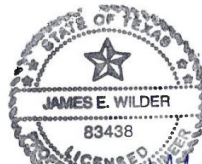
Sara Hensley
Interim City Manager

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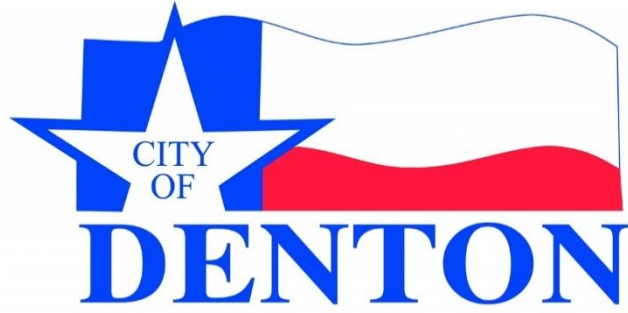
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Director, Water and Wastewater

**Prepared for
The City of Denton**

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James Wilder 11/16/21



City of Denton

Table of Contents - CSP

SECTION 00 00 00
TABLE OF CONTENTS - CSP

Division 00 - General Conditions

00 05 16	Addenda - CSP
00 11 19	Invitation to Offerors - CSP
00 21 16	Instructions to Offerors - CSP
00 35 14	Conflict of Interest Affidavit - CSP
00 41 01	Proposal Form - CSP
00 42 44	Unit Price Proposal Form - CSP
00 43 14	Offeror's Bond - CSP
00 43 38	Proposed Subcontractors Form - CSP
00 43 39	Vendor Compliance to State Law Nonresident Offeror - CSP
00 45 14	Safety Record Questionnaire - CSP
00 45 27	Contractor Compliance with Workers' Compensation Law - CSP
00 45 44	Corporate Resolution of Authorizing Signatories - CSP
00 52 44	Agreement - CSP
00 61 15	Performance Bond - CSP
00 61 16	Payment Bond - CSP
00 61 20	Maintenance Bond - CSP
00 61 26	Certificate of Insurance - CSP
00 72 00	General Conditions
00 73 01	Supplementary Conditions - CSP
00 73 74	Form 1295 – Certificate of Interested Parties - CSP

Division 01 - General Requirements

01 11 00	Summary of Work
01 25 00	Substitution Procedures
01 29 76	Stored Materials and Equipment (Materials On Hand)
01 31 19	Preconstruction Meeting
01 31 20	Project Meetings
01 32 16	Construction Progress Schedule
01 32 33	Preconstruction Video
01 33 00	Submittals
01 35 13	Special Project Procedures
01 45 23	Testing and Inspection Services
01 50 00	Temporary Facilities and Controls
01 57 13	Storm Water Pollution Prevention Plan
01 58 13	Temporary Project Signage
01 60 00	Product Requirements
01 66 00	Product Storage and Handling Requirements
01 70 00	Mobilization and Remobilization
01 71 23	Construction Staking and Survey
01 74 23	Cleaning
01 77 19	Closeout Requirements
01 78 23	Operation and Maintenance Data
01 78 39	Project Record Documents

TECHNICAL SPECIFICATIONS

Division 02 – Existing Conditions

- 02 41 13 Selective Site Demolition
- 02 41 14 Utility Removal/Abandonment
- 02 41 15 Paving Removal

Division 03 – Concrete

- 03 00 00 Concrete and Concrete Reinforcing
- 03 30 00 Cast-In-Place Concrete
- 03 34 13 Controlled Low Strength Material (CLSM)
- 03 80 00 Modifications to Existing Concrete Structures *Revised*

~~Division 26 – Electrical~~

- ~~26 05 00 Common Work Results for Electrical~~
- ~~26 05 10 Demolition for Electrical Systems~~
- ~~26 05 13 Zinc Coated Steel Wire~~
- ~~26 05 19 Signal Cables~~
- ~~26 05 20 Tray Cables~~
- ~~26 05 26 Grounding Conductors, Ground Rods, and Power Lead-in Cable~~
- ~~26 05 33 Raceways and Boxes for Electrical Systems~~
- ~~26 05 35 Ground Boxes~~
- ~~26 56 00 Roadway Illumination Assemblies~~

Division 31 – Earthwork

- 31 10 00 Site Clearing
- 31 23 16 Unclassified Excavation
- 31 24 00 Embankment
- 31 25 14 Erosion and Sediment Control
- 31 34 19 Geosynthetic Soil Reinforcement
- ~~31 36 00 Gabions~~
- ~~31 37 00 Riprap~~

Division 32 – Exterior Improvements

- 32 01 17 Flexible Paving Repair
- 32 01 29 Concrete Repair
- 32 05 16 Aggregates for Exterior Improvements
- 32 11 23 Flexible Base Courses
- 32 11 29 Lime Treated Base Courses
- 32 11 33 Cement Treated Base Courses
- 32 12 16 Asphalt Paving
- 32 12 73 Asphalt Paving Crack Sealants
- 32 13 13 Concrete Paving
- 32 13 16 Decorative Concrete Paving
- 32 13 73 Concrete Paving Joint Sealants
- 32 16 00 Curbs, Gutters, Sidewalks, and Driveways *Revised*
- 32 17 23 Pavement Markings
- 32 31 00 Fences and Gates
- 32 32 00 Retaining Walls

- 32 84 00 Irrigation Installation and Restoration
- 32 93 00 Plantings

Division 33 – Utilities

- 33 01 10 Cleaning and Acceptance Testing of Water and Sewer Force Mains
- ~~33 01 12 Joint Bonding and Electrical Isolation~~
- 33 01 30 Closed Circuit Television (CCTV) Inspection
- 33 01 31 Sewer and Manhole Testing
- 33 01 32 Cleaning of Sewer Mains
- 33 01 33 Sanitary Sewer Pipe Bursting
- ~~33 01 34 Cured in Place Pipe (CIPP)~~
- 33 01 40 Liners for Sanitary Sewer Structures
- 33 01 50 Adjusting Manholes, Inlets, Valve Boxes, and Other Structures to Grade
- 33 05 02 Water Line Lowering
- 33 05 05 Utility Trench Excavation, Embedment, and Backfill
- 33 05 07 Steel Casing Pipe
- ~~33 05 08 Tunnel Liner Plate~~
- 33 05 10 Auger Boring
- ~~33 05 11 Hand Tunneling~~
- 33 05 15 Installation of Carrier Pipe in Casing or Tunnel Liner Plate
- 33 05 61 Cast-in-Place Concrete Manholes
- 33 05 62 Precast Concrete Manholes
- 33 05 63 Concrete Water Vaults
- 33 05 76 Fiberglass Manholes
- 33 05 81 Frame, Cover, and Grade Rings
- 33 05 97 Utility Markers/Locators
- 33 05 98 Location of Existing Utilities
- 33 14 05 Bolts, Nuts, and Gaskets
- 33 14 10 Ductile Iron Pipe and Fittings
- 33 14 11 Polyvinyl Chloride (PVC) Pressure Pipe **“Revised”**
- ~~33 14 12 Concrete Pressure Pipe, Bar Wrapped Steel Cylinder Type~~
- ~~33 14 13 Buried Steel Pipe~~
- 33 14 14 High Density Polyethylene (HDPE) Pipe
- 33 14 17 Water Services 1-inch to 2-inch
- ~~33 14 18 Large Water Meters~~
- 33 14 20 Resilient Seated Gate Valve
- ~~33 14 21 AWWA Rubber Seated Butterfly Valves~~
- 33 14 25 Connection to Existing Water Mains
- ~~33 14 30 Combination Air Valve Assemblies for Potable Water Systems~~
- 33 14 40 Fire Hydrants
- 33 31 10 Fiberglass Reinforced Pipe for Gravity Sanitary Sewers
- 33 31 14 Polyvinyl Chloride (PVC) Gravity Sanitary Sewer Pipe
- 33 31 16 Sanitary Sewer Service Connections and Service Lines
- ~~33 31 23 Combination Air Valve for Sanitary Sewer Force Mains~~
- 33 32 11 Bypass Pumping of Existing Sewer Systems
- 33 42 11 Stormwater Pipe and Boxes
- ~~33 42 23 Stormwater Headwalls, Wingwalls, and End Treatments~~
- 33 42 30 Stormwater Junction Boxes
- 33 42 33 Stormwater Curb Inlets and Drop Inlets
- ~~33 46 00 Subdrainage~~

Division 34 – Transportation

- 34 41 10 — Signal Heads
- 34 41 11 — Accessible Pedestrian Signal
- 34 41 12 — Radar Detection Equipment and Cable
- 34 41 14 — Video Imaging Vehicle Detection System (VIVDS) — 360 Degree Fish Eye
Camera
- 34 41 15 — Emergency Vehicle Preemption Equipment and Cable
- 34 41 16 — Battery Back-up System
- 34 41 21 — Traffic Signal Structures
- 34 41 23 — Treated Timber Poles
- 34 41 24 — Drilled Shaft Foundations
- 34 41 26 — LED Internally Illuminated Street Name Signs
- 34 41 27 — Signal Controller and Cabinet Assembly
- 34 41 28 — Traffic Signal LED Luminaire
- 34 41 29 — Pan-Tilt-Zoom Camera
- 34 41 32 — Temporary Traffic Signals
- 34 41 33 — Removing Traffic Signals
- 34 41 34 — Rectangular Rapid Flashing Beacon
- 34 41 35 — Pedestrian Hybrid Signal
- 34 41 50 — Aluminum Signs and Signposts
- 34 71 13 — Traffic Control

Division 41 – Bulk Material Processing Equipment

- 41 14 00 — Batching Equipment

Appendix

- GC 5.01 — Availability of Lands
- GC-5.03 — Subsurface and Physical Conditions
- GC 5.05 — Underground Facilities
- GC 5.06 — Hazardous Environmental Condition at Site
- GC 7.08 — Required Subcontractors
- GC 7.11 — Permits and Utilities

END OF SECTION

1
2
3
4
5
6
7
8
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SECTION 00 05 16
ADDENDA - CSP

[Assembler: For Contract Document execution, remove this page and replace with any addenda issued.]

END OF SECTION

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SECTION 00 11 19
INVITATION TO OFFERORS
COMPETITIVE SEALED PROPOSAL

RECEIPT OF PROPOSALS

Sealed proposals for the construction of **2020 Street Bundle – Sector III-** will be received by the City of Denton Purchasing Office as outlined at <http://dentontx.ionwave.net/CurrentSourcingEvents.aspx>.

GENERAL DESCRIPTION OF WORK

The major work will consist of the (approximate) following: Reconstruction of 46,000 square yards of city roadway, the installation of 8700 linear feet of 8” and 12” water main, and the installation of 3000 feet of 8” sanitary sewer gravity main on McKinney, Hickory, Crawford, Bradshaw, Wood, Oak, Hettie, Rose and Uland Streets.

COMPETITIVE SEALED PROPOSAL

Submission requirements for the competitive sealed proposals shall be found in the Instructions to Offerors.

DOCUMENT EXAMINATION AND PROCUREMENTS

The Proposal and Contract Documents may be examined or obtained on-line by visiting the City of Denton’s Purchasing Division website at <http://dentontx.ionwave.net>. The Contract Documents may be downloaded, viewed, and printed by interested contractors and/or suppliers. **The contractor is required to fill out the Certificate of Interested Parties Form 1295 and the form must be submitted to the Project Manager before the contract will be presented to the City Council. The form can be obtained at <https://www.ethics.state.tx.us/tec/1295-Info.htm> .**

PRE-PROPOSAL CONFERENCE

A pre-proposal conference will be held as described in Section 00 21 16 - INSTRUCTIONS TO OFFERORS at the following location, date, and time outlined in the City’s solicitation website. To view pre-proposal invitation log-in to your account at <http://dentontx.ionwave.net>, and click the ‘Activities’ tab of this solicitation.

CITY’S RIGHT TO ACCEPT OR REJECT PROPOSALS

City reserves the right to waive irregularities and to accept or reject proposals.

INQUIRIES

All inquiries relative to this procurement should be addressed in the City’s solicitations website. To submit and view questions log-in to your account at <http://dentontx.ionwave.net>, and click the ‘Questions’ tab of this solicitation.

END OF SECTION

1 **SECTION 00 21 16**
2 **INSTRUCTIONS TO OFFERORS**

3 **Defined Terms**

4
5 1.1. Terms used in these INSTRUCTIONS TO OFFERORS, which are defined in Section 00
6 72 00 - GENERAL CONDITIONS.

7
8 1.1.1. Any reference to the term “Bidder” shall also mean “Offeror” and to “Bid” shall
9 mean “Proposal” in the Proposal Documents.

10
11 1.2. Certain additional terms used in these INSTRUCTIONS TO OFFERORS have the
12 meanings indicated below which are applicable to both the singular and plural thereof.

13
14 1.2.1. OFFEROR: Any person, firm, partnership, company, association, or corporation
15 acting directly through a duly authorized representative, submitting a proposal for
16 performing the work contemplated under the Contract Documents.

17
18 1.2.2. Nonresident OFFEROR: Any person, firm, partnership, company, association, or
19 corporation acting directly through a duly authorized representative, submitting a
20 proposal for performing the work contemplated under the Contract Documents
21 whose principal place of business is not in the State of Texas.

22
23 1.2.3. Successful OFFEROR: The Offeror that submits the Proposal that offers the Best
24 Value to the City based on the Evaluation of Proposals published in these
25 Instructions to Offerors.

26
27 1.2.4. Purchasing Agent: City designated representative to assist in solicitation of
28 proposals from vendors for City contracts.

29
30 **2. Copies of Proposal Documents**

31
32 2.1. Neither City nor Engineer shall assume any responsibility for errors or misinterpretations
33 resulting from the Offerors use of incomplete sets of Proposal Documents.

34
35 2.2. City and Engineer in making Proposal Documents available do so only for the purpose
36 of obtaining Proposals for the Work and do not authorize or confer a license or grant for
37 any other use.

38
39 **3. Examination of Proposal and Contract Documents, Other Related Data, and Site**

40
41 3.1. Before submitting a Proposal, each Offeror shall:

42
43 3.1.1. Examine and carefully study the Contract Documents and other related data
44 identified in the Proposal Documents (including "technical data" referred to in
45 Paragraph 4.2. below). No information given by City or any representative of the
46 City other than that contained in the Contract Documents and officially
47 promulgated addenda thereto, shall be binding upon the City.
48
49

- 1 3.1.2. Visit the site to become familiar with and satisfy Offeror as to the general, local
2 and site conditions that may affect cost, progress, performance or furnishing of the
3 Work.
4
- 5 3.1.3. Consider federal, state and local Laws and Regulations that may affect cost,
6 progress, performance or furnishing of the Work.
7
- 8 3.1.4. Study all: (i) reports of explorations and tests of subsurface conditions at or
9 contiguous to the Site and all drawings of physical conditions relating to existing
10 surface or subsurface structures at the Site (except Underground Facilities) that
11 have been identified in the Contract Documents as containing reliable "technical
12 data" and (ii) reports and drawings of Hazardous Environmental Conditions, if any,
13 at the Site that have been identified in the Contract Documents as containing
14 reliable "technical data."
15
- 16 3.1.5. Be advised that the Contract Documents on file with the City shall constitute all of
17 the information which the City will furnish. All additional information and data
18 which the City will supply after promulgation of the formal Contract Documents
19 shall be issued in the form of written addenda and shall become part of the Contract
20 Documents just as though such addenda were actually written into the original
21 Contract Documents. No information given by the City other than that contained in
22 the Contract Documents and officially promulgated addenda thereto, shall be
23 binding upon the City.
24
- 25 3.1.6. Perform independent research, investigations, tests, borings, and such other means
26 as may be necessary to gain a complete knowledge of the conditions which will be
27 encountered during the construction of the project. On request, City may provide
28 each Offeror access to the site to conduct such examinations, investigations,
29 explorations, tests and studies as each Offeror deems necessary for submission of a
30 Proposal. Offeror must fill all holes and clean up and restore the site to its former
31 conditions upon completion of such explorations, investigations, tests and studies.
32
- 33 3.1.7. Determine the difficulties of the Work and all attending circumstances affecting the
34 cost of doing the Work, time required for its completion, and obtain all information
35 required to make a proposal. Offerors shall rely exclusively and solely upon their
36 own estimates, investigation, research, tests, explorations, and other data which are
37 necessary for full and complete information upon which the proposal is to be based.
38 It is understood that the submission of a proposal is prima-facie evidence that the
39 Offeror has made the investigation, examinations and tests herein required. Claims
40 for additional compensation due to variations between conditions actually
41 encountered in construction and as indicated in the Contract Documents will not be
42 allowed.
43
- 44 3.1.8. Promptly notify City of all conflicts, errors, ambiguities or discrepancies in or
45 between the Contract Documents and such other related documents. The Contractor
46 shall not take advantage of any gross error or omission in the Contract Documents,
47 and the City shall be permitted to make such corrections or interpretations as may
48 be deemed necessary for fulfillment of the intent of the Contract Documents.
49

1 3.2. Reference is made to Section 00 73 01 – Supplementary Conditions for identification of:
2

3 3.2.1. those reports of explorations and tests of subsurface conditions at or contiguous to
4 the site which have been utilized by City in preparation of the Contract Documents.
5 The logs of Soil Borings, if any, on the plans are for general information only.
6 Neither the City nor the Engineer guarantee that the data shown is representative of
7 conditions which actually exist.
8

9 3.2.2. those drawings of physical conditions in or relating to existing surface and
10 subsurface structures (except Underground Facilities) which are at or contiguous to
11 the site that have been utilized by City in preparation of the Contract Documents.
12

13 3.2.3. copies of such reports and drawings will be made available by City to any Offeror
14 on request. Those reports and drawings may not be part of the Contract
15 Documents, but the "technical data" contained therein upon which Offeror is
16 entitled to rely as provided in Paragraph 5.03. of the General Conditions has been
17 identified and established in Paragraph SC 5.03 of the Supplementary Conditions.
18 Offeror is responsible for any interpretation or conclusion drawn from any
19 "technical data" or any other data, interpretations, opinions or information.
20

21 3.3. The submission of a Proposal will constitute an incontrovertible representation by
22 Offeror (i) that Offeror has complied with every requirement of this Paragraph 4, (ii) that
23 without exception the Proposal is premised upon performing and furnishing the Work
24 required by the Contract Documents and applying the specific means, methods,
25 techniques, sequences or procedures of construction (if any) that may be shown or
26 indicated or expressly required by the Contract Documents, (iii) that Offeror has given
27 City written notice of all conflicts, errors, ambiguities and discrepancies in the Contract
28 Documents and the written resolutions thereof by City are acceptable to Offeror, and
29 when said conflicts, etc., have not been resolved through the interpretations by City as
30 described in Paragraph 6, and (iv) that the Contract Documents are generally sufficient
31 to indicate and convey understanding of all terms and conditions for performing and
32 furnishing the Work.
33

34 3.4. The provisions of this Paragraph 4, inclusive, do not apply to Asbestos, Polychlorinated
35 biphenyls (PCBs), Petroleum, Hazardous Waste or Radioactive Material covered by
36 Paragraph 5.06. of the General Conditions, unless specifically identified in the Contract
37 Documents.
38

39 3.5. The Offeror acknowledges and agrees to comply with the requirements of City Ethics
40 Ordinance No. 18-157.
41

42 **4. Availability of Lands for Work, Etc.**
43

- 1 4.1. The lands upon which the Work is to be performed, rights-of-way and easements for
2 access thereto and other lands designated for use by Contractor in performing the Work
3 are identified in the Contract Documents. All additional lands and access thereto
4 required for temporary construction facilities, construction equipment or storage of
5 materials and equipment to be incorporated in the Work are to be obtained and paid for
6 by Contractor. Easements for permanent structures or permanent changes in existing
7 facilities are to be obtained and paid for by City unless otherwise provided in the
8 Contract Documents.
9
- 10 4.2. Outstanding right-of-way, easements, and/or permits to be acquired by the City are listed
11 in Paragraph SC 5.01 of the Supplementary Conditions. In the event the necessary right-
12 of-way, easements, and/or permits are not obtained, the City reserves the right to cancel
13 the award of contract at any time before the Offeror begins any construction work on the
14 project.
15
- 16 4.3. The Offeror shall be prepared to commence construction without all executed right-of-
17 way, easements, and/or permits, and shall submit a schedule to the City of how
18 construction will proceed in the other areas of the project that do not require permits
19 and/or easements.
20

21 **5. Interpretations and Addenda**

- 22
- 23 5.1. All questions about the meaning or intent of the Proposal Documents are to be directed to
24 the City in Ion Wave on or before the deadline advertised on this solicitation's page at
25 <http://dentontx.ionwave.net>. Questions received after this day **WILL NOT** be
26 responded to. Interpretations or clarifications considered necessary by City in response
27 to such questions will be issued by Addenda delivered to all parties recorded by City as
28 having received the Proposal Documents or by responding to individual questions via
29 this solicitation's page at <http://dentontx.ionwave.net>. Only questions answered by
30 formal written Addenda will be binding. Oral and other interpretations or clarifications
31 will be without legal effect.
32

33 Address questions for this solicitation's IONWAVE page to the 'Questions' tab
34 (dentontx.ionwave.net).
35

- 36 5.2. Addenda may also be issued to modify the Proposal Documents as deemed advisable by
37 City.
38
- 39 5.3. Addenda or clarifications may be posted via the City's online hosting site, which can be
40 located by visiting and logging-in to the City of Denton's Purchasing solicitation website
41 at <http://dentontx.ionwave.net> and clicking on this solicitation's link.
42
- 43 5.4. A Pre-proposal conference may be held at the time and place indicated in the
44 Advertisement or INVITATION TO OFFERORS. Representatives of City will be
45 present to discuss the Project. Offerors are encouraged to attend and participate in the
46 conference. City will transmit to all prospective Offerors of record such Addenda as
47 City considers necessary in response to questions arising at the conference. Oral
48 statements may not be relied upon and will not be binding or legally effective.
49

1 **6. Proposal Security**
2

3 6.1. Each Proposal for projects over \$100,000, must be accompanied by Offeror's Bond made
4 payable to City in an amount of five (5) percent of Offeror's maximum price proposed
5 Proposal Form attached, issued by a surety meeting the requirements of Paragraphs 6.01
6 of the General Conditions.
7

8 6.2. The Offeror's Bond of all Offerors will be retained until the conditions of the Notice of
9 Award have been satisfied. If the Successful Offeror fails to execute and deliver the
10 complete Agreement within 10 days after the Notice of Award, City may consider
11 Offeror to be in default, rescind the Notice of Award, and the Offeror's Bond of that
12 Offeror will be forfeited. Such forfeiture shall be City's exclusive remedy if Offeror
13 defaults. The Offeror's Bond of all other Offerors whom City believes to have a
14 reasonable chance of receiving the award will be retained by City until final contract
15 execution.
16

17 **7. Contract Times**
18

19 7.1. The Contract will be a Calendar Day contract, and the provisions of the Contract
20 Documents related to Calendar Days will apply.
21

22 7.2. The Contract Time for Substantial Completion will be the number of Calendar Days
23 specified in the Agreement, together with time extensions authorized in accordance with
24 applicable provisions of the Contract Documents.
25

26 7.3. The Contract Time for Final Completion will be the number of Calendar Days specified
27 in the Agreement, together with time extensions authorized in accordance with
28 applicable provisions of the Contract Documents.
29

30 **8. Incentives and Disincentives**
31

32 8.1. Provisions for Incentives (if applicable) and Disincentives are defined in the
33 Supplementary Conditions and set forth in the Agreement.
34

35 **9. Liquidated Damages**
36

37 9.1. Provisions for liquidated damages are set forth in the Agreement.
38
39

40 **10. Substitute and "Or-Equal" Items**
41

1 10.1. The Contract, if awarded, will be on the basis of materials and equipment described
2 in the Proposal Documents without consideration of possible substitute or "or-equal"
3 items. Whenever it is indicated or specified in the Proposal Documents that a
4 "substitute" or "or-equal" item of material or equipment may be furnished or used by
5 Contractor if acceptable to City, application for such acceptance will not be
6 considered by City until after the Effective Date of the Agreement. The procedure
7 for submission of any such application by Contractor and consideration by City is set
8 forth in Paragraphs 7.06 and 7.07 of the General Conditions and is supplemented in
9 Section 01 25 00 of the General Requirements.

11. Subcontractors, Suppliers and Others

11.1. No Contractor shall be required to employ any Subcontractor, Supplier, other person
or organization against whom Contractor has reasonable objection.

12. Submittal Requirements

12.1. Bids shall be submitted electronically. Electronic submittals must be submitted using
this solicitation's page in <http://dentontx.ionwave.net>. Electronic submittals will not
be accepted via email.

12.2. In addition to completing all required sections of the Proposal Documents, the
Offeror shall provide documentation demonstrating the Offeror's qualifications and
experience. This documentation shall be included with the Offeror's Ionwave
submissions. The Offeror shall address each of the following items in the same order
in which they are set forth below. Qualification and experience documentation shall
be submitted on letter-size (8-1/2" x 11") PDF. The qualifications and experience
data provided shall include, but may not be limited to the following:

12.2.1. **Proposal Form** – Provide the information as required in Sections 00 41 01 –
Proposal Form, and 00 42 44 – Unit Price Proposal Form, to establish:

12.2.1.1. Offeror's General Information

12.2.1.2. Proposal Price

12.2.2. **Quality, Reputation, and Ability to Complete Similar Projects on Schedule
and Within Budget:** The Offeror shall demonstrate experience in delivering
similar work as expressed in the Proposal Documents on schedule and within
budget. Submit details of five (5) similar projects completed within the last ten (10)
years. The Offeror should include the following items for each project submitted:

12.2.2.1. Project Name

12.2.2.2. Owner Name

12.2.2.3. Project Owner Contact Name, Phone Number, and Email Address

12.2.2.4. Contract Time and Actual Completion Time

12.2.2.5. Original Contract Cost and Final Contract Cost

12.2.2.6. Detailed Project Description.

12.2.2.7. The Offeror should present projects that demonstrate experience in the
following categories:

Roadway Subgrade Stabilization

Curb and Gutter Construction

1 *Asphalt Paving*
2 *Water Line Installation*
3 *Wastewater Line Installation*
4

5 **12.2.3. Offeror's Key Personnel:** The Offeror shall include an organizational chart
6 (maximum of 1 page) and resume (maximum of 1 page per person) of key team
7 members that will be assigned to the Project. The Offeror should, at a minimum,
8 provide personnel experience for the Project Manager, Superintendent, and the
9 Foreman/Foremen. The Key Personnel resumes should include the following
10 information:

- 11
- 12 12.2.3.1. Name and Job Title
- 13 12.2.3.2. Role and Responsibility
- 14 12.2.3.3. Total number of years of experience and total number of years with
15 current firm.
- 16 12.2.3.4. Licenses and Certifications.
- 17 12.2.3.5. Project Role and Responsibilities.
- 18 12.2.3.6. Relevant experience for the categories listed in 13.1.2.7, specifically
19 within the last 5 years. Identify if projects were completed with current
20 firm or previous firm.
- 21 12.2.3.7. List of other active projects Key Personnel will be assigned to for the
22 duration of this project and include percentage of time allocated for each.
- 23

24 **12.2.4. Detailed Schedule and Written Plan to Achieve Substantial Completion and**
25 **Final Acceptance within the Contract Time:** The Offeror shall demonstrate
26 means and methods to achieve Substantial Completion and Final Acceptance within
27 the Contract Time. The Offeror shall include the following:

- 28
- 29 12.2.4.1. Baseline Schedule – The Offeror shall submit a detailed Baseline
30 Schedule in accordance with Section 01 32 16. The schedule should
31 demonstrate the Offeror's ability to complete the Project within the
32 Contract Time. The Plan should clearly identify the Critical Path Items
33 and the Plan to keep the project on schedule. The Plan should include,
34 but not be limited to:
 - 35
 - 36 12.2.4.1.1. Critical Path Plan
 - 37 12.2.4.1.2. Project Specific Tasks:
38 *Start and completion of wet utilities for each road segment*
39 *Start and completion of roadway reconstruction for each road*
40 *segment*
 - 41
 - 42 12.2.4.1.3. Equipment and material delivery
 - 43 12.2.4.1.4. Hours of Operation
 - 44 12.2.4.1.5. Offeror's Resources to reach Substantial Completion, including
45 the number of shifts or crews working in parallel.
 - 46

47 **12.2.5. Offeror's Safety Record:** The Offeror shall provide responses and any
48 supporting documentation necessary for the Owner to evaluate the safety record for
49 the Offeror and proposed Subcontractors. The response shall include, but may not
50 be limited to the following:

- 1 12.2.5.1. Documentation of any complaints to, or final orders entered by, the
- 2 Occupational Safety and Health Review Commission (OSHRC) against
- 3 the Offeror or a proposed Subcontractor for violation(s) of OSHA
- 4 regulations within the last five (5) years.
- 5 12.2.5.2. Documentation of any citations received by the Offeror or a proposed
- 6 Subcontractor from any federal, state, or local environmental protection
- 7 enforcement agency.
- 8 12.2.5.3. Provide records showing Total Recordable Incident Rate (TRIR) for each
- 9 year for the last five (5) years for the Offeror and each proposed
- 10 Subcontractor.
- 11 12.2.5.4. Provide records documenting the Experience Modification Rate (EMR)
- 12 for the last five (5) years for the Offeror and each proposed
- 13 Subcontractor.
- 14 12.2.5.5. List any fatalities in the safety history for the last ten (10) years for the
- 15 Offeror and each proposed Subcontractor.
- 16 12.2.5.6. Section 00 45 14 – Safety Record Questionnaire.
- 17
- 18 12.3. In addition to the information provided above the Offeror shall submit the following
- 19 forms as part of the Proposal:
- 20
- 21 12.3.1. Section 00 35 14 – Conflict of Interest Affidavit – CSP
- 22 12.3.2. Section 00 41 01 – Proposal Form – CSP
- 23 12.3.3. Section 00 42 44 – Unit Price Proposal Form – CSP
- 24 12.3.4. Section 00 43 14 – Offeror’s Bond – CSP (Hard copy required; must be
- 25 submitted prior to deadline)
- 26
- 27 12.3.5. Section 00 43 38 – Proposed Subcontractors Form – CSP
- 28 12.3.6. Section 00 43 39 – Vendor Compliance to State Law Non-Resident Offeror –
- 29 CSP
- 30 12.3.7. Section 00 45 14 – Safety Record Questionnaire – CSP
- 31 12.3.8. Section 00 45 27 – Contractors Compliance with Workers Compensation Law –
- 32 CSP
- 33 12.3.9. Section 00 45 44 – Corporate Resolution of Authorized Signatories – CSP
- 34

35 13. Proposal Form

- 36
- 37 13.1. The Proposal Form is included with the Proposal Documents; additional copies may
- 38 be obtained from the City.
- 39
- 40 13.2. All blanks on the Proposal Form must be completed and the Proposal Form signed.
- 41 Erasures or alterations shall be initialed by the person signing the Proposal Form. A
- 42 Proposal price shall be indicated for each proposed item, alternative, and unit price
- 43 item listed therein. In the case of optional alternatives, the words "No Proposal," "No
- 44 Change," or "Not Applicable" may be entered. Offeror shall state the prices, in both
- 45 words and numerals, for which the Offeror proposes to do the work contemplated or
- 46 furnish materials required. If handwritten, all prices shall be written legibly. In case
- 47 of discrepancy between price in written/typed words and the price in written/typed
- 48 numerals, the price in written/typed words shall govern.
- 49

- 1 13.3. Proposals by corporations shall be executed in the corporate name by the president or
2 a vice-president or other corporate officer accompanied by evidence of authority to
3 sign, as provided herein, Section 00 45 44 – Corporate Resolution of Authorized
4 Signatories – CSP. The corporate address and state of incorporation shall be shown
5 below the signature.
6
- 7 13.4. Proposals by partnerships shall be executed in the partnership name and signed by a
8 partner, whose title must appear under the signature accompanied by evidence of
9 authority to sign. The official address of the partnership shall be shown below the
10 signature.
11
- 12 13.5. Proposals by limited liability companies shall be executed in the name of the firm by
13 a member and accompanied by evidence of authority to sign. The state of formation
14 of the firm and the official address of the firm shall be shown.
15
- 16 13.6. Proposals by individuals shall show the Offeror's name and official address.
17
- 18 13.7. Proposals by joint ventures shall be executed by each joint venturer in the manner
19 indicated on the Proposal Form. The official address of the joint venture shall be
20 shown.
21
- 22 13.8. All names shall be typed below the signature.
23
- 24 13.9. The Proposal shall contain an acknowledgement of receipt of all Addenda, the
25 numbers of which shall be filled in on the Proposal Form.
26
- 27 13.10. Postal and e-mail addresses and telephone number for communications regarding the
28 Proposal shall be shown.
29
- 30 13.11. Evidence of authority to conduct business as a Nonresident Offeror in the state of
31 Texas shall be provided in accordance with Section 00 43 39 – Vendor Compliance
32 to State Law Non Resident Offeror.
33

34 **14. Submission of Proposals**

- 35
- 36 14.1. Proposals may be submitted electronically. Electronic submittals must be submitted
37 using this solicitation's page in <http://dentontx.ionwave.net>. Electronic submittals
38 will not be accepted via email.
39
- 40 14.2. Hard copies of Offeror's bonds shall be submitted. Bonds must be submitted in a
41 sealed envelope before the due date and time as indicated in
42 <http://dentontx.ionwave.net>.
43
- 44 14.3. Proposals shall be submitted on the prescribed Proposal Form, provided with the
45 Proposal Documents, via this solicitation's Ionwave page
46 (<http://dentontx.ionwave.net>) as indicated in the Advertisement or INVITATION TO
47 OFFERORS.
48
- 49
- 50 14.4. Address hard copy Offer's Bonds as follows:

1
2 City of Denton
3 901-B Texas Street
4 Denton, TX 76209
5 Attn: Materials Management/Purchasing Division, *CSP 7857 2020 Street Bundle*
6 – *Sector III*
7

8 **15. Modification and Withdrawal of Proposals**
9

- 10 15.1. Proposals addressed to the Purchasing Agent and filed with the Purchasing Division
11 may be withdrawn prior to the time set for Proposal opening. A request for
12 withdrawal must be made in writing by an appropriate document duly executed in the
13 manner that a Proposal must be executed and delivered to the place where Proposals
14 are to be submitted at any time prior to the opening of Proposals. After all Proposals
15 not requested for withdrawal are opened and publicly read aloud, the Proposals for
16 which a withdrawal request has been properly filed may, at the option of the City, be
17 returned unopened.
18
19 15.2. Offerors may modify their Proposal by electronic communication at any time prior to
20 the time set for the closing of Proposal receipt.
21

22 **16. Opening of Proposals**
23

- 24 16.1. Proposals will be opened, and the name of each Offeror will be read aloud publicly at
25 the place where Proposals are to be submitted. The proposed price will be read
26 aloud. An abstract of the amounts of the base price proposals and major alternates (if
27 any) will be made available to Offerors only after Proposals have been evaluated in
28 accordance with this Section.
29

30 **17. Proposals to Remain Subject to Acceptance**
31

- 32 17.1. All Proposals will remain subject to acceptance for the time period specified for
33 Notice of Award and execution and delivery of a complete Agreement by Successful
34 Offeror. City may, at City's sole discretion, release any Proposal and nullify the
35 Proposal security prior to that date.
36

37 **18. Rejection of Proposals**
38

- 39 18.1. The City reserves the right to reject any or all Proposals, including without limitation
40 the rights to reject any or all nonconforming, nonresponsive, unbalanced, or
41 conditional Proposals and to reject the Proposal of any Offeror if City believes that it
42 would not be in the best interest of the Project to make an award to that Offeror,
43 whether because the Proposal is not responsive or the Offeror is unqualified or of
44 doubtful financial ability or fails to meet any other pertinent standard or criteria
45 established by City.
46
47

48 **19. Disqualification of Proposals**
49

- 1 19.1. The City reserves the right to waive informalities in a Proposal not involving price.
2 Discrepancies between the multiplication of units of Work and unit prices will be
3 resolved in favor of the unit prices. Discrepancies between the indicated sum of any
4 column of figures and the correct sum thereof will be resolved in favor of the correct
5 sum. Discrepancies between words and figures will be resolved in favor of the
6 words.
7
- 8 19.2. Any of the following **shall** be cause to disqualify a Proposal:
9
- 10 19.2.1. The Proposal is not signed by a person empowered to bind the Offeror.
 - 11 19.2.2. The Proposal is not accompanied by an acceptable Offeror's Bond, with Power
12 of Attorney attached.
 - 13 19.2.3. The Proposal is submitted by an Offeror that has submitted more than one
14 Proposal.
 - 15 19.2.4. There is evidence of collusion between the Offeror submitting the Proposal and
16 one or more other Offerors.
 - 17 19.2.5. The Offeror did not attend or have an authorized agent attend a mandatory Pre-
18 Proposal Conference, if applicable.
 - 19 19.2.6. The Offeror is under debarment or suspension by the Owner.
 - 20 19.2.7. The Offeror or a principal of the Offeror is currently debarred or suspended by a
21 Federal, State or local governmental agency. (Applicable for Proposal amounts
22 equal to or in excess of \$25,000.00)
 - 23 19.2.8. The Offeror is an interested party to any litigation against City, or City or Offeror
24 may have a claim against the other or be engaged in litigation, or Offeror is in
25 arrears on any existing contract or has defaulted on a previous contract.
 - 26 19.2.9. The Offeror has performed a prior contract in an unsatisfactory manner.
 - 27 19.2.10. The Offeror has uncompleted work which in the judgement of the City will
28 prevent or hinder the prompt completion of additional work if awarded.
 - 29 19.2.11. Incompleteness or an omission, alteration of form, or addition, or the inclusion of
30 a qualification or condition not called for or authorized in the Proposal
31 Documents.
 - 32 19.2.12. Ambiguity or lack of clarity in a Proposal, in which case the City reserves the
33 right to interpret the Proposal in the most advantageous manner for the City, or to
34 reject the Proposal.
 - 35 19.2.13. Failure to acknowledge receipt of Addenda.
 - 36 19.2.14. Failure to identify a dollar amount for one or more unit prices required to be
37 provided in the Unit Price Proposal Form.
 - 38 19.2.15. Failure to submit post-Proposal information within the allotted time(s).
 - 39 19.2.16. Failure to timely execute and deliver the Contract to the City after award.

40 41 **20. Evaluation of Proposals**

- 42
- 43 20.1. Proposals will be evaluated by a Selection Team from the relevant City Departments.
44 The Selection Team will score the received Proposals based on the evaluation criteria
45 below to determine the Offeror that provides the Best Value.
46
- 47 20.1.1. In evaluating a Proposal from a Nonresident Offeror, Proposal Prices and/or
48 evaluation scores will be adjusted to the extent practicable to offset the
49 advantage, if any, the Nonresident Offeror would have over a Texas-resident
50 offeror in the Nonresident Offeror's state.

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- 20.2. The City will process and evaluate the received Proposals expeditiously, based on the evaluation criteria below to determine the Offeror that provides the Best Value for the City. The City will not be liable to any Offeror, however, for any delays in connection with the evaluation, award or execution of the Contract.
- 20.3. Evaluation shall be based of the highest scoring of the Proposals with a maximum score of 100 points apportioned as follows:

Evaluation Criteria	Points	Requirements
Proposal Price	40	12.1.1 & 20.4.1
Quality, Reputation, and Ability to Complete Similar Projects on Schedule and Within Budget	25	12.1.2 & 20.4.2
Offeror's Key Personnel	10	12.1.3 & 20.4.3
Detailed Schedule and Written Plan to achieve Substantial and Final Acceptance within the Contract Time	20	12.1.4 & 20.4.4
Offeror's Safety Record	5	12.1.5 & 20.4.5
Maximum Score:		100

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- 20.4. Evaluation criteria will be as follows:
- 20.4.1. **Proposal Price (40 Points):** Points for Proposal Price shall be based on prices submitted by Offerors. The lowest responsible Offeror's Proposal Price receive the highest score in this category. All other Offeror's Proposal Prices will receive decreasing points in order of increasing Proposal Price.
- 20.4.2. **Quality, Reputation, and Ability to Complete Similar Projects on Schedule and Within Budget (25 Points):** Points will be awarded based on the Offeror's experience relevant to this Project, the reputation of the Offeror in performance of similar past projects, and overall reputation and experience of the Offeror. The City will evaluate the projects submitted in accordance with the Submittal Requirements Paragraph, to determine relevancy to the specified scope of this Project and review the Offeror's performance on the submitted projects. The City may contact the references provided by the Offeror, as well as any other additional references, as may be necessary to verify the qualifications, experience, and reputation of the Offeror.
- 20.4.3. **Offeror's Key Personnel (10 Points):** Key Personnel will be awarded points for the listed role and responsibility that the resume demonstrates with a maximum score of ten (10) points for a single team member that demonstrates all desirable characteristics. The scores of the individual team members will then be averaged to determine the score for the Offeror's Key Personnel.

Offeror's Key Personnel	Points
Key personnel have previously worked with other team members within the past 5 years.	1
Key personnel have Relevant Experience to the type and scope of work required for this Project.	3

Key personnel have clearly defined role and past experience that demonstrates their ability to effectively fill the role for the specified Project.	3
Key Personnel has been with the company three (3) or more years.	1
Key Personnel clearly shows time commitment to project.	2
Maximum Score:	10

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20.4.4. **Detailed Schedule and Written Plan to achieve Substantial Completion and Final Acceptance within the Contract Time (20 Points):** The schedule and plan should clearly show the Critical Path and the means and methods the Offeror will use to achieve Substantial Completion and Final Acceptance within the Contract Time. Scoring will be based on the Offeror’s ability to communicate the plan and schedule.

20.4.5. **Offeror’s Safety Record (5 Points):** The Owner will award points based on evaluation of the safety documentation provided by the Offeror as required in the Submittal Requirements paragraph. Safety documentation for the Offeror and Subcontractors will be evaluated and considered in awarding points for this item.

20.5. In the event of a tie in the total summation of Points for the Best Value, the lowest Proposal Price will break the tie and determine the Successful Offeror.

20.6. City may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Contract Documents or upon the request of the City. City also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

20.7. City may conduct such investigations as City deems necessary to assist in the evaluation of any Proposal and to establish the responsibility, qualifications, and financial ability of Offerors, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to City’s satisfaction within the prescribed time.

20.8. Contractor shall perform with his own organization, work of a value not less than 35% of the value embraced on the Contract, unless otherwise approved by the City. Contractor shall complete and submit Section 00 43 38 – Proposed Subcontractors Form – CSP.

21. Award of Contract

21.1. If the Contract is to be awarded, it will be awarded to the Offeror whose evaluation by City indicates that the Award will provide the Best Value for the City.

1 21.2. Pursuant to Texas Government Code Chapter 2252.001, the City will not award
2 contract to a Nonresident Offeror unless the Nonresident Offeror's Proposal is lower
3 than the lowest Proposal submitted by a responsible Texas Offeror by the same
4 amount that a Texas resident Offeror would be required to underbid a Nonresident
5 Offeror to obtain a comparable contract in the state in which the nonresident's
6 principal place of business is located.

7
8 21.3. A contract is not awarded until formal City Council authorization. If the Contract is
9 to be awarded, City will award the Contract within 120 days after the day of the
10 Proposal opening unless extended in writing. No other act of City or others will
11 constitute acceptance of a Proposal. Upon the contractor award a Notice of Award
12 will be issued by the City.

13
14 21.4. Failure or refusal to comply with the requirements may result in rejection of
15 Proposal.

16
17 21.5. Contractor is required to fill out the Certificate of Interested Parties Form 1295 and
18 the form must be submitted to the City Project Manager before the contract will be
19 presented to the City Council. The form can be obtained at
20 <https://www.ethics.state.tx.us/tec/1295-Info.htm>.

21
22 **22. Signing of Agreement**

23 22.1. When City issues a Notice of Award to the Successful Offeror, it will be
24 accompanied by the required number of unsigned counterparts of the Agreement.
25 Within 14 days thereafter Contractor shall sign and deliver the required number of
26 counterparts of the Agreement to City with the required Bonds, Certificates of
27 Insurance, and all other required documentation. City shall thereafter deliver one
28 fully signed counterpart to Contractor.

29
30 **END OF SECTION**

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SECTION 00 35 14
CONFLICT OF INTEREST AFFIDAVIT - CSP

CONFLICT OF INTEREST QUESTIONNAIRE - FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local government entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

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

1 Name of vendor who has a business relationship with local governmental entity.

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

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 Name of local government officer about whom the information in this section is being disclosed.

Name of Officer

This section, (item 3 including subparts A, B, C & D), must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

Yes No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

Yes No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of one percent or more?

Yes No

D. Describe each employment or business and family relationship with the local government officer named in this section.

4 I have no Conflict of Interest to disclose.

5

Signature of vendor doing business with the governmental entity

Date

1

END OF SECTION

SECTION 00 41 01
PROPOSAL FORM - CSP

TO: *Cori Power*
c/o: Purchasing Division
901-B Texas Street
Denton, Texas 76209

FOR: *2020 Street Bundle – Sector III*

1 Enter Into Agreement

The undersigned Offeror proposes and agrees, if this Proposal is accepted, to enter into an Agreement with City in the form included in the Proposal Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Unit Price Proposal and within the Contract Time indicated in this Proposal and in accordance with the other terms and conditions of the Contract Documents.

2 OFFEROR Acknowledgements and Certification

- 2.1 In submitting this Proposal, Offeror accepts all of the terms and conditions of the INVITATION TO OFFERORS and INSTRUCTIONS TO OFFERORS, including without limitation those dealing with the disposition of Offeror's Bond.
- 2.2 Offeror is aware of all costs to provide the required insurance, will do so pending contract award, and will provide a valid insurance certificate meeting all requirements within 14 days of notification of award.
- 2.3 Offeror certifies that this Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
- 2.4 Offeror has not directly or indirectly induced or solicited any other Offeror to submit a false or sham Proposal.
- 2.5 Offeror has not solicited or induced any individual or entity to refrain from proposing.
- 2.6 Offeror has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph:
- a. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the proposal process.
 - b. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the proposal process to the detriment of City (b) to establish proposal prices at artificial non-competitive levels, or (c) to deprive City of the benefits of free and open competition.
 - c. "collusive practice" means a scheme or arrangement between two or more Offerors, with or without the knowledge of City, a purpose of which is to establish proposal prices at artificial, non-competitive levels.
 - d. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the proposal process or affect the execution of the Contract.

2.7 The Offeror acknowledges and agrees to comply with the requirements of City Ethics Ordinance No. 18-757.

3 Time of Completion

- 3.1 The Work will be Substantially Complete as defined in the Supplementary Conditions within [330] Days after the date when the Contract Time commences to run, which is the day indicated in the Notice to Proceed, plus any extension thereof allowed in accordance with Article 11 of the General Conditions.
- 3.2 The Work will be complete for Final Acceptance within [360] Days after the date when the Contract Time commences to run, which is the day indicated in the Notice to Proceed, plus any extension thereof allowed in accordance with Article 11 of the General Conditions.
- 3.3 Offeror accepts the provisions of the Agreement as to Liquidated Damages in the event of failure to obtain Milestones (if applicable), Substantial Completion, and Final Acceptance within the times specified in the Agreement.

4 Attached to this Proposal

- 4.1 The following documents are attached to and made a part of this Proposal:
 - a. Section 00 35 14 – Conflict of Interest Affidavit – CSP
 - b. Section 00 41 01 – This Proposal Form – CSP
 - c. **Section 00 42 44 – Unit Price Proposal Form – CSP – Electronic Excel Copy**
 - d. Section 00 43 14 – Required Offeror’s Bond – CSP, issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions.
 - e. Section 00 43 38 – Proposed Subcontractors Form – CSP
 - f. Section 00 43 39 – Vendor Compliance to State Law Non-Resident Offeror – CSP
 - g. Section 00 45 14 – Safety Record Questionnaire – CSP
 - h. Section 00 45 27 – Contractor’s Compliance with Workers Compensation Law – CSP
 - i. Section 00 45 44 – Corporate Resolution of Authorized Signatories – CSP
 - j. Any additional documents required by Paragraph 12 of Section 00 21 16 – Instructions to Offerors

5 Total Proposal Amount

- 5.1 Offeror will complete the Work in accordance with the Contract Documents for the following proposal amount. In the space provided below, please enter the total proposed amount for this project. This figure will be read publicly by the City at the proposal opening.
- 5.2 It is understood and agreed by the Offeror in signing this proposal that the total proposed amount entered below is subject to verification and/or modification by multiplying the unit prices for each pay item by the respective estimated quantities shown in this proposal and then totaling all of the extended amounts.

Total Proposal Amount (Base):	\$ _____
Total Proposal Amount (Base + Alternate A):	\$ _____
Total Proposal Amount (Base + Alternate B):	\$ _____
Total Proposal Amount (Base + Alternate A and B):	\$ _____

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6 Proposal Submittal

6.1 It is understood by Offeror that submission of the total proposal amount is only one of the factors for the City’s evaluation process, and that any award of contract will be based on the complete evaluation of the Proposal and Offeror by City under the terms provided in the Instructions to Offerors or any validly issued amendments or addenda.

6.2 This Proposal is submitted on _____, 20__ by the entity named below.

Respectfully submitted,

By: _____
(Signature)

(Printed Name)

Title: _____

Company: _____

Receipt is acknowledged of the following Addenda:	Initial
Addendum No. 1:	
Addendum No. 2:	
Addendum No. 3:	
Addendum No. 4:	

Address: _____

State of Incorporation: _____

Email: _____

Phone: _____

END OF SECTION



SECTION 00 42 44 - UNIT PRICE PROPOSAL FORM - CSP

To: City of Denton - Capital Projects
 901-B Texas Street
 Denton, TX 76209
 Cori Power/Purchasing Dept.

From: COMPANY NAME
 STREET ADDRESS
 CITY, STATE
 CONTACT
 PHONE
 EMAIL

PROJ.: **2020 Street Bundle - Sector III**

CSP: 7857
 ENG: 190003
 PMO:

OFFEROR'S APPLICATION - UNIT PRICE PROPOSAL

Item No.	Spec. Section No.	Description	UOM	BID QTY	Unit Price	Extended Price
1	01 70 00	Mobilization	LS	1	\$ -	\$ -
2	01 57 13	SWPPP ≥ 1 acre < 5 acre	LS	1	\$ -	\$ -
3	01 58 13	Project Signs	EA	2	\$ -	\$ -
4	02 41 14	Abandon Utility Manhole	EA	7	\$ -	\$ -
5	02 41 14	Remove Utility Manhole	EA	4	\$ -	\$ -
6	02 41 14	Utility Line Plugging	LS	1	\$ -	\$ -
7	02 41 14	Remove Water Valve	EA	1	\$ -	\$ -
8	02 41 14	Abandon Water Valve	EA	31	\$ -	\$ -
9	02 41 14	Remove Fire Hydrant	EA	15	\$ -	\$ -
10	02 41 15	Remove Cleanout	EA	2	\$ -	\$ -
11	02 41 15	Remove Concrete Curb and Gutter	LF	3,495	\$ -	\$ -
12	02 41 15	Remove Concrete Valley Gutter	SY	118	\$ -	\$ -
13	02 41 15	Remove Sidewalk	SF	1,527	\$ -	\$ -
14	02 41 15	Remove Curb Ramp	EA	5	\$ -	\$ -
15	02 41 15	Remove Asphalt Pavement	SY	45,055	\$ -	\$ -
16	02 41 15	Remove Driveway	SF	4,869	\$ -	\$ -
17	02 41 15	Surface Milling 2"	SY	1,316	\$ -	\$ -
18	31 10 00	Site Clearing	LS	1	\$ -	\$ -
19	31 23 16	Unclassified Excavation	CY	4,284	\$ -	\$ -
20	31 25 14	SWPP Device Installation	LS	1	\$ -	\$ -
21	31 25 14	SWPP Device Removal	LS	1	\$ -	\$ -
22	32 01 17	Temporary Flexible Paving Repair for Utility Trench	SY	5,216	\$ -	\$ -
23	32 11 23	Flexible Base Course (12")	SY	720	\$ -	\$ -
24	32 11 29	Lime Treated Base Course (12")	SY	40,602	\$ -	\$ -
25	32 11 29	Hydrated Lime	TN	1,534	\$ -	\$ -
26	32 11 33	Cement Treated Base Course (12")	SY	3,733	\$ -	\$ -
27	32 11 29	Cement	TN	141	\$ -	\$ -
28	32 12 16	Asphalt Pavement Type B (PG64-22) 6"	SY	33,436	\$ -	\$ -
29	32 12 16	Asphalt Pavement Type B (PG64-22) 9"	SY	11,619	\$ -	\$ -
30	32 12 16	Asphalt Pavement Type D (PG70-22) 2"	SY	26,951	\$ -	\$ -
31	32 12 16	Asphalt Pavement Type C (PG70-22) 3"	SY	19,420	\$ -	\$ -
32	32 16 00	Concrete Curb and Gutter	LF	3,535	\$ -	\$ -
33	32 16 00	Concrete Valley Gutter	LF	153	\$ -	\$ -
34	32 16 00	Concrete Sidewalk	SY	146	\$ -	\$ -
35	32 16 00	Concrete Driveway Approach	SY	707	\$ -	\$ -
36	32 16 00	Concrete Intersection Approach	SY	67	\$ -	\$ -
37	32 16 00	Type 1A Curb Ramp	EA	6	\$ -	\$ -
38	32 16 00	Type 1B Curb Ramp	EA	2	\$ -	\$ -
39	32 16 00	Detectable Warning Surface (Pavers)	EA	2	\$ -	\$ -
40	32 17 23	4" Broken White Stripe with RPM	LF	4,400	\$ -	\$ -

Item No.	Spec. Section No.	Description	UOM	BID QTY	Unit Price	Extended Price
41	32 17 23	4" Double Solid Yellow Stripe with RPM	LF	1,820	\$ -	\$ -
42	32 17 23	4" Solid Yellow Stripe no RPM	LF	500	\$ -	\$ -
43	32 17 23	8" Dotted White Stripe no RPM	LF	220	\$ -	\$ -
44	32 17 23	8" Solid White Stripe with RPM	LF	380	\$ -	\$ -
45	32 17 23	24" Solid White Bar no RPM	LF	70	\$ -	\$ -
46	32 17 23	24" Solid Yellow Bar with RPM	LF	50	\$ -	\$ -
47	32 17 23	Pedestrian Crosswalk White	EA	2	\$ -	\$ -
48	32 17 23	Turn Arrow White	EA	4	\$ -	\$ -
49	32 17 23	Word Pavement Marking White	EA	4	\$ -	\$ -
50	34 71 13	Traffic Control Devices	MO	11	\$ -	\$ -
51	34 71 13	Traffic Control Plan	EA	11	\$ -	\$ -
52	33 05 05	Excavation Protection	LF	11,754	\$ -	\$ -
53	32 93 00	Block Sod	SY	2,320	\$ -	\$ -
54	03 80 00	Core Existing Manhole	EA	1	\$ -	\$ -
55	33 05 61; 33 05 62	Concrete Manhole (4' ID)	EA	15	\$ -	\$ -
56	33 05 61; 33 05 62	Extra Depth Manhole	VF	10	\$ -	\$ -
57	33 14 11	PVC Water Main (12")	LF	1,210	\$ -	\$ -
58	33 14 11	PVC Water Main (8")	LF	7,476	\$ -	\$ -
59	33 14 11	Water Service Connection (1")	EA	133	\$ -	\$ -
60	33 14 17	Water Service Connection (2")	EA	5	\$ -	\$ -
61	33 14 20	Gate Valve (6")	EA	1	\$ -	\$ -
62	33 14 20	Gate Valve (8")	EA	29	\$ -	\$ -
63	33 14 20	Gate Valve (12")	EA	4	\$ -	\$ -
64	33 14 25	City Performed Tapping Sleeve and Valve Connection (6" x 6")	EA	1	\$ -	\$ -
65	33 14 25	City Performed Tapping Sleeve and Valve Connection (12" x 8")	EA	1	\$ -	\$ -
66	33 14 25	City Performed Tapping Sleeve and Valve Connection (16" x 8")	EA	4	\$ -	\$ -
67	33 14 25	Connection to Existing Main (6")	EA	7	\$ -	\$ -
68	33 14 25	Connection to Existing Main (8")	EA	5	\$ -	\$ -
69	33 14 40	Fire Hydrant Assembly	EA	17	\$ -	\$ -
70	33 14 11; 33 31 14	Sanitary Sewer Gravity Main (6")	LF	18	\$ -	\$ -
71	33 14 11; 33 31 14	Sanitary Sewer Gravity Main (8")	LF	3,050	\$ -	\$ -
72	33 01 30	Post-CCTV Inspection	LF	3,050	\$ -	\$ -
73	33 14 16	Sanitary Sewer Service Connection (4")	EA	60	\$ -	\$ -
74	33 14 16	Sanitary Sewer Service Connection (6")	EA	5	\$ -	\$ -
75	33 05 98	Location of Existing Utilities	LS	1	\$ -	\$ -
76	33 32 11	Bypass Pumping	LS	1	\$ -	\$ -

TOTAL BASE PROPOSAL: \$0.00

Alternate A						
75	02 41 15	Remove Concrete Curb and Gutter	LF	10	\$ -	\$ -
76	31 23 16	Unclassified Excavation	CY	56	\$ -	\$ -
77	32 16 00	Concrete Sidewalk	SY	222	\$ -	\$ -
78	32 16 00	Type 1A Curb Ramp	EA	1	\$ -	\$ -
TOTAL Alternate A PROPOSAL:						\$0.00

Alternate B						
79	02 41 15	Remove Curb Ramp	EA	39	\$ -	\$ -
80	32 16 00	Type 1A Curb Ramp	EA	33	\$ -	\$ -
81	32 16 00	Type 1B Curb Ramp	EA	4	\$ -	\$ -
82	32 16 00	Type III Curb Ramp	EA	2	\$ -	\$ -
83	32 16 00	Detectable Warning Surface (Ultratech)	EA	8	\$ -	\$ -
TOTAL Alternate B PROPOSAL:						\$0.00

Item No.	Spec. Section No.	Description	UOM	BID QTY	Unit Price	Extended Price
2020 Street Bundle - Sector III		TOTAL PROPOSAL (BASE Only):				\$0.00
2020 Street Bundle - Sector III		TOTAL PROPOSAL (BASE + Alternate A):				\$0.00
2020 Street Bundle - Sector III		TOTAL PROPOSAL (BASE + Alternate B):				\$0.00
2020 Street Bundle - Sector III		TOTAL PROPOSAL (BASE + Alternate A & B):				\$0.00

1 **SECTION 00 43 14**
2 **OFFEROR'S BOND - CSP**

3
4 **KNOW ALL BY THESE PRESENTS:**

5 That we, (Offeror Name) _____,
6 known as "Principal" herein, and (Surety Name) _____, a
7 corporate surety duly authorized to do business in the State of Texas, known as "Surety" herein,
8 are held and firmly bound unto the City of Denton, a Texas home-rule municipal corporation
9 created pursuant to the laws of Texas, known as "City" herein, in the penal sum of five percent
10 (5%) of Offeror's maximum proposal price, in lawful money of the United States, to be paid in
11 Denton, Denton County, Texas for the payment of which sum well and truly to be made, we bind
12 ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally,
13 firmly by these presents.

14 **WHEREAS**, the Principal has submitted a proposal to perform work for the following
15 project designated as

16 ***2020 Street Bundle – Sector III***

17 ***Limits as follows: McKinney from Crawford to Audra, Wood from McKinney to Paisley, Wood***
18 ***from McKinney to Sycamore, Hickory from Exposition to Ruddell, Bradshaw from Hickory to***
19 ***McKinney, Crawford from Hickory to McKinney, Oak from Bradshaw to Wood, Uland from***
20 ***Railroad to Rose, Rose from Uland to Paisley, Hettie from McKinney to Paisley.***

21
22 **NOW, THEREFORE**, the condition of this obligation is such that if the City shall
23 award the Contract for the foregoing project to the Principal, and the Principal shall satisfy all
24 requirements and conditions required for the execution of the Contract and shall enter into the
25 Contract in writing with the City in accordance with the terms of such same, then this obligation
26 shall be and become null and void. If, however, the Principal fails to execute such Contract in
27 accordance with the terms of same or fails to satisfy all requirements and conditions required for
28 the execution of the Contract, this bond shall become the property of the City, without recourse of
29 the Principal and/or Surety, not to exceed the penalty hereof, and shall be used to compensate
30 City for the difference between Principal's total proposal amount and the next selected offeror's
31 total proposal amount.

32 **PROVIDED FURTHER**, that if any legal action be filed on this Bond, venue shall lie in
33 the state district court of Denton County, Texas.

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SECTION 00 43 38
PROPOSED SUBCONTRACTORS FORM - CSP

Each Offeror for a City procurement is required to complete the information below by identifying the proposed subcontractors whom they intend to utilize and the approximate percentage of the overall contract that will be allocated to each entity. Offeror is reminded that a minimum of 35% of the Contract must be performed by Offeror's company.

Company Name	Type of Work to be Performed	Overall Contract Percentage (%)
General Contractor:		
Subcontractors:		

The undersigned hereby certifies that the subcontractors described in the table above will be utilized for this project at the approximate percentage levels indicated above.

OFFEROR:

_____ By: _____
 Company (Please Print)

_____ Signature: _____
 Address

_____ Title: _____
 City/State/Zip (Please Print)

Date: _____

END OF SECTION

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SECTION 00 43 39

VENDOR COMPLIANCE TO STATE LAW NON-RESIDENT OFFEROR - CSP

Texas Government Code Chapter 2252 was adopted for the award of contracts to nonresident offerors. This law provides that, in order to be awarded a best value contract where the offeror also offered the lowest proposal price, nonresident offerors (out-of-state contractors whose corporate offices or principal place of business are outside the State of Texas) propose on projects for construction, improvements, supplies or services in Texas at an amount lower than the lowest Texas resident offeror by the same amount that a Texas resident offeror would be required to underbid a nonresident offeror in order to obtain a comparable contract in the State which the nonresident’s principal place of business is located.

The appropriate blanks in Section A must be filled out by all nonresident offerors in order for your proposal to meet specifications. The failure of nonresident offerors to do so will automatically disqualify that offeror. Resident offerors must check the box in Section B.

A. Nonresident offerors in the State of _____, our principal place of business, are required to be _____ percent lower than resident offerors by State Law. A copy of the statute is attached.

Nonresident offerors in the State of _____, our principal place of business, are not required to underbid resident Offerors.

B. The principal place of business of our company or our parent company or majority owner is in the State of Texas.

OFFEROR:

Company By: _____
(Please Print)

Address Signature: _____

City/State/Zip Title: _____
(Please Print)

Date: _____

END OF SECTION

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SECTION 00 45 14
SAFETY RECORD QUESTIONNAIRE - CSP

The City of Denton desires to avail itself of the benefits of Section 252.0435 of the Local Government Code, and consider the safety records of potential contractors prior to award of City contracts. Pursuant to Section 252.0435 of the Local Government Code, the City of Denton has adopted the following written definition and criteria for accurately determining the safety record of a Offeror prior to awarding City contracts.

The definition and criteria for determining the safety record of a Offeror for this consideration shall be:

The City of Denton shall consider the safety record of the Offeror in determining the responsibility thereof. The City may consider any incidence involving worker safety or safety of the citizens of the City of Denton, be it related or caused by environmental, mechanical, operational, supervision or any other cause or factor. Specifically, the City may consider, among other things:

- A. Complaints to, or final orders entered by, the Occupational Safety and Health Review Commission (OSHRC), against the Offeror for violations of OSHA regulations within the past three (3) years.
- B. Citations (as defined below) from an Environmental Protection Agency (as defined below) for violations within the past five (5) years. Environmental Protection Agencies include, but are not necessarily limited to, the U.S. Army Corps of Engineers (USACOE), the U.S. Fish and Wildlife Service (USFWS), the Environmental Protection Agency (EPA), the Texas Commission on Environmental Quality (TCEQ), the Texas Natural Resource Conservation Commission (TNRCC) (predecessor to the TCEQ), the Texas Department of Health (TDH), the Texas Parks and Wildlife Department (TPWD), the Structural Pest Control Board (SPCB), agencies of local governments responsible for enforcing environmental protection or worker safety related laws or regulations, and similar regulatory agencies of other states of the United States. 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.
- C. Convictions of a criminal offense within the past ten (10) years, which resulted in bodily harm or death.
- D. Any other safety related matter deemed by the City Council to be material in determining the responsibility of the Offeror and his or her ability to perform the services or goods required by the solicitation documents in a safe environment, both for the workers and other employees of Offeror and the citizens of the City of Denton.

1 In order to obtain proper information from Offerors so that City of Denton may consider the
2 safety records of potential contractors prior to awarding City contracts, City of Denton requires
3 that Offerors answer the following three (3) questions and submit them with their submissions:
4
5

6 **QUESTION ONE**
7

8 Has the Offeror, or the firm, corporation, partnership, or institution represented by the Offeror, or
9 anyone acting for such firm, corporation, partnership or institution, received citations for
10 violations of OSHA within the past three (3) years?
11

12 YES _____ NO _____
13

14 If the Offeror has indicated YES for question number one above, the Offeror must provide to City
15 of Denton, with its submission, the following information with respect to each such citation:
16

17 Date of offense, location of establishment inspected, category of offense, final disposition of
18 offense, if any, and penalty assessed.
19

20 **QUESTION TWO**
21

22 Has the Offeror, or the firm, corporation, partnership, or institution represented by the Offeror, or
23 anyone acting for such firm, corporation, partnership or institution, received citations for
24 violations of environmental protection laws or regulations, of any kind or type, within the past
25 five years? Citations include notice of violation, notice of enforcement, suspension/revocations of
26 state or federal licenses, or registrations, fines assessed, pending criminal complaints,
27 indictments, or convictions, administrative orders, draft orders, final orders, and judicial final
28 judgments.
29

30 YES _____ NO _____
31

32 If the Offeror has indicated YES for question number two above, the Offeror must provide to City
33 of Denton, with its submission, the following information with respect to each such conviction:
34

35 Date of offense or occurrence, location where offense occurred, type of offense, final disposition
36 of offense, if any, and penalty assessed.
37

38 **QUESTION THREE**
39

40 Has the Offeror, or the firm, corporation, partnership, or institution represented by Offeror, or
41 anyone acting for such firm, corporation, partnership, or institution, ever been convicted, within
42 the past ten (10) years, of a criminal offense which resulted in serious bodily injury or death?
43

44 YES _____ NO _____
45
46

- 1 If the Offeror has indicated YES for question number three above, the Offeror must provide to
- 2 City of Denton, with its submission, the following information with respect to each such
- 3 conviction:
- 4 Date of offense, location where offense occurred, type of offense, final disposition of offense, if
- 5 any, and penalty assessed.

6 **END OF SECTION**

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SECTION 00 45 27

CONTRACTOR COMPLIANCE WITH WORKER'S COMPENSATION LAW - CSP

Pursuant to Texas Labor Code Section 406.096(a), as amended, Contractor certifies that it provides worker's compensation insurance coverage for all of its employees employed on *2020 Street Bundle – Sector III*. Contractor further certifies that, pursuant to Texas Labor Code, Section 406.096(b), as amended, it will provide to City its subcontractor's certificates of compliance with worker's compensation coverage.

CONTRACTOR:

Company By: _____
(Please Print)

Address Signature: _____

City/State/Zip Title: _____
(Please Print)

THE STATE OF TEXAS §
COUNTY OF DENTON §

BEFORE ME, the undersigned authority, on this day personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he/she executed the same as the act and deed of _____ for the purposes and consideration therein expressed and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this _____ day of _____, 20__.

Notary Public in and for the State of Texas

END OF SECTION

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SECTION 00 45 44
CORPORATE RESOLUTION AUTHORIZING SIGNATORIES - CSP

[Assembler: For Contract Document execution, remove this page and replace with Offeror's corporate resolution authorizing signatories.]

END OF SECTION

1 **SECTION 00 52 44**
2 **AGREEMENT - CSP**

3 **THIS AGREEMENT**, authorized on _____ is made by and between the City of Denton,
4 a Texas home rule municipal corporation, acting by and through its duly authorized City Manager,
5 (“City”), and _____,
6 authorized to do business in Texas, acting by and through its duly authorized representative,
7 (“Contractor”).

8 City and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

9 **Article 1. WORK**

10 Contractor shall complete all Work as specified or indicated in the Contract Documents for the
11 Project identified herein.

12 **Article 2. PROJECT**

13 The project for which the Work under the Contract Documents may be the whole or only a part is
14 generally described as follows:

15 **2020 Street Bundle – Sector III** _____

16 **Contract No: 7857** _____

17 **Article 3. CONTRACT PRICE**

18 City agrees to pay Contractor for performance of the Work in accordance with the Contract
19 Documents an amount, in current funds, of _____ Dollars
20 (\$_____).

21 **Article 4. CONTRACT TIME**

22 4.1 Time is of the essence.

23 All time limits for Milestones, if any, Substantial Completion and Final Acceptance as
24 stated in the Contract Documents are of the essence to this Contract.

25 4.2 Substantial Completion.

26 The Work will be Substantially Complete, as defined in the Supplementary Conditions,
27 within **{330}** Days after the date when the Contract Time commences to run, which is the
28 day indicated in the Notice to Proceed, plus any extension thereof allowed in accordance
29 with Article 11 of the General Conditions.

30 4.3 Final Acceptance.

31 The Work will be complete for Final Acceptance within **{365}** Days after the date when
32 the Contract Time commences to run, which is the day indicated in the Notice to Proceed,
33 plus any extension thereof allowed in accordance with Article 11 of the General
34 Conditions.
35

1 4.5 Liquidated Damages:

- 2 A. Contractor recognizes that *time is of the essence* to achieve Milestones, Substantial
3 Completion, and Final Acceptance of the Work, and City will suffer financial and other
4 losses if the Work is not completed within the times specified in the Contract
5 Documents. The Contractor also recognizes the delays, expense and difficulties
6 involved in proving, in a legal or arbitration proceeding, the actual loss suffered by the
7 City if the Work related to the Milestones, Substantial Completion, or Final Acceptance
8 is not completed on time. Accordingly, instead of requiring any such proof, Contractor
9 agrees that liquidated damages for delay (but not as a penalty):
- 10 1. *Substantial Completion*: If the Contractor neglects, refuses, or fails to achieve
11 Substantial Completion, as defined in the Supplementary Conditions, within the
12 time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.2,
13 Contractor shall pay City *one thousand* Dollars (\$1000.00) for each day that expires
14 after such time, until Substantial Completion is achieved.
 - 15 2. *Final Acceptance*: If Contractor neglects, refuse, or fails to complete the Work
16 within the time (as duly adjusted pursuant to the Contract) specified in Paragraph
17 4.3, for completion and readiness for Final Payment, Contractor shall pay City *five*
18 *hundred* Dollars (\$500.00) for each day that expires after such time, until the date
19 determined by City as stated in the City-issued Letter of Final Acceptance.

20 **Article 5. CONTRACT DOCUMENTS**

21 5.1 CONTENTS:

- 22 A. The Contract comprises the entire agreement between City and Contractor concerning the
23 Work and consists of this Agreement and the items set forth below. The Contract
24 Documents consist of all items below other than this Agreement:
- 25 1. Attachments to this Agreement:
 - 26 a. Proposal Form
 - 27 1) Proposal Form
 - 28 2) Unit Price Proposal Form
 - 29 3) Vendor Compliance to State Law Non-Resident Offeror
 - 30 4) State and Federal documents (*project specific*)
 - 31 b. Current Prevailing Wage Rate Table
 - 32 c. Worker's Compensation Affidavit
 - 33 d. General Conditions.
 - 34 e. Supplementary Conditions.
 - 35 2. The following located in File 7857 at:
36
37 [https://lfpubweb.cityofdenton.com/MaterialsManagement/Browse.aspx?startid=1](https://lfpubweb.cityofdenton.com/MaterialsManagement/Browse.aspx?startid=19&row=1&dbid=0)
38 [9&row=1&dbid=0](https://lfpubweb.cityofdenton.com/MaterialsManagement/Browse.aspx?startid=19&row=1&dbid=0):
39
40 a. Specifications described in the Table of Contents (Section 00 00 00) of the
41 Project's Contract Documents.
42 b. Drawings.
43 c. Addenda.
44 d. Documentation submitted by Contractor prior to Notice of Award.

- 1 3. The following which shall be issued after the Effective Date of this Agreement and
2 delivered to the City within ten (10) days of the Effective Date and before beginning
3 Work:
4 a. Payment Bond
5 b. Performance Bond
6 c. Maintenance Bond
7 d. Power of Attorney for the Bonds
8 e. Form 1295 – Certificate of Interested Parties (email to City’s Materials
9 Management department)
10 f. Insurance Certificate
11 4. Specifications specifically made a part of the Contract Documents by attachment or,
12 if not attached, as incorporated by reference and described in the Table of Contents
13 of the Project’s Contract Documents.
14 5. The following which may be delivered or issued after the Effective Date of the
15 Agreement and, if issued, become an incorporated part of the Contract Documents:
16 a. Notice to Proceed.
17 b. Field Orders.
18 c. Change Orders.
19 d. Letter of Final Acceptance.
20
21

1 **Article 6. INDEMNIFICATION**

2 **6.1 Contractor covenants and agrees to indemnify, hold harmless and defend, at its own**
3 **EXPENSE, THE CITY, ITS OFFICERS, ELECTED AND APPOINTED OFFICIALS,**
4 **AND EMPLOYEES, FROM AND AGAINST ANY AND ALL CLAIMS FOR**
5 **PERSONAL INJURY OR DEATH, ARISING OUT OF, OR ALLEGED TO ARISE**
6 **OUT OF, RELATED TO OR IN CONNECTION WITH THE WORK AND**
7 **SERVICES TO BE PERFORMED BY THE CONTRACTOR, ITS OFFICERS,**
8 **AGENTS, EMPLOYEES, SUBCONTRACTORS, LICENSEES OR INVITEES**
9 **UNDER THIS CONTRACT. THIS INDEMNIFICATION PROVISION IS**
10 **SPECIFICALLY INTENDED TO OPERATE AND BE EFFECTIVE EVEN IF IT IS**
11 **ALLEGED OR PROVEN THAT ALL OR SOME OF THE DAMAGES BEING**
12 **SOUGHT WERE CAUSED, IN WHOLE OR IN PART, BY ANY ACT, OMISSION**
13 **OR NEGLIGENCE OF THE CITY. THIS INDEMNITY PROVISION IS INTENDED**
14 **TO INCLUDE, WITHOUT LIMITATION, INDEMNITY FOR ANY AND ALL**
15 **COSTS, EXPENSES AND LEGAL FEES INCURRED BY THE CITY IN**
16 **DEFENDING AGAINST SUCH CLAIMS AND CAUSES OF ACTIONS.**

17
18 **6.2 CONTRACTOR COVENANTS AND AGREES TO INDEMNIFY, HOLD**
19 **HARMLESS AND DEFEND, AT ITS OWN EXPENSE, THE CITY, ITS OFFICERS,**
20 **SERVANTS AND EMPLOYEES, FROM AND AGAINST ANY AND ALL CLAIMS**
21 **FOR, LOSS OF, DAMAGE TO, OR DESTRUCTION OF, PROPERTY OF THE CITY**
22 **OR OF A THIRD PARTY, ARISING OUT OF, OR ALLEGED TO ARISE OUT OF,**
23 **RELATED TO OR IN CONNECTION WITH THE WORK AND SERVICES TO BE**
24 **PERFORMED BY THE CONTRACTOR, ITS OFFICERS, AGENTS, EMPLOYEES,**
25 **SUBCONTRACTORS, LICENSEES OR INVITEES UNDER THIS CONTRACT.**
26 **THIS INDEMNIFICATION PROVISION IS SPECIFICALLY INTENDED TO**
27 **OPERATE AND BE EFFECTIVE EVEN IF IT IS ALLEGED OR PROVEN THAT**
28 **ALL OR SOME OF THE DAMAGES BEING SOUGHT WERE CAUSED, IN**
29 **WHOLE OR IN PART, BY ANY ACT, OMISSION OR NEGLIGENCE OF THE**
30 **CITY. THIS INDEMNITY PROVISION IS INTENDED TO INCLUDE, WITHOUT**
31 **LIMITATION, INDEMNITY FOR ANY AND ALL COSTS, EXPENSES AND**
32 **LEGAL FEES INCURRED BY THE CITY IN DEFENDING AGAINST SUCH**
33 **CLAIMS AND CAUSES OF ACTIONS.**

34
35 **Article 7. MISCELLANEOUS**

36 **7.1 Capitalized Terms.**

37 Unless otherwise stated herein, capitalized terms used in this Agreement which are defined
38 in Article 1 of the General Conditions will have the meanings indicated in the General
39 Conditions.

40 **7.2 Assignment of Contract.**

41 This Agreement, including all of the Contract Documents may not be assigned by the
42 Contractor without the advance express written consent of the City.

1 7.3 Successors and Assigns.

2 City and Contractor each binds itself, its partners, successors, assigns and legal
3 representatives to the other party hereto, in respect to all covenants, agreements and
4 obligations contained in the Contract Documents.

5 7.4 Severability.

6 Any provision or part of the Contract Documents held to be unconstitutional, void or
7 unenforceable by a court of competent jurisdiction shall be deemed stricken, and all
8 remaining provisions shall continue to be valid and binding upon City and Contractor.

9 7.5 Venue and Waiver of Sovereign Immunity.

10 This Agreement, including all of the Contract Documents is performable in the State of
11 Texas. Venue shall be in the state district courts of Denton County, Texas. The City's
12 sovereign immunity is waived only to the extent set forth and in accordance with the
13 provisions of Subchapter I, Chapter 271 of the Texas Local Government Code or as otherwise
14 specifically waived by law. The City does not waive its sovereign immunity to suit in federal
15 court.

16 7.6 Authority to Sign.

17 Contractor hereby certifies that the person signing the Agreement on its behalf is the duly
18 authorized signatory of the Contractor.

19

20 7.7 Prohibition On Contracts With Companies Boycotting Israel.

21 Contractor acknowledges that in accordance with Chapter 2270 of the Texas Government
22 Code, the City is prohibited from entering into a contract with a company for goods or
23 services unless the contract contains a written verification from the company that it: (1)
24 does not boycott Israel; and (2) will not boycott Israel during the term of the contract.

25 The terms "boycott Israel" and "company" shall have the meanings ascribed to those terms
26 in Section 808.001 of the Texas Government Code. ***By signing this contract, Contractor***
27 ***certifies that Contractor's signature provides written verification to the City that***
28 ***Contractor: (1) does not boycott Israel; and (2) will not boycott Israel during the term of***
29 ***the contract.***

30

31 7.8 Immigration Nationality Act.

32 Contractor shall verify the identity and employment eligibility of its employees who perform
33 work under this Agreement, including completing the Employment Eligibility Verification
34 Form (I-9). Upon request by City, Contractor shall provide City with copies of all I-9 forms
35 and supporting eligibility documentation for each employee who performs work under this
36 Agreement. Contractor shall adhere to all Federal and State laws as well as establish
37 appropriate procedures and controls so that no services will be performed by any Contractor
38 employee who is not legally eligible to perform such services. **CONTRACTOR SHALL**
39 **INDEMNIFY CITY AND HOLD CITY HARMLESS FROM ANY PENALTIES,**
40 **LIABILITIES, OR LOSSES DUE TO VIOLATIONS OF THIS PARAGRAPH BY**
41 **CONTRACTOR, CONTRACTOR'S EMPLOYEES, SUBCONTRACTORS,**
42 **AGENTS, OR LICENSEES.** City, upon written notice to Contractor, shall have the right
43 to immediately terminate this Agreement for violations of this provision by Contractor.

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7.9 No Third-Party Beneficiaries.

This Agreement gives no rights or benefits to anyone other than the City and the Contractor and there are no third-party beneficiaries.

7.10 No Cause of Action Against Engineer.

Contractor, its subcontractors and equipment and materials suppliers on the Project or their sureties, shall maintain no direct action against the Engineer, its officers, employees, and subcontractors, for any claim arising out of, in connection with, or resulting from the engineering services performed. Only the City will be the beneficiary of any undertaking by the Engineer. The presence or duties of the Engineer's personnel at a construction site, whether as on-site representatives or otherwise, do not make the Engineer or its personnel in any way responsible to Contractor or any other entity for those duties that belong to the City, and do not relieve Contractor or any other entity of its obligations, duties, and responsibilities, including, but not limited to, all construction methods, means, techniques, sequences, and procedures necessary for performing, coordinating and completing all portions of the Work in accordance with the Contract Documents and any health or safety precautions required by such Work. The Engineer and its personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions.

SIGNATURE PAGE TO FOLLOW

1 IN WITNESS WHEREOF, City and Contractor have each executed this Agreement to be effective
2 as of the date subscribed by the City's City Manager or his designee ("Effective Date").
3

4 CITY OF DENTON
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7 BY: _____
8
9 TITLE: _____
10
11 DATE: _____
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15 CONTRACTOR
16 *[CONTRACTOR'S CORPORATE NAME HERE]*
17

18
19 BY: _____
20 AUTHORIZED AGENT
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22
23 _____
24 NAME

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26 _____
27 TITLE

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29 _____
30 PHONE NUMBER

31
32 _____
33 EMAIL ADDRESS
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38 ADD OPERATIONAL APPROVAL HERE

39
40 ATTEST:
41 ROSA RIOS, CITY SECRETARY
42
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44 _____

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47 APPROVED AS TO LEGAL FORM:
48 AARON LEAL, CITY ATTORNEY
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SECTION 00 61 15
PERFORMANCE BOND - CSP

THE STATE OF TEXAS §
§ **KNOW ALL BY THESE PRESENTS:**
§
COUNTY OF DENTON §

That we, _____, known as
“Principal” herein and _____, a corporate
surety(sureties, if more than one) duly authorized to do business in the State of Texas, known as
“Surety” herein (whether one or more), are held and firmly bound unto the City of Denton, a
Texas home-rule municipal corporation created pursuant to the laws of Texas, known as “City”
herein, in the penal sum of, _____ Dollars
(\$_____), lawful money of the United States, to be paid in Denton, Denton
County, Texas for the payment of which sum well and truly to be made, we bind ourselves, our
heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these
presents.

WHEREAS, the Principal has entered into a certain written contract with the City
awarded the ____ day of _____, 20____, which Contract is hereby referred to and
made a part hereof for all purposes as if fully set forth herein, to furnish all materials, equipment
labor and other accessories defined by law, in the prosecution of the Work, including any Change
Orders, as provided for in said Contract designated as **2020 Street Bundle – Sector III**.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal
shall faithfully perform it obligations under the Contract and shall in all respects duly and
faithfully perform the Work, including Change Orders, under the Contract, according to the plans,
specifications, and contract documents therein referred to, and as well during any period of
extension of the Contract that may be granted on the part of the City, then this obligation shall be
and become null and void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that if any legal action be filed on this Bond, venue shall lie in
the state district courts of Denton County, Texas.

1 This bond is made and executed in compliance with the provisions of Chapter 2253 of the
2 Texas Government Code, as amended, and all liabilities on this bond shall be determined in
3 accordance with the provisions of said statute.

4 **IN WITNESS WHEREOF**, the Principal and the Surety have SIGNED and SEALED
5 this instrument by duly authorized agents and officers on this the _____ day of _____
6 _____, 20 ____.

7 PRINCIPAL:
8 _____
9 _____

10 BY: _____
11 Signature

12 ATTEST:
13 _____
14 (Principal) Secretary

15 _____
16 Name and Title

17 Address: _____
18 _____
19 _____

20 _____
21 Witness as to Principal

22 SURETY:
23 _____
24 _____

25 BY: _____
26 Signature

27 _____
28 Name and Title

29 Address: _____
30 _____
31 _____

32 _____
33 Witness as to Surety

34 Telephone Number: _____

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41 *Note: If signed by an officer of the Surety Company, there must be on file a certified extract
42 from the by-laws showing that this person has authority to sign such obligation. If
43 Surety's physical address is different from its mailing address, both must be provided.
44 The date of the bond shall not be prior to the date the Contract is awarded.

45

1 **SECTION 00 61 16**
2 **PAYMENT BOND - CSP**

3
4 **THE STATE OF TEXAS** §
5 § **KNOW ALL BY THESE PRESENTS:**
6 **COUNTY OF DENTON** §

7 That we, _____, known as
8 “Principal” herein, and _____, a
9 corporate surety (sureties), duly authorized to do business in the State of Texas, known as “Surety”
10 herein (whether one or more), are held and firmly bound unto the City of Denton, a Texas home-
11 rule municipal corporation created pursuant to the laws of the State of Texas, known as “City”
12 herein, in the penal sum of _____ Dollars
13 (\$ _____), lawful money of the United States, to be paid in Denton, Denton
14 County, Texas, for the payment of which sum well and truly be made, we bind ourselves, our heirs,
15 executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

16 **WHEREAS**, Principal has entered into a certain written Contract with City, awarded the
17 _____ day of _____, 20____, which Contract is hereby referred to and made
18 a part hereof for all purposes as if fully set forth herein, to furnish all materials, equipment, labor
19 and other accessories as defined by law, in the prosecution of the Work as provided for in said
20 Contract and designated as **2020 Street Bundle – Sector III**.

21 **NOW, THEREFORE**, THE CONDITION OF THIS OBLIGATION is such that if
22 Principal shall pay all monies owing to any (and all) payment bond beneficiary (as defined in
23 Chapter 2253 of the Texas Government Code, as amended) in the prosecution of the Work under
24 the Contract, then this obligation shall be and become null and void; otherwise to remain in full
25 force and effect.

26 This bond is made and executed in compliance with the provisions of Chapter 2253 of the
27 Texas Government Code, as amended, and all liabilities on this bond shall be determined in
28 accordance with the provisions of said statute.

29 **PROVIDED FURTHER**, that if any legal action be filed on this Bond, venue shall lie in
30 the state district courts of Denton County, Texas.

1 **IN WITNESS WHEREOF**, the Principal and Surety have each SIGNED and SEALED
2 this instrument by duly authorized agents and officers on this the _____ day of
3 _____, 20_____.

4

PRINCIPAL:

ATTEST:

BY: _____
Signature

(Principal) Secretary

Name and Title
Address: _____

Witness as to Principal

SURETY:

ATTEST:

BY: _____
Signature

(Surety) Secretary

Name and Title

Witness as to Surety

Address: _____

Telephone Number: _____

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Note: If signed by an officer of the Surety, there must be on file a certified extract from the bylaws showing that this person has authority to sign such obligation. If Surety's physical address is different from its mailing address, both must be provided.

**THE DATE OF THE BOND SHALL NOT BE PRIOR
TO THE DATE THE CONTRACT IS AWARDED.**

END OF SECTION

SECTION 00 61 20
MAINTENANCE BOND - CSP

THE STATE OF TEXAS §
§ **KNOW ALL BY THESE PRESENTS:**
COUNTY OF TARRANT §

That we _____, known as
“Principal” herein and _____, a corporate surety
(sureties, if more than one) duly authorized to do business in the State of Texas, known as
“Surety” herein (whether one or more), are held and firmly bound unto the City of Denton, a
Texas home-rule municipal corporation created pursuant to the laws of the State of Texas, known
as “City” herein, in the sum of _____ Dollars
(\$ _____), lawful money of the United States, to be paid in Denton, Denton
County, Texas, for payment of which sum well and truly be made unto the City and its
successors, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly
and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the City awarded
the ____ day of _____, 20____, which Contract is hereby
referred to and a made part hereof for all purposes as if fully set forth herein, to furnish all
materials, equipment labor and other accessories as defined by law, in the prosecution of the
Work, including any Work resulting from a duly authorized Change Order (collectively herein,
the “Work”) as provided for in said contract and designated as **2020 Street Bundle – Sector III**;
and

WHEREAS, Principal binds itself to use such materials and to so construct the Work in
accordance with the plans, specifications and Contract Documents that the Work is and will
remain free from defects in materials or workmanship for and during the period of **two (2) years**
after the date of Final Acceptance of the Work by the City (“Maintenance Period”); and

WHEREAS, Principal binds itself to repair or reconstruct the Work in whole or in part
upon receiving notice from the City of the need therefor at any time within the Maintenance
Period.

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NOW THEREFORE, the condition of this obligation is such that if Principal shall remedy any defective Work, for which timely notice was provided by City, to a completion satisfactory to the City, then this obligation shall become null and void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, if Principal shall fail so to repair or reconstruct any timely noticed defective Work, it is agreed that the City may cause any and all such defective Work to be repaired and/or reconstructed with all associated costs thereof being borne by the Principal and the Surety under this Maintenance bond; and

PROVIDED FURTHER, that if any legal action be filed on this Bond, venue shall lie in the state district courts of Denton County, Texas; and

PROVIDED FURTHER, that this obligation shall be continuous in nature and successive recoveries may be had hereon for successive breaches.

1 **IN WITNESS WHEREOF**, the Principal and the Surety have each SIGNED and SEALED this
2 instrument by duly authorized agents and officers on this the _____ day of _____
3 _____, 20____.

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ATTEST:

(Principal) Secretary

Witness as to Principal

ATTEST:

(Surety) Secretary

Witness as to Surety

PRINCIPAL:

BY: _____
Signature

Name and Title

Address: _____

SURETY:

BY: _____
Signature

Name and Title

Address: _____

Telephone Number: _____

*Note: If signed by an officer of the Surety Company, there must be on file a certified extract from the by-laws showing that this person has authority to sign such obligation. If Surety's physical address is different from its mailing address, both must be provided. The date of the bond shall not be prior to the date the Contract is awarded.

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SECTION 00 61 26
CERTIFICATE OF INSURANCE - CSP

[Assembler: For Contract Document execution, remove this page and replace with standard ACORD Certificate of Insurance form.]

END OF SECTION

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
ARTICLE 1 – DEFINITIONS AND TERMINOLOGY	1
1.01 Defined Terms	1
1.02 Terminology	6
ARTICLE 2 – PRELIMINARY MATTERS	7
2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance	7
2.02 Copies of Documents	7
2.03 Before Starting Construction	7
2.04 Preconstruction Conference Meeting	8
2.05 Public Meeting	8
2.06 Initial Acceptance of Schedules	8
2.07 Electronic Submittals and Transmittals	8
ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE	8
3.01 Intent	8
3.02 Reference Standards	9
3.03 Reporting and Resolving Discrepancies	9
3.04 Requirements of the Contract Documents	10
3.05 Reuse of Documents	10
ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK	11
4.01 Commencement of Contract Time; Notice to Proceed	11
4.02 Starting the Work	11
4.03 Delays in Contractor’s Progress	11
ARTICLE 5 – SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS	12
5.01 Availability of Lands	12
5.02 Use of Site and Other Areas	13
5.03 Subsurface and Physical Conditions	14
5.04 Differing Subsurface or Physical Conditions	15
5.05 Underground Facilities	16
5.06 Hazardous Environmental Conditions at Site	17

ARTICLE 6 – BONDS AND INSURANCE.....	18
6.01 Licensed Sureties and Insurers.....	18
6.02 Performance, Payment, and Maintenance Bonds.....	18
6.03 Certificates of Insurance.....	19
6.04 Contractor’s Insurance	21
6.05 Acceptance of Bonds and Insurance; Option to Replace.....	22
ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES	22
7.01 Contractor’s Means and Methods of Construction	22
7.02 Supervision and Superintendence	22
7.03 Labor; Working Hours	23
7.04 Services, Materials, and Equipment.....	23
7.05 Project Schedule.....	24
7.06 “Or Equals”.....	24
7.07 Substitutions	25
7.08 Concerning Subcontractors and Suppliers.....	27
7.09 Wage Rates	28
7.10 Patent Fees and Royalties	29
7.11 Permits and Utilities.....	29
7.12 Taxes	30
7.13 Laws and Regulations	30
7.14 Record Documents.....	31
7.15 Safety and Protection	31
7.16 Hazard Communication Programs	32
7.17 Emergencies and/or Rectification	32
7.18 Submittals.....	33
7.19 Continuing the Work.....	34
7.20 Contractor’s General Warranty and Guarantee.....	34
7.21 Indemnification.....	35
7.22 Delegation of Professional Design Services	36
7.23 Right to Audit	36
7.24 Nondiscrimination.....	37
ARTICLE 8 – OTHER WORK AT THE SITE.....	37
8.01 Other Work	37
8.02 Coordination	38

8.03	Legal Relationships.....	38
ARTICLE 9 – CITY’S RESPONSIBILITIES		39
9.01	Communications to Contractor	39
9.02	Furnish Data	39
9.03	Pay When Due	39
9.04	Lands and Easements; Reports, Tests, and Drawings	39
9.05	Change Orders	39
9.06	Inspections, Tests, and Approvals.....	39
9.07	Limitations on City’s Responsibilities	39
9.08	Undisclosed Hazardous Environmental Condition	39
9.09	Compliance with Safety Program	39
ARTICLE 10 – CITY’S OBSERVATION DURING CONSTRUCTION		40
10.01	City’s Project Manager or Duly Authorized Representative	40
10.02	Visits to Site.....	40
10.03	Determinations for Work Performed.....	40
10.04	Decisions on Requirements of Contract Documents and Acceptability of Work	40
ARTICLE 11 – CHANGES IN THE WORK; CLAIMS; EXTRA WORK		41
11.01	Amending and Supplementing the Contract	41
11.02	Execution of Change Orders	41
11.03	Field Orders	41
11.04	Authorized Changes in the Work – Extra Work	41
11.05	Unauthorized Changes in the Work	41
11.06	Dispute of Extra Work.....	42
11.07	Contract Claims Process	42
11.08	Change of Contract Price.....	43
11.09	Change of Contract Time.....	44
11.10	Notification to Surety	44
ARTICLE 12 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK; PLANS QUANTITY MEASUREMENT		45
12.01	Cost of the Work.....	45
12.02	Allowances	48
12.03	Unit Price Work	48
12.04	Plans Quantity Measurement for Unclassified Excavation or Embankment	49

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK	50
13.01 Access to Work	50
13.02 Tests, Inspections	50
13.03 Defective Work	51
13.04 Rejecting Defective Work	51
13.05 Acceptance of Defective Work	52
13.06 Uncovering Work	52
13.07 City May Stop the Work	52
13.08 City May Correct Defective Work	53
ARTICLE 14 – PAYMENTS TO CONTRACTOR; COMPLETION; CORRECTION PERIOD.....	53
14.01 Progress Payments	53
14.02 Contractor’s Warranty of Title.....	56
14.03 Partial Utilization	56
14.04 Final Inspection.....	57
14.05 Final Acceptance	57
14.06 Final Payment	57
14.07 Final Completion Delayed and Partial Retainage Release.....	58
14.08 Waiver of Claims	58
14.09 Correction Period	58
ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION.....	59
15.01 City May Suspend Work	59
15.02 City May Terminate for Cause.....	60
15.03 City May Terminate for Convenience	61
ARTICLE 16 – FINAL RESOLUTION OF DISPUTES	63
16.01 Methods and Procedures.....	63
ARTICLE 17 – MISCELLANEOUS	64
17.01 Giving Notice.....	64
17.02 Computation of Times.....	64
17.03 Cumulative Remedies.....	64
17.04 Limitation of Damages	64
17.05 No Waiver.....	65
17.06 Survival of Obligations.....	65
17.07 Assignment of Contract	65

17.08 Successors and Assigns 65
17.09 Headings 65

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Contract or in other Contract Documents, the terms listed below have the meanings indicated which are applicable to both the singular and plural thereof, and words denoting gender shall include the masculine, feminine and neuter. When used in a context consistent with the definition of a listed-defined term, the term shall have a meaning as defined below whether capitalized or italicized or otherwise. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument titled “Agreement”, “Agreement – CSP”, or “Agreement – Unit Price Bid” executed by the City and Contractor for the Work, setting forth the name of the Project, Contract Price, Contract Time and the items included in the Contract.
 3. *Application for Payment*—The form acceptable to City which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Award*—Authorization by the City Council for the City to enter into an Agreement.
 6. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed. The term “Bid” shall be defined to include the term “Proposal” in those instances where the City utilizes a Request for Proposal rather than an Invitation for Bid.
 7. *Bidder*—The individual or entity that submits a Bid directly to City. The term “Bidder” shall be defined to include the terms “Proposer” or “Offeror” in those instances where the City utilizes a Request for Proposal rather than an Invitation for Bid.
 8. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda). The term “Bidding Documents” shall be defined to include the terms “Proposal Documents” in those instances where the City utilizes a Request for Proposal rather than an Invitation for Bid.
 9. *Bidding Requirements*—The Advertisement or Invitation to Bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments. The term “Bidding Requirements” shall be defined to include the terms “Proposal Requirements” in those instances where the City utilizes a Request for Proposal rather than an Invitation for Bid and will include the Request for Proposal or Invitation to Offerors, Instructions to Offerors, Offerors Bond or other Proposal security, if any, the Proposal Form, and the Proposal with any attachments.

10. *Business Day*—A day that the City conducts normal business, generally Monday through Friday, except for federal or state holidays observed by the City.
11. *Calendar Day*—A day consisting of 24 hours measured from midnight to the next midnight.
12. *Change Order*—A document which is prepared by the Contractor or City, approved by the City, and signed by Contractor and City, authorizing an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.
13. *City*—The City of Denton is, a Texas home-rule municipal corporation acting by its City Council through its City Manager or his or her designee.
14. *City Attorney*—The officially appointed City Attorney of the City of Denton or his or her designee.
15. *City Council*—The duly elected and qualified governing body of the City of Denton.
16. *City Manager*—The officially appointed authorized City Manager of the City of Denton.
17. *Contract*—The entire and integrated set of written instruments between the City and Contractor concerning the Work comprised of the Agreement and all Contract Documents, which written instruments supersede all prior negotiations, representations, or agreements, whether written or oral, concerning the Work.
18. *Contract Claim*—A demand or assertion by City or Contractor seeking an adjustment of Contract Price or Contract Time, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Contract Claim.
19. *Contract Documents*—Those items so designated as “Contract Documents.” in the Agreement at Paragraph 5.1.A. Approved Submittals, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
20. *Contract Price*—The moneys payable by City to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 12.03 in the case of Unit Price Work). The Contract Price does not include any “Incentive”, if applicable.
21. *Contract Time*—The number of days or the dates stated in the Agreement to: (a) achieve Milestones, if any and (bb) complete the Work so that it is ready for Final Acceptance.
22. *Contractor*—The individual or entity with whom City has entered into the Agreement.
23. *Cost of the Work*—See Paragraph 12.01 of these General Conditions for definition.
24. *Damage Claims*—A demand for money or services arising from the Project or Site from a third party, City or Contractor exclusive of a Contract Claim.
25. *Day or day*—A day, unless otherwise defined, shall mean a Calendar Day.
26. *Drawings*—The part of the Contract Documents prepared or approved by an Engineer that graphically shows the scope, extent, and character of the Work to be performed by Contractor. Submittals, as defined, are not considered Drawings as so defined here.

27. *Effective Date of the Agreement*—The date, indicated in the Agreement, on which it becomes effective,, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the City.
28. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, text, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
29. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by the Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.
30. *Engineer*—The licensed professional engineer or engineering firm registered in the State of Texas performing professional services for the City.
31. *Extra Work*—Additional work made necessary by City-approved changes or alterations to the Contract Documents. Extra Work shall be part of the Work.
32. *Field Order*—A written directive issued by City that requires changes in the Work but does not involve a change to the Contract Price, Contract Time, or Drawings, Plan, or Shop Drawings.
33. *Final Acceptance*—The written notice given by the City to the Contractor that the Work specified in the Contract Documents has been completed to the satisfaction of the City.
34. *Final Inspection*—The inspection performed by the City to determine whether the Contractor has completed each and every part or appurtenance of the Work fully, entirely, and in conformance with the Contract Documents.
35. *General Requirements*—Sections of The information set forth in “Division 101 – General Requirements” of the Standard Construction Specification Documents.
36. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, P C B s , Petroleum, Hazardous Waste, Radioactive Material, or any other substance, product, waste or materials, in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
37. *Hazardous Waste*—Any solid waste listed as hazardous or which possesses one or more hazardous characteristics as defined in applicable Laws and Regulations.
38. *Incidental or incidental*—Work items that the Contractor is not paid for directly, but costs for which are included under the various bid items of the Project.
39. *Laws and Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all

governmental bodies, agencies, authorities, and courts having jurisdiction over the Site or any portion or part of the Work to be performed.

40. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
41. *Major Item*—An item of work included in the Contract Documents that has a total cost equal to or greater than 5% of the original Contract Price.
42. *Milestone*—A principal event specified in the Contract Documents relating to the performance of an identified portion of the Work by an intermediate Contract Time prior to Final Acceptance of the Work.
43. *Notice of Award*—The written notice by City to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed in such notice, City will sign and deliver the Agreement.
44. *Notice to Proceed*—A written notice given by City to Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work specified in Contract Documents.
45. *PCBs*—Polychlorinated biphenyls.
46. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), and including but not limited to oil, fuel oil, oil sludge, oil refuse, gasoline, diesel fuel, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
47. *Plans*—This term will have the same definition of as “Drawings”.
48. *Project* —The Work to be performed under the Contract.
49. *Project Manager*—The authorized representative of the City who will be assigned to the Project.
50. *Project Manual*—The documentary information prepared for bidding or proposing and furnishing the Work.
51. *Project Schedule*—A schedule, prepared and maintained by Contractor, in accordance with the General Requirements, describing the sequence and duration of the activities comprising Contractor’s plan to achieve each Milestone and accomplish the Work within the Contract Time.
52. *Public Meeting*—An announced meeting conducted by the City to facilitate public participation and to assist the public in gaining an informed view of the Project.
53. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
54. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

55. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
56. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
57. *Site*—Lands or areas indicated in the Contract Documents as being furnished by City upon which the Work is to be performed, including rights-of-way, permits, and easements for access thereto, and such other lands furnished by City which are designated for the use of Contractor.
58. *Specifications or Technical Specifications* —The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work. Specifications may be specifically made a part of the Contract Documents by attachment or, if not attached, may be incorporated by reference as indicated in the Table of Contents (Section 00 00 00) of the Project.
59. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
60. *Submittal*—All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to the City to illustrate some portion of the Work.
61. *Subsidiary or subsidiary*—*These terms will have the same* definition as “Incidental. or incidental”.
62. *Successful Bidder*—The Bidder to whom City issues a Notice of Award. The term “Bidder” shall be defined to include the terms “Proposer” or “Offeror” in those instances where the City utilizes a Request for Proposal rather than an Invitation for Bid and is the Proposer or Offeror submitting the proposal or offer that provides the best value to the City and to whom the City issues a Notice of Award.
63. *Superintendent*—The representative of the Contractor who is available at all times and able to receive instructions from the City and to act for the Contractor.
64. *Supplementary Conditions*—The part of the Contract set forth at Division 00 73 00 that amends or supplements these General Conditions.
65. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
66. *Underground Facilities*—All underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid

petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

67. *Unit Price Work*—Work for which the Contract Price is determined by multiplying the unit price for the item by the estimated quantity of the item.
68. *Weekend Working Hours*—Those hours between 8:00 a.m. and 8:30 p.m. on Saturday, and between 1:00 p.m. and 8:30 p.m. on Sunday or on a federal or state holiday observed by the City, as approved in advance by the City for performing Work.
69. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction including any Change Order or Field Order, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
70. *Working Day*—Defined as a Business Day but excluding any days that weather or other conditions beyond the reasonable control of the Contractor prevents the performance of the principal unit of work underway for a continuous period of not less than 7 hours between 7:00 a.m. and 8:00 p.m.

1.02 *Terminology*

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*: The Contract includes the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of judgment by CityCity. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of City as to the Work. It is intended that such exercise of judgment, action, or determination will be to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise).
- C. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 1. does not conform to the Contract Documents; or
 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 3. has been damaged prior to City’s written notice of Final Acceptance.
- D. *Furnish, Install, Perform, Provide*
 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to execute, carry out, furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- E. Unless stated otherwise in the Contract, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. **Performance and Payment Bonds:** When Contractor delivers the signed counterparts of the Agreement to City, Contractor shall also deliver to City the performance bond, payment bond and maintenance bond that comply with the provisions of Chapter 2253 of the Texas Government Code. Work will not be allowed to begin until the performance and payment bonds have been provided by the Contractor to the City.
- B. **Evidence of Contractor’s Insurance:** When Contractor delivers the signed counterparts of the Agreement to City, Contractor shall also deliver to City, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6. Work will not be allowed to begin until the evidence of insurance has been provided by the Contractor to the City.

2.02 *Copies of Documents*

- A. City shall furnish to Contractor one (1) original executed copy and one (1) electronic copy of the Contract, and three (3) additional copies of the Drawings. Additional printed copies will be furnished upon request at the cost of reproduction.

2.03 *Before Starting Construction*

Baseline starting Work, Contractor shall submit for review by City the following in accordance with the Contract Documents:

- A. Baseline Schedules in accordance with General Requirements, Section 01 32 16.
- B. Preliminary Schedule of Submittals.
- C. **Preliminary Schedule of Values:** For lump sum contracts, a Schedule of Values for all of the Work that includes quantities and prices of items that when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Meeting*

- A. Before any Work at the Site is started, the Contractor shall attend a Preconstruction Meeting as specified in Section 01 31 19.

2.05 *Public Meeting*

- A. Contractor may not mobilize any equipment, materials, or resources to the Site prior to Contractor attending the Public Meeting as scheduled by the City.

2.06 *Initial Acceptance of Schedules*

- A. No progress payment shall be made to Contractor until acceptable Project Schedules are submitted to City in accordance with the Contract Documents.

2.07 *Electronic Submittals and Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the City and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then City and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract to describe a functionally complete Project to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to City.
- C. City will issue clarifications and interpretations of the Contract Documents as provided herein.
- D. The Specifications may vary in form, forma and style. Some Specification sections may be written in varying degrees of streamlined or declarative style, and some sections may be relatively narrative by comparison. Omission of such words and phrases as “the Contractor shall,” “in conformity with,” “as shown,” or “as specified” are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. The Contractor shall not take advantage of any variation of form, format or style in making Contract Claims or Damage Claims.

- E. The cross-referencing of Specification sections under the subparagraph heading “Related Sections include but are not necessarily limited to:” and elsewhere within each Specification section is provided as an aid and convenience to the Contractor. The Contractor shall not rely on the cross-referencing provided and shall be responsible to coordinate the entire Work under the Contract Documents and provide a complete Project whether or not cross-referencing is provided in each section or whether the cross-referencing is complete or accurate.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of City, Contractor, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to City or any of its officers, elected or appointed officials, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor’s Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements, and conditions. Contractor shall promptly report in writing to City any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from City before proceeding with any Work affected thereby.
2. *Contractor’s Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to City in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.1717) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by City, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to City for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier; or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).
2. In case of discrepancies, figured dimensions shall govern over scaled dimensions, Drawings shall govern over Specifications, and Supplementary Conditions shall govern over General Conditions and Specifications.

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor shall submit to the City in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. City will be the interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.
- B. City will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. City's written clarification, interpretation, or decision will be final and binding on Contractor, unless Contractor appeals by filing a Contract Claim.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 1. 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 Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of CityCity and specific written verification or adaptation by Engineer; or
 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without City's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Time; Notice to Proceed*

- A. The Contract Time will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Time commences to run. No Work may be done at the Site prior to the date on which the Contract Time commences to run.

4.03 *Delays in Contractor's Progress*

- A. If Contractor is delayed, City shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project. The City shall be liable only to the extent allowed by the provisions of the Contract and as allowed by Subchapter I, Chapter 271 of the Texas Local Government Code.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Time for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. The Contractor shall receive no compensation for delays or hindrances to the Work, except when direct and unavoidable extra cost to the Contractor is caused by the failure of the City to provide information or material, if any, that the Contract specifies is to be furnished by the City.
- D. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of City, Contractor, and those for whom they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Time. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this Paragraph 4.03. D. The Contractor is responsible for the prompt submission of a request for an adjustment to the Contract Time under this Paragraph to the City. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Time under this Paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with City, as contemplated in Article 8); and

4. Acts of war or terrorism.
- E. Contractor's entitlement to an adjustment of Contract Time or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Time is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Time to which Contractor is otherwise entitled.
 3. Adjustments of Contract Time or Contract Price are subject to the provisions of Article 11.
- F. Each Contractor request or Change Order seeking an increase in Contract Time or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Time claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.08.
 6. Contractor shall also furnish such additional supporting documentation as City may require including, where appropriate, a revised Project Schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- G. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from undisclosed Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.03.F and 4.03.G.

ARTICLE 5 – SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. City shall furnish the Site. City shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which

Contractor must comply in performing the Work. City will be responsible for obtaining any necessary easements for permanent structures or permanent changes in existing facilities.

1. The City has obtained or anticipates acquisition of and/or access to right-of-way, and/or easements. Any outstanding right-of-way and/or easements are anticipated to be acquired in accordance with the schedule set forth in the Supplementary Conditions. The Project Schedule submitted by the Contractor in accordance with the Contract Documents must consider any outstanding right-of-way, and/or easements.
 2. Unless otherwise specified in the Contract Documents, the City has or anticipates moving and/or relocating utilities, and obstructions to the Site. Any outstanding movement or relocation of utilities or obstructions is anticipated in accordance with the schedule set forth in the Supplementary Conditions. The Project Schedule submitted by the Contractor in accordance with the Contract Documents must consider any outstanding utilities or obstructions to be moved and/or relocated by others.
- B. Upon reasonable written request of Contractor, City shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed.
- C. Contractor shall provide for any additional lands and access thereto not included in the Site that may be required for construction facilities or storage of materials and equipment. The cost of such shall be part of the Contract Price.

5.02 *Use of Site and Other Areas*

- A. Limitation on Use of Site and Other Areas
1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, worker car parking and the operations of workers to the Site, to adjacent areas that Contractor has arranged to use through construction easements or otherwise, and to other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with worker car parking, construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries, including death, and damage to or losses of property sustained by the owners or occupants of any such land or areas; provided that such damage, losses, injuries or deaths arose out of or result from the performance of the Work or arose out of or resulted from any other actions or conduct of the Contractor or those for whom Contractor is responsible.
 2. At any time when, in the judgment of the City, the Contractor has obstructed, closed, or is carrying on operations in a portion of a street, right-of-way, or easement greater than is necessary for proper execution of the Work, the City may require the Contractor to reduce the area impacted to only that necessary for proper execution of the Work and/or to finish the section on which operations are in progress before work is commenced on any additional area of the Site.

3. Construction equipment, spoil materials, supplies, forms, buildings, labs, or equipment and supply storage buildings, or any other item that may be transported by flood flows, shall not be stored within existing federal floodways during the course of the Work.
 4. Should any Damage Claim be made by any such owner or occupant adversely impacted because of the performance of the Work, Contractor shall promptly attempt to resolve the Damage Claim.
 5. ***PURSUANT TO PARAGRAPH 7.21, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS CITY AND ITS OFFICERS, ELECTED AND APPOINTED OFFICIALS, AND EMPLOYEES, FROM AND AGAINST ALL CLAIMS, COSTS, LOSSES, AND DAMAGES ARISING OUT OF OR RELATING TO ANY CLAIM OR ACTION, LEGAL OR EQUITABLE, BROUGHT BY ANY SUCH ADVERSELY IMPACTED OWNER OR OCCUPANT AGAINST CITY.***
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Site Maintenance Cleaning:* If 24 hours after written notice is given to the Contractor that the clean-up at the Site is insufficient or occurring in a manner unsatisfactory to the City, the Contractor fails to correct the unsatisfactory condition and/or procedures, the City may take such direct action as the City deems appropriate to correct the clean-up deficiencies cited to the Contractor in the written notice, and the costs of such direct corrective action, plus 25 % of such costs, shall be deducted from the monies due or to become due to the Contractor under the Contract.
- D. *Final Site Cleaning:* Prior to Final Acceptance of the Work, Contractor shall clean the Site and the Work and make it ready for utilization by City and any adjacent property owners, if applicable. At the completion of the Work, Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, surplus materials, waste materials, rubbish and other debris and shall restore to original condition or better all areas impacted or disturbed by the Work.
- E. *Loading of Structures:* 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. Those reports known to City of explorations and tests of subsurface conditions at or contiguous to the Site; and
 2. Those drawings known to City of existing physical conditions at or contiguous to the Site, including those drawings known to City depicting existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities.).
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A.

Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as technical data.

- C. *Reliance by Contractor on Technical Data:* Contractor is provided certain technical data identified in the Supplementary Conditions with respect to such reports and drawings for its use, but the City does not warrant or guarantee the accuracy of the information, and such information including reports and drawings are not Contract Documents. Contractor may not make any Contract Claim against City, or any of theirits officers, elected or appointed officials, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness or accuracy of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or City’s archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any “technical data” is materially inaccurate; or
 2. is of such a nature as to require a change in the Contract Documents; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.17), notify City in writing about such condition.

- B. *Possible Price and Time Adjustments*
1. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Time if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a final commitment to City with respect to Contract Price and Contract Time by the submission of a Bid or becoming bound under the Contract; or

- b. The existence of such condition reasonably could have been discovered or revealed as a result of the examination of the Contract Documents or the Site; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
- C. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the Site is based on information and data furnished to City or Engineer by the owners of such Underground Facilities, including City, or by others, unless it is otherwise expressly provided in the Supplementary Conditions::
- 1. City and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data;
 - b. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 - c. coordination and adjustment of the Work with the owners (including City) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Not Shown or Indicated:*
- 1. If an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings or otherwise indicated in the Contract Documents, or was not shown or indicated on the Drawings or in the Contract Documents with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.17), identify the owner of such Underground Facility and give notice to that owner and to City. Contractor shall be responsible for the safety and protection of such discovered Underground Facility.
 - 2. If City concludes that a change in the Contract Documents is required, a Change Order may be issued to reflect and document such consequences, subject to the provisions of Article 11.
 - 3. Verification of existing utilities, structures, and service lines shall include notification of all utility companies a minimum of 48 hours in advance of construction including exploratory excavation if necessary.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports known to City relating to Hazardous Environmental Conditions that have been identified at the Site; or
 2. drawings known to City relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Reliance by Contractor on Technical Data*: Contractor is provided certain technical data identified in the Supplementary Conditions with respect to such reports and drawings for its use, but the City does not warrant or guarantee the accuracy of the information, and such information including reports and drawings are not Contract Documents. Contractor may not make any Contract Claim against City, or any of its officers, elected or appointed officials, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness or accuracy of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or City's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.
- C. Contractor shall not be responsible for a Hazardous Environmental Condition uncovered or revealed at the Site if such Hazardous Environmental Condition was not shown or indicated in Drawings or Specifications or identified if the removal or remediation of such Hazardous Environmental Condition was not identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created by the actions of or with any materials brought to the Site by Contractor, Subcontractors, Suppliers or anyone else for whom Contractor is responsible and the costs associated with the same.
- D. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.17); and (3) notify City (and promptly thereafter confirm such notice in writing). City may consider the necessity to retain a qualified expert to evaluate such condition or take corrective action, if any.

- E. Contractor shall not be required to resume Work in connection with a Hazardous Environmental Condition identified pursuant to Paragraph 5.06.D or in any affected area until after City has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed.
- F. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then City may order the portion of the Work that is in the area affected by such condition to be deleted from the Work and the Contract Price. City may have such deleted portion of the Work performed by City's own forces or others.
- G. ***TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS CITY, AND ITS OFFICERS, ELECTED AND APPOINTED OFFICIALS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS, AND SUBCONTRACTORS OF EACH AND ANY OF THEM, 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 ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) FOR PERSONAL INJURY, DEATH OR PROPERTY DAMAGE ARISING OUT OF OR RELATING TO A HAZARDOUS ENVIRONMENTAL CONDITION CREATED BY CONTRACTOR OR BY ANYONE FOR WHOM CONTRACTOR IS RESPONSIBLE. NOTHING IN THIS PARAGRAPH 5.06.CityG OBLIGATES CONTRACTOR TO INDEMNIFY ANY INDIVIDUAL OR ENTITY FROM AND AGAINST THE CONSEQUENCES OF THAT INDIVIDUAL'S OR ENTITY'S OWN NEGLIGENCE.***
- H. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the State of Texas to issue bonds or insurance policies for the limits and coverages required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

6.02 *Performance, Payment, and Maintenance Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, in accordance with the provisions of the Texas Government Code Chapter 2253 or successor statute and as required by the City, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. The performance and payment bonds must be provided by the Contractor to the City prior to the Contractor beginning any Work.

- B. Contractor shall furnish maintenance bonds in an amount equal to the Contract Price as security to protect the City against any defects in any portion of the Work described in the Contract Documents. Maintenance bonds shall remain in effect for two (2) years after the date of Final Acceptance by the City. The maintenance bond(s) shall be provided as directed by the City as part of the close-out of the Contract and shall be provided prior to the final payment being made.
- C. All bonds shall be in the form prescribed by the Contract Documents, except as provided otherwise by Laws and Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, or its right to do business is terminated in the State of Texas, then Contractor shall promptly notify City in writing and shall, within 30 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, City may refuse to allow the Contractor to begin Work, exclude the Contractor from the Site and exercise City’s termination rights under Article 15.
- F. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.03 *Certificates of Insurance*

- A. Contractor shall deliver to City, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance and endorsements (and other evidence of insurance requested by City or any other additional insured) establishing that Contractor has obtained and is maintaining the policies and coverages required by these General Conditions and the Supplementary Conditions prior to beginning any Work.
 - 1. The certificate of insurance shall document the City, and all identified entities named in the Supplementary Conditions as “additional insureds” on all liability policies.
 - 2. The Contractor’s general liability insurance shall include a “per project” or “per location” endorsement, that shall be identified in the certificate of insurance provided to the City.
 - 3. The certificate shall be signed by an agent authorized to bind coverage on behalf of the insured, be complete in its entirety, and show complete insurance carrier names as listed in the current A.M. Best Property & Casualty Guide.
 - 4. The insurers for all policies must be licensed and/or approved to do business in the State of Texas. Except for workers’ compensation, all insurers must have a minimum rating of A-: VII in the current A. M. Best Key Rating Guide or have reasonably equivalent

financial strength and solvency to the satisfaction City. If the rating is below that required, written approval of City is required.

5. All applicable policies shall include a Waiver of Subrogation (Rights of Recovery) in favor of the City. In addition, the Contractor agrees to waive all rights of subrogation against the Engineer (if applicable), and each additional insured identified in the Supplementary Conditions
6. Failure of the City to demand such certificates or other evidence of full compliance with the insurance requirements or failure of the City to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such lines of insurance coverage or to provide such certificates or other evidence of full compliance with the insurance requirements.
7. If insurance policies are not written for specified coverage limits, an Umbrella or Excess Liability insurance for any differences is required. Excess Liability shall follow form of the primary coverage.
8. Unless otherwise stated, all required insurance shall be written on the "occurrence basis". If If City agrees in writing that coverage is underwritten may be written on a claims-made basis, the retroactive date shall be coincident with or prior to the date of the effective date of the Agreement and the certificate of insurance shall state that the coverage is claims-made and the retroactive date. The insurance coverage shall be maintained for the duration of the Contract and for three (3) years following Final Acceptance or for the warranty period provided for under the Contract Documents or for the warranty period, whichever is longer. An annual certificate of insurance submitted to the City shall evidence such insurance coverage.
9. Policies shall have no exclusions by endorsements that either nullify or amend the required lines of coverage, nor or decrease the limits of said coverage unless such endorsements are approved in writing by the City. In the event a Notice of an Award has been issued or the Agreement executed, and the policy exclusions are determined to be unacceptable or the City desires that the Contractor obtain additional insurance coverage the contract price shall be adjusted by the cost of the premium for such additional coverage plus 10%.
10. For any proposed self-insured retention (SIR,) in excess of \$25,000.00, affecting insurance coverage, Contractor must obtain the written approval of the City in regard to asset value and stockholders' equity. In lieu of traditional insurance, proposed alternative coverage maintained through insurance pools or, risk retention groups, or self-funding will also require the written approval of the City.
11. Any deductible in excess of \$5,000.00, for any policy that does not provide coverage on a first-dollar basis must be acceptable to and approved in writing by the City.
12. City, at its sole discretion, reserves the right to review the insurance requirements and to make reasonable adjustments to insurance coverages and limits when deemed necessary and prudent by the City based upon the scope of the Work, changes in statutory law, court decision or the claims history of the industry as well as of the contracting party to the City. The City will provide prior notice of 90 days and the insurance adjustments shall be incorporated into the Work by Change Order.

13. City shall be entitled, upon written request to Contractor and without expense to City, to receive copies of policies and endorsements thereto and. City may make any reasonable requests for deletion or revision or modifications of particular policy terms, conditions, limitations, or exclusions necessary to conform the policy and endorsements to the requirements of the Contract. Deletions, revisions, or modifications shall not be required where policy provisions are established by law or regulations binding upon either party or the underwriter on any such policies.
14. City shall not be responsible for the direct payment of insurance premium costs for Contractor's insurance.

6.04 *Contractor's Insurance*

- A. *Workers Compensation and Employers' Liability:* Contractor shall purchase and maintain such insurance coverage with limits consistent with statutory benefits outlined in the Texas Workers' Compensation Act (Texas Labor Code, Ch. 406, as amended), and minimum limits for Employers' Liability as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 2. claims for damages because of bodily injury, occupational sickness or disease, or death of employees.
- B. *Commercial General Liability.* Coverage shall include but not be limited to covering liability (bodily injury, including death, or property damage) arising from: premises/operations, independent contractors, products/completed operations, personal injury including death, liability under an insured contract, and explosion/collapse/underground (where those exposures exist). Insurance shall be provided on an occurrence basis, and as comprehensive as the current Insurance Services Office (ISO) policy. This insurance shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to the City. The Commercial General Liability policy shall have no exclusions by endorsements that would alter or nullify premises/operations, products/completed operations, contractual, personal injury, or advertising injury, that are normally contained with the policy, unless the City approves such exclusions in writing.

For construction projects that present a substantial completed operation exposure, the City may require the Contractor to maintain completed operations coverage for a minimum of no less than three (3) years following the completion of the project (if identified in the Supplementary Conditions)).
- C. *Automobile Liability.* A commercial business auto policy shall provide coverage on "any auto", defined as autos owned, hired and non-owned and provide indemnity for claims for damages because of bodily injury or death of any person and/or property damage arising out of or related to the work, maintenance or use of any motor vehicle by the Contractor, any

Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

- D. *Railroad Protective Liability.* If any of the Work or any warranty work is within the limits of railroad right-of-way, the Contractor shall comply with the requirements identified in the Supplementary Conditions.
- E. *Notification of Policy Cancellation:* Contractor shall immediately notify City upon cancellation or other loss of insurance coverage. Contractor shall stop Work until replacement insurance has been procured. There shall be no time credit for delays or days not worked pursuant to this section.

6.05 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If City has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the Contractor in accordance with Article 6 or the Supplementary Conditions on the basis of non-conformance with the Contract Documents, the City shall so notify the Contractor in writing within 10 Business Days after receipt of the certificates (or other evidence requested). Contractor shall provide to the City such additional information in respect of insurance provided as the City may reasonably request. If Contractor does not purchase or maintain all of the bonds and insurance required by the Contract Documents, the City shall notify the Contractor in writing of such failure prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Such failure to provide bonds or insurance as required by the Contract Documents is a breach of the terms of the Contract and the City may terminate the Contractor in accordance with the provisions of the Contract Documents.

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

7.01 *Contractor’s Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor’s responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor’s expense. Such services are not City-delegated professional design services under this Contract, and neither City nor Engineer has any responsibility with respect to (1) Contractor’s determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. 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.
- B. At all times during the progress of the Work, Contractor shall identify and assign a competent superintendent, who is proficient in English, and who shall not be replaced without written

notice to City of the name of the replacement superintendent. If at any time the superintendent is not satisfactory to the City, Contractor shall, if requested by City, replace the superintendent with another satisfactory to City.

- C. Contractor shall notify the City 24 hours prior to moving areas during the sequence of construction.

7.03 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to City for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours on Business Days. Contractor will not permit the performance of Work outside of regular working hours on Business Days without City's prior written consent (which will not be unreasonably withheld). Contractor's written request (by letter or electronic communication) for City's written consent must be made as follows:
 - 1. for Work beyond regular working hours on Business Days, request must be made by noon at least two (2) Business Days prior;
 - 2. for Work during Weekend Working Hours, request must be made by noon of the preceding Wednesday; and
 - 3. for Work on state or federal holidays observed by the City, request must be made sufficiently in advance of the holiday, to satisfy requirements for City Council approval.

7.04 Services, Materials, and Equipment

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, 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 performance, Contractor required testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of sufficient quality to complete the Work, and must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of City. If required by City, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment to be incorporated into the Work shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with

instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

- D. All items of standard equipment to be incorporated into the Work shall be the latest model at the time of bid, unless otherwise specified.

7.05 *Project Schedule*

- A. Contractor shall adhere to the Project Schedule established in accordance with Paragraph 2.06 and the General Requirements as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to the City for acceptance (to the extent indicated in Paragraph 2.06 and the General Requirements) proposed adjustments in the Project Schedule that will not result in changing the Contract Time. Such adjustments must comply with any provisions of the General Requirements applicable thereto.
 - 2. Contractor shall submit to City a monthly Project Schedule with a monthly progress payment request for the duration of the Contract in accordance with the Construction Progress Schedule, General Requirements 01 32 16.
 - 3. Proposed adjustments in the Project Schedule that will change the Contract Time shall be submitted in accordance with the requirements of Article 11. Adjustments in Contract Time may only be made by a Change Order.

7.06 *“Or Equals”*

- A. *Contractor’s Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that City permit the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If City in its sole discretion determines that an item of equipment or material 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 City as an “or equal” item. For the purposes of this Paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. the City determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to City.

- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the City or increase in Contract Time; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *City's Evaluation and Determination*: City will be allowed a reasonable time to evaluate each "or-equal" request. City may require Contractor to furnish additional data about the proposed "or-equal" item. City will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until City's review is complete and City determines that the proposed item is an "or-equal." City." City will advise Contractor in writing of its determination.
- D. *Effect of City's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The City's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If City determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that City consider the item a proposed substitution pursuant to Paragraph 7.07.

7.07 Substitutions

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that City permit the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related Work at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow City to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitution therefor. City will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 - 2. The requirements for review by City will be as set forth in Paragraph 7.07.B, as supplemented by the Specifications, and as City may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to City for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application shall comply with Section 01 25 00 and:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be substantially similar in substance to the item specified; and

- 3) be well-suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will adversely impact Contractor's achievement of Final Acceptance on or before the Contract Time;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with City for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and Damage Claims of other contractors affected by any resulting change.
- B. *City's Evaluation and Determination:* City will be allowed a reasonable time to evaluate each substitution request. City may require Contractor to furnish additional data about the proposed substitute item. City will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until City's review is complete and City determines that the proposed item is an acceptable substitution. City's approval determination will be evidenced by a Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Time. City will advise Contractor in writing of any denial determination.
- C. *Special Guarantee:* City may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitution. ***Contractor shall indemnify and hold harmless City and its officers, elected and appointed officials, employees, agents, consultants and subcontractors and anyone directly or indirectly employed by them from and against any and all claims, damages, losses and expenses (including attorney's fees) arising out of or relateds to the use of substituted materials or equipment.***
- D. *Reimbursement of City's Cost:* City will record City's costs in evaluating a substitution proposed or submitted by Contractor. Whether or not City approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse City for evaluating each such proposed substitute. Contractor shall also reimburse City for the charges for making changes in the Contract Documents (or in the provisions of any other direct contract with City) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

- F. *City Substitution Reimbursement:* Cost savings attributable to acceptance of a substitution shall be paid to City by Contractor by an appropriate Change Order decreasing the Contract Price.
- G. *Effect of City's Determination:* If City approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The City's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.07.D, by timely submittal of a Change Order.

7.08 *Concerning Subcontractors and Suppliers*

- A. Contractor shall perform with its own organization, and with the assistance of workmen under its immediate superintendence, work of a value not less than 35% of the Contract Price, unless otherwise approved by the City.
- B. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, against whom City may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection, except as provided in Paragraph 7.08.C. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to City to perform and complete the Work in accordance with the Contract.
- C. The City may require the use of specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work , and will provide such requirements in the Supplementary Conditions.
- D. Contractor shall provide to City as part of the Bid, the identity of all proposed Subcontractors and Suppliers. Such proposed Subcontractor or Supplier shall be deemed acceptable to City unless City raises a substantive, reasonable objection prior to execution of the Agreement.
- E. Contractor shall be fully responsible to City for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities 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:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between City and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of City to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- F. No acceptance by City of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of City to the completion of the Work in accordance with the Contract Documents, Contract Price and Contract Time.
- G. Contractor shall be solely responsible for scheduling and coordinating the tasks of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

- H. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of City. Contractor must comply with all applicable federal, state, and local laws, statutes, ordinances or regulations, including but not limited to immigration laws, workers compensation laws and wage laws, in the hiring of any Subcontractor or Supplier and shall ensure that each Subcontractor or Supplier has the same obligations.
- I. Contractor shall restrict all Subcontractors and Suppliers from communicating with City, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.09 *Wage Rates*

- A. *Duty to pay Prevailing Wage Rates:* The Contractor shall comply with all requirements of Chapter 2258, Texas Government Code (as amended), including the payment of not less than the rates determined by the City Council of the City of Denton to be the prevailing wage rates in accordance with Chapter 2258. The then current prevailing wage rates at the time of execution of the Agreement are included in these Contract Documents.
- B. *Penalty for Violation:* A Contractor or any Subcontractor who does not pay the prevailing wage shall, upon demand made by the City, pay to the City \$60 for each worker employed for each calendar day or part of the day that the worker is paid less than the prevailing wage rates stipulated in these contract documents. This penalty shall be retained by the City to offset its administrative costs, pursuant to Texas Government Code Section 2258.023.
- C. *Complaints of Violations and City Determination of Good Cause:* On receipt of information, including a complaint by a worker, concerning an alleged violation of Section 2258.023, Texas Government Code, by a Contractor or Subcontractor, the City shall make an initial determination, before the 31st day after the date the City receives the information, as to whether good cause exists to believe that the violation occurred. The City shall notify in writing the Contractor or Subcontractor and any affected worker of its initial determination. Upon the City's determination that there is good cause to believe the Contractor or Subcontractor has violated Chapter 2258, the City shall retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the prevailing wage rates, such amounts being retained from successive progress payments pending a final determination of the violation.
- D. *Arbitration Required if Violation Not Resolved:* An issue relating to an alleged violation of Section 2258.023, Texas Government Code, including a penalty owed to the City or an affected worker, shall be submitted to binding arbitration in accordance with the Texas General Arbitration Act (Article 224 et seq., Revised Statutes) if the Contractor or Subcontractor and any affected worker does not resolve the issue by agreement before the 15th day after the date the City makes its initial determination pursuant to Paragraph 7.09.C. If the persons required to arbitrate under this section do not agree on an arbitrator before the 11th day after the date that arbitration is required, a district court shall appoint an arbitrator on the petition of any of the persons. The City is not a party in the arbitration. The decision and award of the arbitrator is final and binding on all parties and may be enforced in any court of competent jurisdiction.

- E. *Records to be Maintained:* The Contractor and each Subcontractor shall, for a period of three (3) years following the date of Final Acceptance, maintain records that show (i) the name and occupation of each worker employed by the Contractor in the construction of the Work provided for in this Contract; and (ii) the actual per diem wages paid to each worker. The records shall be available in Denton County, Texas at all reasonable hours for inspection by the City. The provisions of Paragraph 7.23, Right to Audit, shall pertain to this inspection.
- F. *Progress Payments:* With each progress payment request or payroll period, whichever is less, the Contractor shall submit an affidavit stating that the Contractor has complied with the requirements of Chapter 2258, Texas Government Code.
- G. *Posting of Wage Rates:* The Contractor shall post prevailing wage rates in a conspicuous place at the Site at all times.
- H. *Subcontractor Compliance:* The Contractor shall include in its subcontracts and/or shall otherwise require all of its Subcontractors to comply with Paragraphs 7.09.A through 7.09.G.

7.10 *Patent Fees and Royalties*

- A. Contractor shall pay all patent or license fees and royalties and pay all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of City, its use is subject to patent rights or copyrights calling for the payment of any patent or license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents. Failure of the City to disclose such information does not relieve the Contractor from its obligations to pay said fees or, royalties or costs to others.
- B. ***TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS CITY, AND ITS OFFICERS, ELECTED AND APPOINTED OFFICIALS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS AND SUBCONTRACTORS OF EACH AND ANY OF THEM, 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 RELATING TO ANY INFRINGEMENT OF PATENT RIGHTS OR COPYRIGHTS INCIDENT TO THE USE IN THE PERFORMANCE OF THE WORK OR RESULTING FROM THE INCORPORATION IN THE WORK OF ANY INVENTION, DESIGN, PROCESS, PRODUCT, OR DEVICE.***

7.11 *Permits and Utilities*

- A. *Contractor obtained permits and licenses.* Unless otherwise expressly provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. City shall provide reasonable assistance to Contractor, if necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work applicable at the time the Notice of Award is issued, except for permits provided by the City as specified in Paragraph 7.11.B. City shall pay the charges of utility service providers for connections for providing permanent service to the Work.

- B. *City obtained permits and licenses.* City will obtain and pay for those permits and licenses identified as City's responsibility in the Supplementary Conditions or Contract Documents. It will be the Contractor's responsibility to comply with and carry out the provisions of the permit. If the Contractor initiates changes to the Contract and the City approves the changes, the Contractor is responsible for obtaining clearances and coordinating with the appropriate regulatory agency, relating to the changes. The City will not reimburse the Contractor for any cost associated with the requirements of any City acquired permit. The following are permits the City will obtain if required:
1. Texas Department of Transportation Permits
 2. U.S. Army Corps of Engineers Permits
 3. Texas Commission on Environmental Quality Permits
 4. Railroad Company Permits
 5. Texas Department of Licensing and Regulation (TDLR) Permits
- C. *Outstanding permits and licenses.* Any outstanding permits and licenses are anticipated to be acquired in accordance with the schedule set forth in the Supplementary Conditions. The Project Schedule submitted by the Contractor in accordance with the Contract Documents must consider any outstanding permits and licenses.

7.12 *Taxes*

- A. On issuance of a Notice of Award by the City, an organization which qualifying for exemption pursuant to Texas Tax Code, Subchapter H (as amended), the Contractor may purchase, rent or lease all materials, supplies and equipment used or consumed in the performance of this contract by issuing to hisits Supplier an exemption certificate in lieu of the tax, said exemption certificate to comply with State Comptroller's Rulings applicable to Texas Tax Code, Subchapter H. Any such exemption certificate issued to the Contractor in lieu of the tax shall be subject to and shall comply with all applicable rulings pertaining to the Texas Tax Code, Subchapter H.
- B. Texas tax permits and information may be obtained from:
1. Comptroller of Public Accounts
Sales Tax Division
Capitol Station
Austin, TX 78711; or
 2. <http://www.window.state.tx.us/taxinfo/taxforms/93-forms.html>

7.13 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, City shall not be responsible for monitoring Contractor's compliance with any Laws and Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws and Regulations, Contractor shall be liable for all resulting claims, costs losses, and damages, and shall indemnify and hold harmless City, and its officers, elected

and appointed officials, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, 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 relating to such Work or other action.

- C. Changes in Laws and Regulations not known at the time of the City's issuance of a Notice of Award having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Time.

7.14 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. Contractor shall include accurate locations for buried and imbedded items. These record documents, together with all approved Samples, will be available to City for reference. Upon completion of the Work, Contractor shall deliver these record documents to City prior to Final Inspection.

7.15 *Safety and Protection*

- A. As between City and Contractor, Contractor shall be responsible for the safety of persons and property in the performance of the Work, for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work and for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs. Contractor shall inform the City in writing of Contractor's designated safety representative at the Site.
- C. 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 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 trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.1515.C.2 or 7.1515.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be the responsibility of and remedied by Contractor at its expense.
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss;

and shall implement, erect and maintain all necessary safeguards for such safety and protection.

- F. Contractor shall notify City; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of City's safety programs, if any.
- H. Contractor shall inform City in advance in writing of the specific requirements of Contractor's safety program with which City's and Engineer's employees and representatives must comply while at the Site.
- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed and City has issued a Letter of Final Acceptance.
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.16 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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.

7.17 *Emergencies and/or Rectification*

- A. In the event of threatened or actual emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to immediately act to prevent damage, injury, or loss. Contractor shall give City prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency or are required as a result of Contractor's response to an emergency. If City determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Change Order may be issued.
- B. Should the Contractor fail to respond to a request from the City to rectify any discrepancies, omissions, or correction necessary to conform with the requirements of the Contract Documents, the City shall give the Contractor written notice that such work or changes are to be performed. The written notice shall direct attention to the discrepant condition and request the Contractor to take remedial action to correct the condition. In the event the Contractor does not take proper action within 24 hours to fulfill this written request or fails to show just cause for not taking the proper action, within 24 hours, the City may take such remedial action with City resources or by contract. The City shall deduct an amount equal to the entire cost for such remedial action, plus 25% from any funds due or to become due the Contractor on the Project.

7.18 Submittals

- A. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit required Submittals to City for review and acceptance in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.03).
1. Contractor shall submit the Submittals in accordance with Section 01 33 00 of the General Requirements.
 2. Data shown on the Submittals must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to demonstrate to City the services, materials, and equipment Contractor proposes to provide, and to enable City to review the information for the limited purposes required by Paragraph 7.18.C.
 3. Submittals reviewed and accepted by City for conformance with the design concept shall be executed in conformity with the Contract Documents unless otherwise required by City.
 4. When Submittals are submitted for the purpose of showing the installation in greater detail, their review shall not excuse Contractor from requirements shown on the Drawings and Specifications.
 5. For-Information-Only submittals upon which the City is not expected to conduct a review or take responsive action may be so identified in the Contract Documents.
 6. Contractor shall submit the required number of Samples specified in the Specifications.
 7. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which it is intended and other data as City may require to enable City to review the Submittal for the limited purposes set forth in Paragraph 7.18.C.
- B. Where a Submittal is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to City's review and acceptance of the pertinent submittal will be at the sole risk, expense and responsibility of Contractor.
- C. City's Review
1. City will provide timely review of Submittals in accordance with the accepted Schedule of Submittals. City's review and acceptance will be to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. City's review and acceptance will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents), or to safety precautions or programs incident thereto.
 3. City's review and acceptance of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. City's review and acceptance of a Submittal will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Section 01 33 00 of the General

Requirements, and City has given written acceptance of each such variation by specific written notation thereof incorporated in or accompanying the Submittal.

5. City's review and acceptance of a Submittal will not relieve Contractor from responsibility for complying with the requirements of the Contract Documents.
6. City's review and acceptance of a Submittal, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Time or Contract Price, unless such changes are included in a Change Order.
7. Neither City's receipt, review, or acceptance of a Submittal will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in accepted Submittals, subject to the provisions of Section 01 33 00 of the General Requirements.

7.19 *Continuing the Work*

- A. Except as otherwise provided, Contractor shall carry on the Work and adhere to the Project Schedule during all disputes or disagreements with City. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as City and Contractor may otherwise agree in writing.

7.20 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to City that all Work will be in accordance with the Contract Documents and will not be defective. City and its officers, elected and appointed officials, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Contractor's warranty and guarantee under this Paragraph 7.20:
 1. Observations by Engineer or City;
 2. Recommendation by Engineer or payment by City of any progress or final payment;
 3. The issuance of a letter or certificate of Final Acceptance by City or any payment related thereto by City;
 4. Use or occupancy of the Work or any part thereof by City;
 5. Any review and acceptance of a Submittal by City;

6. Any inspection, test, or acceptance by others; or
 7. Any correction of defective Work by City.
- D. The Contractor shall remedy any defects or damages in the Work and pay for any damage to other work or property resulting therefrom which shall appear within a period of two (2) years from the date of Final Acceptance of the Work unless a longer period is specified. Contractor shall furnish a good and sufficient maintenance bond, complying with the requirements of Paragraph 6.02.B. The City will give notice of observed defects with reasonable promptness.

7.21 *Indemnification*

- A. **CONTRACTOR COVENANTS AND AGREES TO INDEMNIFY, HOLD HARMLESS, AND DEFEND, AT ITS OWN EXPENSE, THE CITY, ITS OFFICERS, ELECTED AND APPOINTED OFFICIALS, EMPLOYEES, AGENTS, CONSULTANTS AND SUBCONTRACTORS AND ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM , FROM AND AGAINST ANY AND ALL CLAIMS FOR PERSONAL OR BODILY INJURY OR DEATH, ARISING OUT OF OR RELATED TO, OR ALLEGED TO ARISE OUT OF OR BE RELATED TO, THE WORK AND SERVICES TO BE PERFORMED BY THE CONTRACTOR, ITS OFFICERS, AGENTS, EMPLOYEES, SUBCONTRACTORS, LICENSEES OR INVITEES UNDER THESE CONTRACT DOCUMENTS. THIS INDEMNIFICATION PROVISION IS SPECIFICALLY INTENDED TO OPERATE AND BE EFFECTIVE EVEN IF IT IS ALLEGED OR PROVEN THAT ALL OR SOME OF THE DAMAGES BEING SOUGHT WERE CAUSED, IN WHOLE OR IN PART, BY ANY ACT, OMISSION OR NEGLIGENCE OF THE CITY, OR ITS OFFICERS, ELECTED OR APPOINTED OFFICIALS, EMPLOYEES, AGENTS, CONSULTANTS OR SUBCONTRACTORS OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM. THIS INDEMNITY PROVISION IS INTENDED TO INCLUDE, WITHOUT LIMITATION, INDEMNITY FOR COSTS, EXPENSES AND LEGAL FEES INCURRED IN DEFENDING AGAINST SUCH CLAIMS AND CAUSES OF ACTIONS.**
- B. **CONTRACTOR COVENANTS AND AGREES TO INDEMNIFY AND HOLD HARMLESS, AT ITS OWN EXPENSE, THE CITY, ITS OFFICERS, ELECTED AND APPOINTED OFFICIALS, EMPLOYEES, AGENTS, CONSULTANTS AND SUBCONTRACTORS AND ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM FROM AND AGAINST ANY AND ALL LOSS, DAMAGE OR DESTRUCTION OF PROPERTY OF THE CITY, ARISING OUT OF OR RELATED TO, OR ALLEGED TO ARISE OUT OF OR BE RELATED TO, THE WORK AND SERVICES TO BE PERFORMED BY THE CONTRACTOR, ITS OFFICERS, AGENTS, EMPLOYEES, SUBCONTRACTORS, LICENSEES OR INVITEES UNDER THIS CONTRACT. THIS INDEMNIFICATION PROVISION IS SPECIFICALLY INTENDED TO OPERATE AND BE EFFECTIVE EVEN IF IT IS ALLEGED OR PROVEN THAT ALL OR SOME OF THE DAMAGES BEING SOUGHT WERE CAUSED, IN WHOLE OR IN PART, BY ANY ACT, OMISSION OR NEGLIGENCE OF THE CITY OR ITS OFFICERS, ELECTED OR APPOINTED OFFICIALS, EMPLOYEES, AGENTS, CONSULTANTS OR SUBCONTRACTORS OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM.**

7.22 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, City will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Submittal related to the requirements indicated in Paragraph 7.22.B is prepared by Contractor, a Subcontractor, or others for submittal to City, then such Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to City.
- D. City shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under the conditions indicated in Paragraph 7.22.B, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.22, City's review, acceptance, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to the conditions indicated in Paragraph 7.22.B, will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.22;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

7.23 *Right to Audit*

- A. The City shall have the right to audit and make copies of the books, records and computations pertaining to the Contract. The Contractor shall retain such books, records, documents and other evidence pertaining to the Contract during the term of the Contract and for five years thereafter, except if an audit is in progress or audit findings are yet unresolved, in which case records shall be kept until all audit tasks are completed and resolved. These books, records, documents and other evidence shall be made available, in Denton County, Texas within ten (10) Business Days of City's written request. Further, the Contractor shall also require all Subcontractors, material suppliers, and other payees to retain all books, records, documents and other evidence pertaining to the Contract, and to allow the City similar access to those documents. All books and records will be made available within Denton County, Texas. Except as otherwise provided herein, the cost of the audit will be borne by the City

unless the audit reveals an overpayment of 1% or greater. If the City is undertaking an audit or inspection pursuant to Paragraph 7.09 or if an overpayment of 1% or greater occurs, the City's reasonable cost of the audit, including any travel costs, must be paid by the Contractor within five (5) Business Days of receipt of City's invoice for such costs.

- B. Failure to comply with the provisions of this section shall be a material breach of the Contract and shall constitute, in the City's sole discretion, grounds for termination thereof. Each of the terms "books", "records", "documents" and "other evidence", as used above, shall be construed to include drafts and electronic files, even if such drafts or electronic files are subsequently used to generate or prepare a final printed document.

7.24 *Nondiscrimination*

- A. The City is responsible for operating Public Transportation Programs and implementing transit-related projects, funded in part with Federal financial assistance awarded by the U.S. Department of Transportation and the Federal Transit Administration (FTA), without discriminating against any person in the United States on the basis of race, color, or national origin.
- B. Contractor shall comply with the requirements of *Title VI, Civil Rights Act of 1964 as amended* and the regulations promulgated thereunder, as may be further defined in the Supplementary Conditions, for any project receiving Federal assistance.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the City may perform other work at or adjacent to the Site. Such other work may be performed by City's employees, or through contracts between the City and third parties. City may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If City performs other work at or adjacent to the Site with City's employees, or through contracts for such other work, then City shall give Contractor written notice thereof prior to starting any such other work, if such other work is not noted in the Contract Documents.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and City, if City is performing other work with City's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of City and the others whose work will be affected.
- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to City 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 so report will constitute an acceptance of such other work as fit and proper for integration with

Contractor's Work except for latent defects and deficiencies in such other work that could not have been discovered through a proper inspection.

- F. The provisions of this Article 8 are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with City, or that is performed without having been arranged by City. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.03.D.3.

8.02 *Coordination*

- A. If City intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with City's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, City shall have authority for such coordination.

8.03 *Legal Relationships*

- A. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of City, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. When City is performing other work at or adjacent to the Site with City's employees, Contractor shall be liable to City for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by City as a result of Contractor's failure to take reasonable and customary measures with respect to City's other work.
- B. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any Damage Claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, City, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify, defend and hold harmless City and Engineer, and the officers, elected and appointed officials, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all 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 relating to such damage, delay, disruption, or interference.

ARTICLE 9 – CITY’S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in the Supplementary Conditions, City shall issue all communications to Contractor.

9.02 *Furnish Data*

- A. City shall promptly furnish the data required of City under the Contract Documents.

9.03 *Pay When Due*

- A. City shall make payments to Contractor when they are due in accordance with and subject to the provisions of Article 14.

9.04 *Lands and Easements; Reports, Tests, and Drawings*

- A. City’s duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Article 5 refers to City’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by City in preparing the Contract Documents.

9.05 *Change Orders*

- A. City’s responsibilities with respect to Change Orders are set forth in Article 11.

9.06 *Inspections, Tests, and Approvals*

- A. City’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.02.DD.

9.07 *Limitations on City’s Responsibilities*

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

9.08 *Undisclosed Hazardous Environmental Condition*

- A. City’s responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.09 *Compliance with Safety Program*

- A. While at the Site, City’s employees and representatives shall comply with the specific applicable requirements of Contractor’s safety programs of which City has been informed in advance in writing pursuant to Paragraph 7.15.

ARTICLE 10 – CITY’S OBSERVATION DURING CONSTRUCTION

10.01 *City’s Project Manager or Duly Authorized Representative*

- A. City will provide a Project Manager or duly authorized representative during the construction period. The duties and responsibilities and the limitations of authority of City’s Project Manager or duly appointed representative during construction are set forth in the Contract Documents.
- B. City’s Project Manager for these Contract Documents is as set forth in the Supplementary Conditions. City will establish a duly authorized representative at the Preconstruction Meeting in accordance with Section 01 31 19 of the General Requirements.

10.02 *Visits to Site*

- A. City will make visits to the Site at intervals appropriate to the various stages of construction as City deems necessary in order to observe 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, City will determine, in general, if the Work is proceeding in accordance with the Contract Documents. City will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. City’s efforts will be directed toward providing City a greater degree of confidence that the completed Work will conform generally to the Contract Documents.
- B. City’s visits and observations are subject to all the limitations on City’s responsibility set forth in Paragraph 99.07. Particularly, but without limitation, during or as a result of City’s visits or observations of Contractor’s Work, City 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, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Determinations for Work Performed*

- A. As applicable, Contractor will determine the actual quantities and classifications of Work performed.. City’s Project Manager or duly authorized representative will review with Contractor the preliminary determinations on such matters before rendering a written recommendation. City’s written decision will be final (except as modified to reflect changed factual conditions or more accurate data).

10.04 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. City will be the interpreter of the requirements of the Contract Documents and judge the acceptability of the Work thereunder.
- B. City will render a written decision on any issue referred.
- C. City’s written decision on the issue referred will be final and binding on the Contractor, subject to the provisions of Paragraph 11.07.

ARTICLE 11 – CHANGES IN THE WORK; CLAIMS; EXTRA WORK

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof, including in the Contract Price or Contract Time, but such amendment will be made by Change Order only.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work not involving a change in Contract Price or Contract Time, may be authorized, by one of the following ways:
 - 1. A Field Order; or
 - 2. City's review of a Submittal (subject to the provisions of Paragraph 7.18.C); or
 - 3. City's written interpretation or clarification.

11.02 *Execution of Change Orders*

- A. City and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in the Contract Price or Contract Time which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed..
 - 2. Changes in the Work which are: (a) ordered by City pursuant to Paragraph 11.04, (b) required because of City's acceptance of defective Work under Paragraph 13.05 or City's correction of defective Work under Paragraph 13.08, or (c) as otherwise agreed to by the parties.

11.03 *Field Orders*

- A. City may authorize minor variations and deviations in changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Time and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on both the City and Contractor, which shall perform the Work involved promptly.

11.04 *Authorized Changes in the Work – Extra Work*

- A. Without invalidating the Contract and without notice to any surety, City may, at any time or from time to time, order Extra Work. Upon notice of such Extra Work, Contractor shall proceed with the Work involved only upon receiving written notice from City. Extra Work will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided). Extra Work shall be memorialized by a Change Order which may or may not precede an order of Extra Work.
- B. For minor changes of Work not requiring changes to Contract Time or Contract Price, a Field Order may be issued by City.

11.05 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract

Documents, as amended, modified, or supplemented as allowed herein, except in certain cases of an emergency as provided in Paragraph 7.17.A.

11.06 *Dispute of Extra Work*

- A. Should a difference arise as to what does or does not constitute Extra Work, or as to the payment for such Extra Work, and the City requires its performance, the Contractor shall proceed with the Extra Work after making written request for a Change Order and shall keep accurate account of the actual reasonable cost thereof. Contract Claims regarding Extra Work shall be made pursuant to Paragraph 11.07.
- B. The Contractor shall furnish the City such records of all deviations from the original Contract Documents as may be necessary to enable the City to prepare for permanent record a corrected set of plans showing the actual work performed.
- C. The compensation agreed upon for Extra Work whether or not initiated by a Change Order shall be the full, complete and final payment for all charges, fees and costs Contractor incurs as a result of or relating to the Extra Work, whether said charges, fees or costs are known, unknown, foreseen or unforeseen at that time, including without limitation, any charges, fees or costs for delay, extended overhead, ripple or impact cost, or any other effect on changed or unchanged work as a result of the Extra Work.

11.07 *Contract Claims Process*

- A. *City's Decision Required:* All Contract Claims, except those waived pursuant to Paragraph 14.08, shall be referred to the City for decision. A decision by City shall be required as a condition precedent to any exercise by Contractor of any rights or remedies he may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Contract Claims.
- B. *Notice:*
 - 1. Written notice stating the general nature of each Contract Claim shall be delivered by the Contractor to City no later than 15 days after the start of the event giving rise thereto. The responsibility to substantiate a Contract Claim shall rest with the party making the Contract Claim.
 - 2. Notice of the amount or extent of the Contract Claim, with supporting data shall be delivered to the City no later than 45 days after the start of the event giving rise thereto (unless the City notifies Contractor in writing that City will allow additional time for Contractor to submit additional or more accurate data in support of such Contract Claim).
 - 3. A Contract Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 11.08.
 - 4. A Contract Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 11.09.
 - 5. Each Contract Claim shall be accompanied by Contractor's written statement that the adjustment claimed is the entire adjustment to which the Contractor believes it is entitled as a result of said event.

6. The City shall submit any response to the Contractor within 30 days after receipt of the Contractor's last submittal (unless in connection with the Contract Claim (unless Contractor allows the City additional time to submit a response).
- C. *City's Action:* City will review each Contract Claim and, within 30 days after receipt of the last submittal of the Contractor unless action by City's Council is required, take one of the following actions in writing:
 1. deny the Contract Claim in whole or in part;
 2. approve the Contract Claim; or
 3. notify the Contractor that the City is unable to resolve the Contract Claim if, in the City's sole discretion, it would be inappropriate for the City to do so. For purposes of further resolution of the Contract Claim, such notice shall be deemed a denial.
- D. City's written action under this Paragraph 11.07 will be final and binding, unless City or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- E. No Contract Claim for an adjustment in Contract Price or Contract Time will be valid if not submitted in accordance with this Paragraph 11.07.
- F. If the City fails to take any action pursuant to this Paragraph 11.07, the Contract Claim is considered to have been denied by the City.

11.08 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order.
- B. TheThe value of any Work covered by a Change Order will be determined as follows:
 1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 12.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum or unit price (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.08.C.2), and shall include the cost of any secondary impacts that are foreseeable at the time of pricing the cost of Extra Work; or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum or unit price, then on the basis of the Cost of the Work (determined as provided in Paragraph 12.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.08.C).
- C. *Contractor's Fee:* The Contractor's fee for overhead and profit will be determined as follows:
 1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

- a. For costs incurred under Paragraphs 12.01.B.1, 12.01.B.2, and 12.01.B.3, the Contractor's fee will be 15 percent except for:
 - 1) rental fees for Contractor's own equipment; and
 - 2) bonds and insurance;
- b. For costs incurred under Paragraph 12.01.B.4, the Contractor's fee will be 5 percent;
 - 1) Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.08.C.2.a and 11.08.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 12.01.B.1, 12.01.B.2, and 12.01.B.3 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, in no case shall the cumulative total of fees paid be in excess of 25% of the Cost of the Work;
- c. No fee will be payable on the basis of costs itemized under Paragraphs 12.01.B.5, 12.01.B.6, and 12.01.C;
- d. The amount of credit to be allowed by Contractor to City for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

11.09 *Change of Contract Time*

- A. The Contract Time may only be changed by a Change Order.
- B. No extension of the Contract Time will be allowed under a Change Order for Extra Work or for claimed delay unless the Extra Work contemplated or claimed delay is shown to be on the critical path of the Project Schedule or Contractor can show by critical path method analysis how the Extra Work or claimed delay adversely affects the critical path.
- C. Delay, disruption, and interference in the Work, and any related changes in Contract Time, are addressed in and governed by Paragraph 4.03.

11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted by the Contractor to reflect the effect of any such change.

ARTICLE 12 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK; PLANS QUANTITY MEASUREMENT

12.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work:* The term “Cost of the Work” means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 12.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. When needed to determine the value of a Change Order. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* The term, “Cost of the Work” means the sum of all costs, except those excluded in Paragraph 12.01.C, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work is covered by a Change Order, the costs reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work. Such costs shall be in amounts no higher than those calculated based on the prevailing wage rates contained in the Contract Documents, shall not include any of the costs itemized in Paragraph 12.01.C, and may include as applicable, but not be limited to the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by City and Contractor. Such employees shall include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs shall include, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers’ compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours on Business Days, during Weekend Working Hours, or on a state or federal holiday observed by the City, shall be included in the above to the extent authorized by City.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers’ field services required in connection therewith.
 3. Rentals of all construction equipment and machinery and the parts thereof, whether rented from Contractor or others, in accordance with rental agreements approved in writing by City, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. and the Contract Documents. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

4. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by City, Contractor shall obtain competitive bids from subcontractors acceptable to City. Contractor shall deliver such bids to City, which will then determine, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 12.01 and Paragraph 11.08.C.
5. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work and specifically included in the agreed upon schedule of job classifications referred to in Paragraph 12.01.B.1 or otherwise specifically included in the Contract.
6. Supplemental costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, and temporary office or facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations, excluding those taxes for which an exemption is available as described in Paragraph 7.12.
 - d. Deposits lost for causes other than the negligence or willful misconduct of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - e. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work, provided such losses and damages have resulted from causes other than the negligence or willful misconduct of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of CityCity. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.
 - f. The cost of utilities, fuel, and sanitary facilities at the Site.
 - g. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - h. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 12.01.B.1 or otherwise specifically covered in the Contract. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. Costs due to the acts, omissions, negligence or willful misconduct of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 5. Other overhead or general expense costs of any kind.
- D. *Contractor's Fee*
1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Agreement will be determined as set forth in the Contract.
 - b. for any Work covered by a Change Order for an adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as set forth in Paragraph 11.08.C.
 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order for for an adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.08.C.2.
- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 12, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices, and submit in a form acceptable to City an itemized cost breakdown together with supporting data. Subject to prior written notice, City will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by City. Contractor will be responsible for ensuring that pertinent Subcontractors will afford such access to City, and preserve such documents, to the same extent as is required of Contractor.

12.02 Allowances

- A. *Specified Allowance*: It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to City.
- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances, have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of City.
- D. Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

12.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work multiplied by the estimated quantity of each item as indicated in the Agreement.
- B. 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 Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by City subject to the provisions of Paragraph 10.03.
- C. 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. Work described in the Contract Documents, or reasonably inferred as required for a functionally complete installation, but not identified in the listing of unit price items shall be considered incidental to Unit Price Work listed and the cost of incidental work included as part of the unit price.
- D. Adjustments in Contract Price
 - 1. City may make an adjustment in the Contract Price in accordance with Paragraph 11.08 if:
 - a. the quantity of the item of Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. there is no corresponding adjustment with respect to any other item of Work.
 - 2. Adjusted unit prices will apply to all units of that item.

- E. Increased or Decreased Quantities: The City reserves the right to order Extra Work in accordance with Paragraph 11.04.
1. If the changes in quantities or the alterations do not significantly change the character of the Work under the Contract Documents, the altered Work will be paid for at the Contract unit price.
 2. If the changes in quantities or alterations materially and significantly change the character of the Work, the Contract will be amended by a Change Order.
 3. If no unit prices exist, this any increase or decrease in quantities will be considered Extra Work and the Contract will be amended by a Change Order in accordance with Article 11.
 4. A significant change in the character of Work occurs when:
 - a. the character of work for any Item as altered differs materially or significantly in kind or nature from that in the Contract; or
 - b. a Major Item of work varies by more than 25% from the original Contract quantity.
 5. When the quantity of work to be done under any Major Item of the Contract is more than 125% of the original quantity stated in the Contract, then either party to the Contract may request an adjustment to the unit price on the portion of the work that is above 125%.
 6. When the quantity of work to be done under any Major Item of the Contract is less than 75% of the original quantity stated in the Contract, then either party to the Contract may request an adjustment to the unit price.

12.04 *Plans Quantity Measurement for Unclassified Excavation or Embankment*

- A. Plans quantities may or may not represent the exact quantity of Work performed or material moved, handled, or placed during the term of the Contract. The estimated bid quantities are designated as final payment quantities, unless revised in accordance with the Contract.
- B. If the total actual quantity measured for an individual item varies by more than 25% (or as stipulated under "Price and Payment Procedures" for specific Items) from the total estimated quantity for an individual Item originally shown in the Contract Documents, an adjustment may be made to the quantity of authorized Work done for payment purposes. The party to the Contract requesting the adjustment will provide field measurements and calculations showing the final quantity for which payment will be made. Payment for revised quantity will be made at the unit price bid for that Item, except as provided for in Article 11.
- C. When quantities are revised by a change in design approved by the City, by Change Order, or to correct an error, or to correct an error on the plans, the plans quantity will be increased or decreased by the amount identified in the approved change, and the 25% variance provisions of Paragraph 12.04.B will apply to the new plans quantity.
- D. If the total Contract quantity multiplied by the unit price bid for an individual Item is less than \$250 and the Item is not originally a plans quantity Item, then the Item may be paid as a plans quantity Item if the City and Contractor agree in writing to fix the final quantity as a plans quantity.

- E. For callout work or non-site specific Contracts, the plans quantity measurement requirements are not applicable.

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

13.01 *Access to Work*

- A. City and its Engineer, consultants, representatives, employees, and independent testing laboratories, and authorities having jurisdiction shall have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor’s safety procedures and programs so that they may comply with such procedures and programs as applicable.

13.02 *Tests and Inspections*

- A. Contractor shall give City timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. If the Contract Documents or any Laws and Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish City the required certificates of inspection, testing or approval, except that those fees specifically identified in the Supplementary Conditions or any Texas Department of Licensure and Regulation (TDLR) inspections, which shall will be paid as described in the Supplementary Conditions.
- C. Contractor shall be responsible for arranging, obtaining, and paying for all inspections, tests, re-tests, and approvals required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to City;
 - 2. to attain City’s acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor’s purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to City.

- D. City may arrange for the services of an independent testing laboratory (“Testing Lab”) to perform any inspections or tests (“Testing”) for any part of the Work, as determined solely by City.
 - 1. City will coordinate such Testing to the extent possible, with Contractor;

2. Should any Testing under this Section 13.03.D result in a “fail”, “did not pass” or other similar negative result, the Contractor shall be responsible for paying for any and all retests. Contractor’s cancellation without cause of City initiated Testing shall be deemed a negative result and require a retest.
 3. Any amounts owed for any retest under this Section 13.02.D shall be paid directly to the Testing Lab by Contractor. City will forward all invoices for retests to Contractor.
 4. If Contractor fails to pay the Testing Lab, City will not issue Final Payment until the Testing Lab is paid.
- E. If the Contract Documents require the Work (or part thereof) to be approved by City or another designated individual or entity, then Contractor shall assume full responsibility for seeking and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without the written approval of City, Contractor shall, if requested by City, uncover such Work for observation. Such uncovering and the recovering of such Work will be at Contractor’s expense.

13.03 *Defective Work*

- A. *Contractor’s Obligation:* It is Contractor’s obligation to assure that the Work is not defective.
- B. *City’s Authority:* City has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Written notice of all defective Work of which City has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if City has rejected the defective Work, shall remove the defective Work from the Project and replace it with Work that is not defective. Failure to require the removal of any defective Work shall not constitute acceptance of such Work.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair City’s warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Contractor or City by governmental authorities because the Work is defective, and the costs of repair, replacement or reconstruction of work of others resulting from defective Work.

13.04 *Rejecting Defective Work*

- A. City will have authority to reject Work which City believes to be defective or will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. City will have authority to conduct special inspection or testing

of the Work as provided in this Article 13, whether or not the Work is fabricated, installed, or completed.

13.05 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, City prefers to accept it, City may do so. Contractor shall pay 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) attributable to City's evaluation of and determination to accept such defective Work, and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to Final Acceptance, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and City shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of the Work so accepted.

13.06 *Uncovering Work*

- A. City has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the Contract Documents or specific instructions of City and if requested by City, Contractor shall uncover such Work for City's observation, inspection or testing and then replace the covering, all at Contractor's expense.
- C. If City considers it necessary or advisable that covered Work be observed by City or inspected or tested by others, then Contractor, at City's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as City may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for 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 dispute resolution costs) arising out of or relating to 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). City shall be entitled to accept defective Work in accordance with Paragraph 13.05 and in such case Contractor shall still be responsible for all costs associated with exposing, observing, and testing defective Work.
 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an extension of the Contract Time to the extent directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction.

13.07 *City May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or Contractor fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then City may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been corrected or eliminated; however, this right of City to stop the Work will not give rise to any duty on the part of City to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or any employee or agent of, any of them.

13.08 *City May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from City to correct defective Work, or to remove and replace defective Work as required by City, 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, then City may, after providing 7 days' advance written notice to Contractor, correct or remedy any such deficiency.
- B. In connection with such corrective or remedial action, City 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 City has paid Contractor but which are stored elsewhere. Contractor shall allow City, City's representatives, agents and employees, and City's other contractors access to the Site to enable City to exercise the rights and remedies under this Paragraph 13.08.
- C. 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) incurred or sustained by City in exercising the rights and remedies under this Paragraph 13.08 will be the responsibility of and will be charged against Contractor. A Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and City shall be entitled to an appropriate decrease in the Contract Price. 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.
- D. Contractor shall not be allowed an extension of the Contract Time because of any delay in the performance of the Work attributable to the exercise by City of City's rights and remedies under this Paragraph 13.08.

ARTICLE 14 – PAYMENTS TO CONTRACTOR; COMPLETION; CORRECTION PERIOD

14.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Paragraph 2.03 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to City. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 12.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. Applications for Payments
 - 1. Contractor is responsible for providing all information as required to become a vendor of the City.
 - 2. At least 20 days before the date established in the General Requirements for each progress payment (but not more often than once a month), Contractor shall submit to City for review an Application for Payment 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.

3. If payment is requested on the basis of materials and 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 must also be accompanied by: (a) bill of sale, invoice, or purchase order payments, copies of cancelled checks or other documentation establishing full payment by Contractor for the materials and equipment; (b) at City's request, documentation warranting that City has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, or other arrangements to protect City's interest therein, all of which must be satisfactory to City.
4. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received on account of the Work by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
5. The amount of retainage with respect to progress payments will be as stipulated in the Contract Documents.

C. Review of Applications

1. City will, after receipt of each Application for Payment, either indicate in writing it will proceed to process the Application for Payment or return the Application to Contractor indicating reasons for refusing payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. City's processing of any payment requested in an Application for Payment will be based on City's observations of the executed Work, and on City's review of the Application for Payment and the accompanying data and schedules, that based City's actual knowledge:
 - a. the Work has progressed to the point indicated; and
 - b. the quality and/or quantity of the Work is generally in accordance with the Contract Documents (subject to any subsequent evaluations of the Work, an evaluation of the Work as a functioning whole prior to or upon Final Acceptance, the results of any subsequent tests or inspections called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraphs 10.05 and 12.03, and any other qualifications stated).
3. Processing any such payment will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work; or
 - b. there are no other matters or issues between the parties that might entitle Contractor to be paid additionally by City or entitle City to withhold payment to Contractor; or
 - c. Contractor has complied with Laws and Regulations applicable to Contractor's performance of the Work.
4. City may refuse to process or pay the whole or any part of any payment because of subsequently discovered evidence or the results of subsequent inspections or tests, and

may revise or revoke any such payment previously made, to such extent as may be necessary to protect City from loss because:

- a. the Work is defective, or the completed Work has been damaged by the Contractor or his subcontractors, requiring correction or replacement;
- b. there are discrepancies in quantities contained in previous applications for payment;
- c. the Contract Price has been reduced by Change Orders;
- d. City has been required to correct defective Work in accordance with Paragraph 1313.08, or has accepted defective Work pursuant to Paragraph 13.05;
- e. City has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
- f. City has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Retainage:

1. For all contracts, retainage shall be five percent (5%).

E. *Liquidated Damages*: For each calendar day that any work shall remain uncompleted after the time specified in the Contract Documents, the sum per day specified in the Agreement will be paid by the Contractor to the City, not as a penalty, but as liquidated damages suffered by the City. If feasible, the parties may agree to have the liquidated damages deducted from any amounts owned to Contractor by City instead of being paid directly to City by Contractor.

F. *Payment*: Contractor will be paid pursuant to the requirements of this Article 14 and payment will become due in accordance with the Contract Documents.

G. Reduction in Payment

1. City may refuse to make payment of the of the amount requested because:
 - a. Claims have been made against City based on Contractor's performance or furnishing of the Work, or City has incurred costs, losses, or damages resulting from Contractor's performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, or patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. City has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. City has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;

- g. City has been required to correct defective Work in accordance with Paragraph 13.08, or has accepted defective Work pursuant to Paragraph 13.05;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones or Final Acceptance of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to City to secure the satisfaction and discharge of such Liens;
 - l. Other items entitle City to a set-off against the payment amount requested; or
 - m. City has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.
2. If City refuses to make payment of the amount requested, City will give Contractor written notice stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. City shall pay Contractor the amount so withheld, or any adjustment thereto agreed to by City and Contractor, within a reasonable time after Contractor remedies the reasons for such action to the satisfaction of City and City has confirmed such action.

14.02 *Contractor's Warranty of Title*

- A. 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 City no later than the time of payment free and clear of all Liens.

14.03 *Partial Utilization*

- A. Prior to Final Acceptance of all the Work, City may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which City determines constitutes a separately functioning and usable part of the Work that can be used by City for its intended purpose without significant interference with Contractor's performance of the remainder of the Work. City at any time may notify Contractor in writing to of any such part of the Work which City determines to be ready for its intended use. In addition, City may request in writing that Contractor permit City to use or occupy any such part of the Work that City believes to be substantially complete, subject to the following conditions:
 1. At any time, Contractor may notify City that Contractor considers any such part of the Work ready for its intended use.
 2. Within a reasonable time after notification as enumerated in Paragraph 14.03, City and Contractor shall make an inspection of that part of the Work to determine its status of completion. If City does not consider that part of the Work to be substantially complete, City will notify Contractor in writing giving the reasons therefor.
 3. Partial Utilization by City will not constitute Final Acceptance by City.

14.04 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work is complete in accordance with the Contract Documents:
 - 1. City will promptly schedule a Final Inspection with Contractor.
 - 2. City will notify Contractor in writing 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.
- B. City reserves the right to deny request for Final Inspection if City determines that the entire Work is not sufficiently complete to warrant a Final Inspection.

14.05 *Final Acceptance*

- A. Upon completion by Contractor to City's satisfaction, of any and all Work in accordance with the Contract Documents, including any corrections or additional Work identified in the Final Inspection and delivery of all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurances, certificates of inspection, annotated record documents and other required documents in accordance with the Contract Documents, City will issue to Contractor a letter of Final Acceptance.

14.06 *Final Payment*

- A. Application for Payment
 - 1. Upon receipt of a letter of Final Acceptance from City, Contractor may make application for Final Payment following the procedures for requesting payments in accordance with the Contract Documents.
 - 2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 6.03;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to City free and clear of any Liens or other title defects or will so pass upon final payment.
 - d. a list of all Contract Claims or Damage Claims against City that Contractor believes are unsettled; and
 - e. affidavits of payments and complete and legally effective releases or waivers (satisfactory to City) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- B. Payment Becomes Due: The final payment requested by Contractor, less previous payments made and less any sum to which City is entitled, including but not limited to liquidated damages, will become due and payable:
 - 1. After City's acceptance of the Application for Payment and accompanying documentation; and

2. After all Damage Claims have been resolved:
 - a. directly by the Contractor; or
 - b. Contractor provides evidence that the Damage Claim has been reported to Contractor's insurance provider for resolution.

The making of the final payment by the City shall not relieve the Contractor of any guarantees or other requirements of the Contract that continue thereafter.

14.07 *Final Completion Delayed and Partial Retainage Release*

- A. If final completion of the Work is significantly delayed, and if City so confirms, City may, upon receipt of Contractor's final Application for Payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by City for Work not fully completed or corrected is less than the retainage stipulated in Paragraph 14.01.D, and if bonds have been furnished as required in Paragraph 6.02, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to City with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Contract Claims.
- B. *Partial Retainage Release.* If the Contract provides for separate establishment and maintenance periods and/or test and performance periods following the completion of all other construction in the Contract Documents for all Work locations, the City may release a portion of the amount retained provided that all other work is completed as determined by the City. Before the release, all submittals and final quantities must be completed and accepted for all other work. An amount sufficient to ensure Contract compliance will be retained.

14.08 *Waiver of Claims*

- A. The acceptance of final payment will constitute a waiver and release by Contractor of all claims, rights, causes of action, or liabilities, including Contract Claims, against City arising out of, related to or under the Contract or for any act, omission or neglect of City.

14.09 *Correction Period*

- A. If within two (2) years after the date of Final Acceptance (or such longer period of time as may be prescribed by the Contract Documents) any Work has been found to be defective, or Contractor's repair of any damages to the Site, adjacent areas, or areas made available for Contractor's use by City has been found to be defective, then after receipt of City's written notice of defect, Contractor shall promptly, without cost to City and in accordance with City's written instructions:
 1. correct the defective repairs to the Site or such adjacent areas, or areas made available for Contractor's use by City;
 2. correct such defective Work;
 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by City, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. If Contractor does not promptly comply with the terms of City's written instructions, or in an emergency where delay would cause serious risk of loss or damage, City may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all 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 relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Final Acceptance of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected, repaired or removed and replaced under this Paragraph 14.09, the correction period hereunder with respect to such Work may be extended for an additional period of one year after the end of the initial correction period.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this Paragraph 14.09 are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *City May Suspend Work*

- A. At any time and without cause, City may suspend the Work or any portion thereof by written notice to Contractor. City may fix the date on which Work will be resumed in such notice, and Contractor shall resume the Work on the date so fixed. During a temporary suspension of the Work covered by these Contract Documents, for any reason, the City will make no extra payment for stand-by time of construction equipment and/or construction crews.
- B. Should the Contractor not be able to complete a portion of the Project due to causes beyond the control of and without the fault or negligence of the Contractor, and should it be determined by mutual consent of the Contractor and City that a solution to allow construction to proceed is not available within a reasonable period of time, Contractor may request an extension in Contract Time, directly attributable to any such suspension.
- C. If it should become necessary to suspend the Work for an indefinite period, the Contractor shall store all materials in such a manner that they will not obstruct or impede the public unnecessarily nor become damaged in any way; Contractor shall take every precaution to prevent damage or deterioration of the work performed; and Contractor shall provide suitable drainage about the work, and erect temporary structures where necessary.
- D. Contractor may be reimbursed for the cost of moving its equipment off the job and returning the necessary equipment to the job when it is determined by the City that construction may be resumed. Such reimbursement shall be based on actual cost to the Contractor of moving the

equipment and no profit or overhead will be allowed. Reimbursement may not be allowed if the equipment is moved to another construction project for the City.

15.02 *City May Terminate for Cause*

- A. The occurrence of any one or more of the following events by way of example, but not of limitation, may justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Project Schedule established under Paragraph 2.06 as adjusted from time to time pursuant to Paragraph 7.05);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract; or
 3. Contractor's disregard of Laws and Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of City; or
 5. Contractor's failure to promptly make good any defect in materials or workmanship, or defects of any nature, the correction of which has been directed in writing by the City; or
 6. Substantial indication that the Contractor has made an unauthorized assignment of the Contract or any funds due therefrom for the benefit of any creditor or for any other purpose; or
 7. Substantial indication that the Contractor has become insolvent or bankrupt, or otherwise financially unable to perform the Work satisfactorily; or
 8. Contractor commences legal action in a court of competent jurisdiction against the City.
- B. If one or more of the events identified in Paragraph 15.02.A occurs, City will provide written notice to Contractor and Surety to arrange a conference with Contractor and Surety to address Contractor's failure to perform the Work. The conference shall be held not later than 15 days after receipt of notice. by both Contractor and surety.
1. If the City, the Contractor, and the Surety do not agree to allow the Contractor to proceed to perform the Contract, the City may, to the extent permitted by Laws and Regulations, declare a Contractor default and formally terminate the Contractor's right to complete the Contract. Contractor default shall not be declared earlier than 20 days after the Contractor and Surety have received notice of the conference to address Contractor's failure to perform the Work.
 2. If Contractor's services are terminated, Surety shall be obligated to take over and perform the Work. If Surety does not commence performance thereof within 15 consecutive calendar days after date of an additional written notice demanding Surety's performance of its obligations, then City, without process or action at law, may take over any portion of the Work and complete it as described below.
 - a. If City completes the Work, City may exclude Contractor and Surety from the Site and take possession of the Work, and all materials and equipment stored at the Site

or for which City has paid Contractor, but which are stored elsewhere, and the Work as City may deem expedient.

3. Whether City or Surety completes the Work, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by City, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to City. Such claims, costs, losses, and damages incurred by City will be incorporated in a Change Order, provided that when exercising any rights or remedies under this Paragraph 15.02, City shall not be required to obtain the lowest price for the Work performed.
 4. Neither City, nor any of its respective consultants, agents, officers, elected or appointed officials, directors or employees shall be in any way liable or accountable to Contractor or Surety for the method by which the completion of the said Work, or any portion thereof, may be accomplished or for the price paid therefor.
 5. City, notwithstanding the method used in completing the Contract, shall not forfeit the right to recover damages from Contractor or Surety for Contractor's failure to timely complete the entire Contract. Contractor shall not be entitled to any claim, counterclaim or offset on account of the method used by City in completing the Contract.
 6. Maintenance of the Work shall continue to be Contractor's and Surety's responsibilities as provided for in the bond requirements of the Contract Documents or any special guarantees provided for under the Contract Documents or any other obligations otherwise under the Contract or prescribed by law.
- C. Notwithstanding Paragraph 15.02.B, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- D. Where Contractor's services have been so terminated by City, the termination will not affect any rights or remedies of City against Contractor then existing or which may thereafter accrue, or any rights or remedies of City against Contractor or Surety. Any retention or payment of money due Contractor by City will not release Contractor from liability.
- E. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.02, the termination procedures of that bond shall not supersede the provisions of this Article 15.

15.03 *City May Terminate for Convenience*

- A. City may, without cause and without prejudice to any other right or remedy of City, terminate the Contract, in whole or in part. Any termination shall be affected by giving notice of the termination to the Contractor specifying the extent to which performance of Work under the contract is terminated, and the date upon which such termination becomes effective. Notice shall be deemed validly given if given in accordance with Paragraph 17.01.A.

- B. After a notice of termination, has been given, and except as otherwise directed by the City, the Contractor shall:
1. stop work under the Contract on the date and to the extent specified in the notice of termination;
 2. place no further orders or subcontracts for materials, services or facilities except as may be necessary for completion of such portion of the Work under the Contract as is not terminated;
 3. terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by notice of termination;
 4. transfer title to the City and deliver in the manner, at the times, and to the extent, if any, directed by the City:
 - a. the fabricated or unfabricated parts, Work in progress, completed Work, supplies and other material produced as a part of, or acquired in connection with the performance of, the Work terminated by the notice of the termination; and
 - b. the completed, or partially completed plans, drawings, information and other property which, if the Contract had been completed, would have been required to be furnished to the City.
 5. complete performance of such Work as shall not have been terminated by the notice of termination; and
 6. take such action as may be necessary, or as the City may direct, for the protection and preservation of the property related to the Contract that is in the possession of the Contractor and in which the City has or may acquire the rest.
- C. At a time not later than 30 days after the termination date specified in the notice of termination, the Contractor may submit to the City a list, certified as to quantity and quality, of any or all items of termination inventory not previously disposed of in accordance with the Contract, exclusive of items the disposition of which has been directed or authorized by City.
- D. Not later than 15 days after Contractor's submission of the certified list to City pursuant to Paragraph 15.03.C, the City shall accept title to such items, subject to verification of the list by the City upon removal of the items or, If the items are stored, then City shall have 45 days after submission of the list, to verify the list submitted and accept title to such items. Any necessary adjustments to correct the list as submitted, shall be made prior to final settlement.
- E. Not later than 60 days after the notice of termination has been given, the Contractor shall submit hisits termination claim to the City in the form and with the certification prescribed by the City. Unless an extension request is made in writing within such 60-day period by the Contractor, and granted by the City, any and all such claims of Contractor that are not submitted to City within such 60-day period shall be conclusively deemed waived.
- F. Should a termination claim be timely submitted to the City, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead

- and profit on such Work calculated and determined in accordance with the Contract Documents;
2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses calculated and determined in accordance with the Contract Documents; and
 3. reasonable expenses directly attributable to reasonable and necessary wind-down and termination activities, without any overhead or profit.
- G. In the event of the failure of the Contractor and City to agree upon the whole amount to be paid to the Contractor by reason of the termination of the Work, the City shall determine, on the basis of information submitted and available to it, the amount, if any, due to the Contractor by reason of the termination and City shall pay to the Contractor the amounts so determined. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of, related to or resulting from such termination.

ARTICLE 16 – RESOLUTION OF DISPUTES

16.01 *Methods and Procedures*

- A. Either City or Contractor may request mediation of any Contract Claim submitted for a decision under Paragraph 11.07 before such decision becomes final and binding. The request for mediation shall be submitted to the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 11.07.E.
- B. City and Contractor shall participate in the mediation process in good faith. The process shall be commenced within 60 calendar days of filing of the request.
- C. The parties shall agree on a mediator; however, if they cannot agree within 14 calendar days then the Denton County Alternative Dispute Resolution Program (“DCAP”) shall appoint a mediator. The mediation session shall be held within 45 days of the retention of the mediator, and last for at least one full mediation day, before any party has the option to withdraw from the process. The parties may agree to continue the mediation process beyond one day, until there is a settlement agreement, or one party, or the mediator, states that there is no reason to continue because of an impasse that cannot be overcome and sends a “notice of termination of mediation.” All reasonable efforts will be made to complete the mediation within 30 days of the first mediation session. All costs of mediation shall be borne equally by the parties.
- D. All communications, both written and oral, during Phases A and B are confidential and shall be treated as settlement negotiations for purposes of applicable rules of evidence; however, documents generated in the ordinary course of business prior to the Dispute, that would otherwise be discoverable, do not become confidential simply because they are used in the Negotiation and/or Mediation process.
- E. The process shall be confidential based on terms acceptable to the mediator and/or mediation service provider.

- F. If the Contract Claim is not resolved by mediation, City's action under Paragraph 11.07.C or a denial pursuant to Paragraphs 11.07.C.3 or 11.07.D shall become final and binding 30 days after termination of the mediation unless, within that time period, City or Contractor:
1. elects in writing to invoke any other dispute resolution process provided for in the Supplementary Conditions; or
 2. agrees with the other party to submit the Contract Claim to another dispute resolution process; or
 3. gives written notice to the other party of the intent to submit the Contract Claim to a court of competent jurisdiction as set forth within the Contract Documents.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice, it will be deemed to have been validly given if delivered:
1. in person, by a commercial courier service or otherwise, if to City, to the duly authorized representative of City identified in the Contract Documents or to City's Project Manager or, if to Contractor, to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 3. by e-mail to the recipient.

17.02 *Computation of Time*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day that is a state or federal holiday observed by the City, the next Business Day shall become the last day of the period.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and 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 and Regulations, in equity, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this Paragraph 17.03 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.

17.04 *Limitation of Damages*

- A. With respect to any and all claims, disputes subject to final resolution, and other matters at issue, neither City, nor any of its officers, directors, elected or appointed officials, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project. Further, the Contractor may only claim and the City may only be liable for those damages that are set forth in Subchapter I, Chapter 271 of the Texas

Local Government Code and the City shall not be liable for any consequential damages, exemplary damages or damages for unabsorbed home office overhead.

17.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.
- B. The City has not waived its sovereign immunity except as expressly set forth in Subchapter I, Chapter 271 of the Texas Local Government Code or as expressly waived by other statute.

17.06 *Survival of Obligations*

All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and Final Acceptance of the Work or termination of the Contract or of the services of Contractor.

17.07 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

17.08 *Successors and Assigns*

- A. City and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

17.09 *Governing Law*

- A. The Contract shall be construed in accordance with the laws of the State of Texas without regard to conflicts of law principles.

17.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00 73 01
SUPPLEMENTARY CONDITIONS - CSP
TO
GENERAL CONDITIONS

Supplementary Conditions

These Supplementary Conditions modify and supplement Section 00 72 00 - General Conditions, and other provisions of the Contract Documents as indicated below. All provisions of the General Conditions that are modified or supplemented remain in full force and effect as so modified or supplemented. All provisions of the General Conditions which are not so modified or supplemented remain in full force and effect.

Defined Terms

The terms used in these Supplementary Conditions which are defined in the General Conditions have the meaning assigned to them in the General Conditions, unless specifically noted herein.

Modifications and Supplements

The following are instructions that modify or supplement specific paragraphs in the General Conditions and other Contract Documents.

SC-1.01 “Defined Terms”

The following Terms listed in the General Conditions are modified as follows:

Bid – See Proposal.

Bidder – See Offeror.

Bidding Documents – See Proposal Documents.

Bidding Requirements – See Proposal Requirements.

The following Terms are added to the General Conditions as follows:

Competitive Sealed Proposals – A procurement method by which a governmental entity requests proposals, evaluates and ranks the Offerors, and negotiates a contract with a general contractor for the construction, rehabilitation, alteration, or repair of a facility.

Daily Value – The City-determined value in dollars as indicated in the Proposal Form as the value of one Day for the purposes of determining the Incentive (if applicable) for Substantial Completion relative to the Contract Time and achievement of Substantial Completion.

Offeror – The individual or entity that submits a Proposal directly to City.

Proposal – The offer or proposal of an Offeror submitted in accordance with the requirements set forth in the Instructions to Offerors.

Proposal Documents – The Proposal Requirements and the Proposed Contract Documents.

1 Proposal Requirements – The Advertisement or Invitation to Offerors, Instructions to Offerors,
 2 Offeror’s Bond or other Proposal security, if any, the Proposal Form, and the Proposal with any
 3 attachments.
 4

5 Substantial Completion – The completion of the Work necessary for the project to function as it
 6 was intended pursuant to the Contract Documents and as specified below, to the reasonable
 7 satisfaction of the City. The date of Substantial Completion shall be memorialized by written
 8 notice given by the City to the Contractor.
 9

10 **SC-5.01A**

11
 12 Easement limits shown on the Drawing are approximate and were provided to establish a basis for
 13 proposals. Upon receiving the final easements descriptions, Contractor shall compare them to the lines
 14 shown on the Contract Drawings.
 15

16 **SC-5.01A.1., “Availability of Lands”**

17
 18 The following is a list of known outstanding right-of-way, and/or easements to be acquired, if any as of
 19 *October 28, 2021*:
 20

21 **Outstanding Right-Of-Way, and/or Easements to Be Acquired**

PARCEL NUMBER	OWNER	TARGET DATE OF POSSESSION
------------------	-------	------------------------------

None

22 The Contractor understands and agrees that the dates listed above are estimates only, are not guaranteed,
 23 and do not bind the City.
 24

25 If Contractor considers the final easements provided to differ materially from the representations on the
 26 Contract Drawings, Contractor shall within five (5) Business Days and before proceeding with the Work,
 27 notify City in writing associated with the differing easement line locations.
 28

29 **SC-5.01A.2, “Availability of Lands”**

30
 31 **Utilities or obstructions to be removed, adjusted, and/or relocated**

32
 33 The following is list of utilities and/or obstructions that have not been removed, adjusted, and/or relocated
 34 as of *[October 28, 2021]*
 35

EXPECTED OWNER	UTILITY AND LOCATION	TARGET DATE OF ADJUSTMENT
-------------------	----------------------	------------------------------

None

36 The Contractor understands and agrees that the dates listed above are estimates only, are not guaranteed,
 37 and do not bind the City.
 38

39 **SC-5.03A., “Subsurface and Physical Conditions”**

40
 41 The following are reports of explorations and tests of subsurface conditions at the site of the Work:
 42

1 A *subsurface geotechnical investigation* Report No. W21158, dated October 1, 2021, prepared by *Alpha*
2 *Testing, Inc.*, a consultant of the City, providing additional information on *existing pavement thickness,*
3 *subgrade soil characteristics and recommendations for lime and/or cement stabilization rates under*
4 *proposed pavement sections.*

5
6 The following are drawings of physical conditions in or relating to existing surface and subsurface
7 structures (except Underground Facilities) which are at or contiguous to the site of the Work:
8 *["None"]*

9
10 **SC-5.05 A., "Underground Facilities"**

11
12 The following are additional resources for identification of Underground Facilities which are at or
13 contiguous to the site of the Work, and which are not necessarily shown in the Drawings:
14 *["None"]*

15
16 **SC-5.06A., "Hazardous Environmental Conditions at Site"**

17
18 The following are reports and drawings of existing hazardous environmental conditions known to the City:
19 *["None"]*

20
21 **SC-6.02, "Performance, Payment, and Maintenance Bonds"**

22
23 **The "Contract Price" for Performance, Payment, and Maintenance Bonds will be the same as**
24 **indicated in Article 3 as listed in the Agreement.**

25
26 **SC-6.03A., "Certificates of Insurance"**

27
28 The entities listed below are "additional insureds as their interest may appear" including their respective
29 officers, directors, agents and employees.

- 30
31 (1) City
32 (2) Consultant: *"None"*
33 (3) Other: *["None"]*

34
35 **SC-6.04A., "Contractor's Insurance"**

36
37 The limits of liability for the insurance required by Paragraph GC-6.04 shall provide the following
38 coverages for not less than the following amounts or greater where required by laws and regulations:

39
40 **6.04A. Workers' Compensation, under Paragraph GC-6.04A.**

41
42 *Statutory limits*
43 *Employer's liability*
44 *\$100,000 each accident/occurrence*
45 *\$100,000 Disease - each employee*
46 *\$500,000 Disease - policy limit*

47
48 **SC-6.04B., "Contractor's Insurance"**

49
50 **6.04B. Commercial General Liability, under Paragraph GC-6.04B. Contractor's Liability Insurance**
51 **under Paragraph GC-6.04B., which shall be on a per project basis covering the Contractor with**
52 **minimum limits of:**

53
54 *\$1,000,000 each occurrence*

1 \$2,000,000 aggregate limit

2
3 The policy must have an endorsement (Amendment – Aggregate Limits of Insurance) making the
4 General Aggregate Limits apply separately to each job site.

5
6 The Commercial General Liability Insurance policies shall provide “X”, “C”, and “U” coverage’s.
7 Verification of such coverage must be shown in the Remarks Article of the Certificate of Insurance.

8
9 **SC 6.04C., “Contractor’s Insurance”**

10 **6.04C.** Automobile Liability, under Paragraph GC-6.04C. Contractor’s Liability Insurance under
11 Paragraph GC-6.04C., which shall be in an amount not less than the following amounts:

12
13 (1) **Automobile Liability** - a commercial business policy shall provide coverage on "Any Auto",
14 defined as autos owned, hired and non-owned.

15
16 \$1,000,000 each accident on a combined single limit basis. Split limits are acceptable if limits are at
17 least:

- 18
19 \$250,000 Bodily Injury per person /
20 \$500,000 Bodily Injury per accident /
21 \$100,000 Property Damage

22
23 **SC-6.04D., “Contractor’s Insurance”**

24
25 The Contractor’s construction activities will require its employees, agents, subcontractors, equipment, and
26 material deliveries to cross railroad properties and tracks, or perform work within 25 feet of the center line
27 of tracks [*“None”*].

28
29 The Contractor shall conduct its operations on railroad properties in such a manner as not to interfere with,
30 hinder, or obstruct the railroad company in any manner whatsoever in the use or operation of its/their trains
31 or other property. Such operations on railroad properties may require that Contractor to execute a “Right of
32 Entry Agreement” with the particular railroad company or companies involved, and to this end the
33 Contractor should satisfy itself as to the requirements of each railroad company and be prepared to execute
34 the right-of-entry (if any) required by a railroad company. The requirements specified herein likewise relate
35 to the Contractor’s use of private and/or construction access roads crossing said railroad company’s
36 properties.

37
38 The Contractual Liability coverage required by Paragraph 5.04D of the General Conditions shall provide
39 coverage for not less than the following amounts, issued by companies satisfactory to the City and to the
40 Railroad Company for a term that continues for so long as the Contractor’s operations and work cross,
41 occupy, or touch railroad property:

- 42
43 (1) General Aggregate: \$Confirm Limits with Railroad
44
45 (2) Each Occurrence: \$Confirm Limits with Railroad
46
47 Required for this Contract x Not required for this Contract

48
49 With respect to the above outlined insurance requirements, the following shall govern:

- 50
51 1. Where a single railroad company is involved, the Contractor shall provide one insurance policy in
52 the name of the railroad company. However, if more than one grade separation or at-grade
53 crossing is affected by the Project at entirely separate locations on the line or lines of the same
54 railroad company, separate coverage may be required, each in the amount stated above.

- 1
 2 2. Where more than one railroad company is operating on the same right-of-way or where several
 3 railroad companies are involved and operated on their own separate rights-of-way, the Contractor
 4 may be required to provide separate insurance policies in the name of each railroad company.
 5
 6 3. If, in addition to a grade separation or an at-grade crossing, other work or activity is proposed on a
 7 railroad company's right-of-way at a location entirely separate from the grade separation or at-
 8 grade crossing, insurance coverage for this work must be included in the policy covering the grade
 9 separation.
 10
 11 4. If no grade separation is involved but other work is proposed on a railroad company's right-of-
 12 way, all such other work may be covered in a single policy for that railroad, even though the work
 13 may be at two or more separate locations.
 14

15 No work or activities on a railroad company's property to be performed by the Contractor shall be
 16 commenced until the Contractor has furnished the City with an original policy or policies of the insurance
 17 for each railroad company named, as required above. All such insurance must be approved by the City and
 18 each affected Railroad Company prior to the Contractor's beginning work.
 19

20 The insurance specified above must be carried until all Work to be performed on the railroad right-of-way
 21 has been completed and the grade crossing, if any, is no longer used by the Contractor. In addition,
 22 insurance must be carried during all maintenance and/or repair work performed in the railroad right-of-way.
 23 Such insurance must name the railroad company as the insured, together with any tenant or lessee of the
 24 railroad company operating over tracks involved in the Project.
 25

26 **SC-7.08C., "Concerning Subcontractors and Suppliers"**
 27

28 The following subcontractors shall be required to be utilized by the Contractor for specific portions of the
 29 Work as indicated below:
 30

31 **Required Subcontractors**

SUBCONTRACTOR COMPANY NAME	DESCRIPTION OF WORK TO BE PERFORMED
None	

32

33 **SC-7.11., "Permits and Utilities"**
 34

35 **SC-7.11A., "Contractor obtained permits and licenses"**

36 The following are known permits and/or licenses required by the Contract to be acquired by the Contractor:

37 *None*.
 38

39 **SC-7.11B. "City obtained permits and licenses"**

40 The following are known permits and/or licenses required by the Contract to be acquired by the City:

41 *None*.
 42

43 **SC-7.11C. "Outstanding permits and licenses"**
 44

45 The following is a list of known outstanding permits and/or licenses to be acquired, if any as of *[October*
 46 *28, 2021]*:
 47

48 **Outstanding Permits and/or Licenses to Be Acquired**

OWNER	PERMIT OR LICENSE AND LOCATION	TARGET DATE OF POSSESSION
CITY OF DENTON		

OWNER	PERMIT OR LICENSE AND LOCATION	TARGET DATE OF POSSESSION
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None

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SC-8.02., “Coordination”

The individuals or entities listed below have contracts with the City for the performance of other work at the Site:

“None”

Vendor	Scope of Work	Coordination Authority

SC-9.01, “Communications to Contractor”

There are no special communication coordination requirements for this project.

SC-10.01B., “City’s Project Manager”

The City’s Project Manager for this Contract is *Scott Fettig*, or his/her successor pursuant to **written notification from the City Engineer.**

SC-13.02B., “Tests and Inspections”

“None”

SC-14.01G, “Reduction in Payment”

Add Paragraph 14.01G.3:

- 3. *City may reduce payments to the Contractor, if the number of Days that have passed after the date listed on the Notice to Proceed exceeds the Contract Time for Substantial Completion.*

SC-16.01C.1, “Methods and Procedures”

“None”

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE



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SECTION 00 73 74
FORM 1295 - CERTIFICATE OF INTERESTED PARTIES - CSP

[Contractor: Replace this page with Form 1295 for this Contract, which can be obtained at www.ethics.state.tx.us]

END OF SECTION

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**SECTION 01 11 00
SUMMARY OF WORK**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Summary of Work to be performed in accordance with the Contract Documents
- B. Deviations from this City of Denton Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 1 - General Requirements

SCOPE OF WORK

- The project consists of the following:
- a) Approximately 46,000 square yards of roadway reconstruction
 - b) Approximately 8700 feet of 8” and 12” water main
 - c) Approximately 3000 feet of 8” sanitary sewer gravity main

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered incidental to the various items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Work Covered by Contract Documents
 - 1. Work is to include furnishing all labor, materials, and equipment, and performing all Work necessary for this construction project as detailed in the Drawings and Specifications.
- B. Incidental Work
 - 1. Any and all Work specifically governed by documentary requirements for the project, such as conditions imposed by the Contract Documents in which no specific item for bid has been provided for in the Proposal, then the item shall be considered as an incidental item of Work, the cost of which shall be included in the price bid in the Proposal for various bid items.
- C. Use of Premises
 - 1. Coordinate uses of premises under direction of the City.

- 1 2. Assume full responsibility for protection and safekeeping of materials and
2 equipment stored on the Site.
- 3 3. Use and occupy only portions of the public streets and alleys, or other public places
4 or other rights-of-way as provided for in the ordinances of the City, as shown in the
5 Contract Documents, or as may be specifically authorized in writing by the City.
 - 6 a. A reasonable amount of tools, materials, and equipment for construction
7 purposes may be stored in such space, but no more than is necessary to avoid
8 delay in the construction operations.
 - 9 b. Excavated and waste materials shall be stored in such a way as not to interfere
10 with the use of spaces that may be designated to be left free and unobstructed
11 and so as not to inconvenience occupants of adjacent property.
 - 12 c. If the street is occupied by railroad tracks, the Work shall be carried on in such
13 manner as not to interfere with the operation of the railroad.
 - 14 1) All Work shall be in accordance with railroad requirements set forth in
15 Division 0 as well as the railroad permit.
- 16 D. Work within Easements
 - 17 1. Do not enter upon private property for any purpose without having previously
18 obtained permission from the owner of such property.
 - 19 2. Do not store equipment or material on private property unless and until the
20 specified approval of the property owner has been secured in writing by the
21 Contractor and a copy furnished to the City.
 - 22 3. Unless specifically provided otherwise, clear all rights-of-way or easements of
23 obstructions which must be removed to make possible proper prosecution of the
24 Work as a part of the project construction operations.
 - 25 4. Preserve and use every precaution to prevent damage to, all trees, shrubbery, plants,
26 lawns, fences, culverts, curbing, and all other types of structures or improvements,
27 to all water, sewer, and gas lines, to all conduits, overhead pole lines, or
28 appurtenances thereof, including the construction of temporary fences and to all
29 other public or private property adjacent to the Work.
 - 30 5. Notify the proper representatives of the owners or occupants of the public or private
31 lands of interest in lands which might be affected by the Work.
 - 32 a. Such notice shall be made at least 48 hours in advance of the beginning of the
33 Work.
 - 34 b. Notices shall be applicable to both public and private utility companies and any
35 corporation, company, individual, or other, either as owners or occupants,
36 whose land or interest in land might be affected by the Work.
 - 37 c. Be responsible for all damage or injury to property of any character resulting
38 from any act, omission, neglect, or misconduct in the manner or method or
39 execution of the Work, or at any time due to defective work, material, or
40 equipment.
 - 41 6. Fence
 - 42 a. Restore all fences encountered and removed during construction of the Work to
43 the original or a better than original condition.
 - 44 b. Erect temporary fencing in place of the fencing removed whenever the Work is
45 not in progress and when the site is vacated overnight, and/or at all times to
46 provide site security.

1 c. The cost for all fence work within easements, including removal, temporary
2 closures and replacement, shall be incidental to the various items bid in the
3 project proposal, **unless a bid item is specifically provided in the proposal.**

4 **1.5 SUBMITTALS [NOT USED]**

5 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

6 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

7 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

8 **1.9 QUALITY ASSURANCE [NOT USED]**

9 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

10 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

11 **1.12 WARRANTY [NOT USED]**

12 **PART 2 - PRODUCTS [NOT USED]**

13 **PART 3 - EXECUTION [NOT USED]**

14 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

16

1 **SECTION 01 25 00**
2 **SUBSTITUTION PROCEDURES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

6 1. The procedure for requesting the approval of substitution of a product that is not
7 equivalent to a product which is specified by descriptive or performance criteria or
8 defined by reference to 1 or more of the following:

- 9 a. Name of manufacturer
10 b. Name of vendor
11 c. Trade name
12 d. Catalog number

13 2. Substitutions are not "or-equals".

14 B. Deviations from this City of Denton Standard Specification

15 1. None.

16 C. Related Specification Sections include, but are not necessarily limited to:

- 17 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
18 2. Division 1 – General Requirements

19 **1.2 PRICE AND PAYMENT PROCEDURES**

20 A. Measurement and Payment

21 1. Work associated with this Item is considered incidental to the various items bid.
22 No separate payment will be allowed for this Item.

23 **1.3 REFERENCES [NOT USED]**

24 **1.4 ADMINISTRATIVE REQUIREMENTS**

25 A. Request for Substitution - General

26 1. Within 30 days after award of Contract (unless noted otherwise), the City will
27 consider formal requests from Contractor for substitution of products in place of
28 those specified.

29 2. Certain types of equipment and kinds of material are described in Specifications by
30 means of references to names of manufacturers and vendors, trade names, or
31 catalog numbers.

32 a. When this method of specifying is used, it is not intended to exclude from
33 consideration other products bearing other manufacturer's or vendor's names,
34 trade names, or catalog numbers, provided said products are "or-equals," as
35 determined by City.

36 3. Other types of equipment and kinds of material may be acceptable substitutions
37 under the following conditions:

38 a. Or-equals are unavailable due to strike, discontinued production of products
39 meeting specified requirements, or other factors beyond control of Contractor;
40 or,

1 b. Contractor proposes a cost and/or time reduction incentive to the City.

2 **1.5 SUBMITTALS**

3 A. See Request for Substitution Form (attached)

4 B. Procedure for Requesting Substitution

5 1. Substitution shall be considered only:

- 6 a. After award of Contract
- 7 b. Under the conditions stated herein

8 2. Submit one PDF copy via email to the Project Manager and their duly appointed
9 representative, including:

10 a. Documentation

- 11 1) Complete data substantiating compliance of proposed substitution with
- 12 Contract Documents
- 13 2) Data relating to changes in construction schedule, when a reduction is
- 14 proposed
- 15 3) Data relating to changes in cost

16 b. For products

- 17 1) Product identification
 - 18 a) Manufacturer's name
 - 19 b) Telephone number and representative contact name
 - 20 c) Specification Section or Drawing reference of originally specified
 - 21 product, including discrete name or tag number assigned to original
 - 22 product in the Contract Documents
 - 23 2) Manufacturer's literature clearly marked to show compliance of proposed
 - 24 product with Contract Documents
 - 25 3) Itemized comparison of original and proposed product addressing product
 - 26 characteristics including, but not necessarily limited to:
 - 27 a) Size
 - 28 b) Composition or materials of construction
 - 29 c) Weight
 - 30 d) Electrical or mechanical requirements
 - 31 4) Product experience
 - 32 a) Location of past projects utilizing product
 - 33 b) Name and telephone number of persons associated with referenced
 - 34 projects knowledgeable concerning proposed product
 - 35 c) Available field data and reports associated with proposed product
 - 36 5) Samples
 - 37 a) Provide at request of City.
 - 38 b) Samples become the property of the City.

39 c. For construction methods:

- 40 1) Detailed description of proposed method
- 41 2) Illustration drawings

42 C. Approval or Rejection

- 43 1. Written approval or rejection of substitution given by the City
- 44 2. City reserves the right to require proposed product to comply with color and pattern
- 45 of specified product if necessary to secure design intent.
- 46 3. In the event the substitution is approved, the resulting cost and/or time reduction
- 47 will be documented by Change Order in accordance with the General Conditions.

- 4. No additional contract time will be given for substitution.
- 5. Substitution will be rejected if:
 - a. Submittal is not through the Contractor with his stamp of approval
 - b. Request is not made in accordance with this Specification Section
 - c. In the City's opinion, acceptance will require substantial revision of the original design
 - d. In the City's opinion, substitution will not perform adequately the function consistent with the design intent

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

- A. In making request for substitution or in using an approved product, the Contractor represents that the Contractor:
 - 1. Has investigated proposed product, and has determined that it is adequate or superior in all respects to that specified, and that it will perform function for which it is intended
 - 2. Will provide same guarantee for substitute item as for product specified
 - 3. Will coordinate installation of accepted substitution into Work, to include building modifications if necessary, making such changes as may be required for Work to be complete in all respects
 - 4. Waives all claims for additional costs related to substitution which subsequently arise

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

EXHIBIT A
REQUEST FOR SUBSTITUTION FORM:

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TO: _____

PROJECT: _____ DATE: _____

We hereby submit for your consideration the following product instead of the specified item for the above project:

SECTION	PARAGRAPH	SPECIFIED ITEM

Proposed Substitution: _____

Reason for Substitution: _____

Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Fill in Blanks Below:

A. Will the undersigned contractor pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

B. What effect does substitution have on other trades?

C. Differences between proposed substitution and specified item?

D. Differences in product cost or product delivery time?

E. Manufacturer's guarantees of the proposed and specified items are:

_____ Equal _____ Better (explain on attachment)

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By: _____ For Use by City

Signature _____ as noted _____ Recommended _____ Recommended

Firm _____ _____ Not recommended _____ Received late

Address _____ By _____

Date _____

Date _____ Remarks _____

Telephone _____

For Use by City:

_____ Approved _____ Rejected

City _____ Date _____

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SECTION 01 31 19
PRECONSTRUCTION MEETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Provisions for the preconstruction meeting to be held prior to the start of Work to clarify construction contract administration procedures
- B. Deviations from this City of Denton Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered incidental to the various items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination
 - 1. Attend preconstruction meeting.
 - 2. Representatives of Contractor, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
 - 3. Meeting administered by City may be tape recorded.
 - a. If recorded, tapes will be used to prepare minutes and retained by City for future reference.
 - 4. Project Manager will establish their duly authorized representative(s) authorized to make decisions as identified in the Contract Documents.
- B. Preconstruction Meeting
 - 1. A preconstruction meeting will be held within 14 days after the execution of the Agreement and before Work is started.
 - a. The meeting will be scheduled and administered by the City.
 - 2. The Project Manager will preside at the meeting, prepare the notes of the meeting and distribute copies of same to all participants who so request by fully completing the attendance form to be circulated at the beginning of the meeting.
 - 3. Attendance shall include:
 - a. Project Manager
 - b. Project Manager’s duly authorized representative (if any)
 - c. Contractor's project manager

- 1 d. Contractor's superintendent
- 2 e. Any subcontractor or supplier representatives whom the Contractor may desire
- 3 to invite or the City may request
- 4 f. Other City representatives
- 5 g. Others as appropriate
- 6 4. Construction Schedule
- 7 a. Prepare baseline construction schedule in accordance with Section 01 32 16 and
- 8 provide at Preconstruction Meeting.
- 9 b. City will notify Contractor of any schedule changes upon Notice of
- 10 Preconstruction Meeting.
- 11 5. Preliminary Agenda may include:
- 12 a. Introduction of Project Personnel
- 13 b. General Description of Project
- 14 c. Status of right-of-way, utility clearances, easements or other pertinent permits
- 15 d. Contractor's work plan and schedule
- 16 e. Contract Time
- 17 f. Notice to Proceed
- 18 g. Construction Staking
- 19 h. Progress Payments
- 20 i. Extra Work and Change Order Procedures
- 21 j. Field Orders
- 22 k. Disposal Site Letter for Waste Material
- 23 l. Insurance Renewals
- 24 m. Payroll Certification
- 25 n. Material Certifications and Quality Control Testing
- 26 o. Public Safety and Convenience
- 27 p. Documentation of Pre-Construction Conditions
- 28 q. Weekend Work Notification
- 29 r. Legal Holidays
- 30 s. Trench Safety Plans
- 31 t. Confined Space Entry Standards
- 32 u. Coordination with the City's representative for operations of existing water
- 33 systems
- 34 v. Storm Water Pollution Prevention Plan
- 35 w. Coordination with other Contractors
- 36 x. Early Warning System
- 37 y. Contractor Evaluation
- 38 z. Special Conditions applicable to the project
- 39 aa. Damages Claims
- 40 bb. Submittal Procedures
- 41 cc. Substitution Procedures
- 42 dd. Correspondence Routing
- 43 ee. Record Drawings
- 44 ff. Temporary construction facilities
- 45 gg. Final Acceptance
- 46 hh. Final Payment
- 47 ii. Communications Plan
- 48 jj. Questions or Comments

- 1 **1.5 SUBMITTALS [NOT USED]**
- 2 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**
- 3 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**
- 4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**
- 5 **1.9 QUALITY ASSURANCE [NOT USED]**
- 6 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**
- 7 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**
- 8 **1.12 WARRANTY [NOT USED]**

9 **PART 2 - PRODUCTS [NOT USED]**

10 **PART 3 - EXECUTION [NOT USED]**

11 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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1 **SECTION 01 31 20**
2 **PROJECT MEETINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Provisions for project meetings throughout the construction period to enable orderly
7 review of the progress of the Work and to provide for systematic discussion of
8 potential problems

9 B. Deviations this City of Denton Standard Specification

- 10 1. None.

11 C. Related Specification Sections include, but are not necessarily limited to:

- 12 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
13 2. Division 1 – General Requirements

14 **1.2 PRICE AND PAYMENT PROCEDURES**

15 A. Measurement and Payment

- 16 1. Work associated with this Item is considered incidental to the various items bid.
17 No separate payment will be allowed for this Item.

18 **1.3 REFERENCES [NOT USED]**

19 **1.4 ADMINISTRATIVE REQUIREMENTS**

20 A. Coordination

- 21 1. Schedule, attend and administer as specified, periodic progress meetings, and
22 specially called meetings throughout progress of the Work.
23 2. Representatives of Contractor, subcontractors and suppliers attending meetings
24 shall be qualified and authorized to act on behalf of the entity each represents.
25 3. Meetings administered by City may be recorded.
26 4. Meetings, in addition to those specified in this Section, may be held when requested
27 by the City, Engineer or Contractor.

28 B. Progress Meetings

- 29 1. Formal project coordination meetings will be held *<biweekly>*. Meetings will be
30 scheduled and administered by Project Manager.
31 a. Additional meetings may be held at the request of the :
32 1) City
33 2) Engineer
34 3) Contractor
35 2. Additional progress meetings to discuss specific topics will be conducted on an as-
36 needed basis. Such additional meetings shall include, but not be limited to:
37 a. Coordinating shutdowns
38 b. Installation of piping and equipment

- 1 c. Coordination between other construction projects
- 2 d. Resolution of construction issues
- 3 e. Equipment approval
- 4 3. The Project Manager will preside at progress meetings, prepare the notes of the
- 5 meeting and distribute copies of the same to all participants who so request by fully
- 6 completing the attendance form to be circulated at the beginning of each meeting.
- 7 4. Attendance shall include:
- 8 a. Contractor's project manager
- 9 b. Contractor's superintendent
- 10 c. Any subcontractor or supplier representatives whom the Contractor may desire
- 11 to invite or the City may request
- 12 d. Engineer's representatives
- 13 e. City's representatives
- 14 f. Others, as requested by the Project Manager
- 15 5. Preliminary Agenda may include:
- 16 a. Review of Work progress since previous meeting
- 17 b. Field observations, problems, conflicts
- 18 c. Items which impede construction schedule
- 19 d. Review of off-site fabrication, delivery schedules
- 20 e. Review of construction interfacing and sequencing requirements with other
- 21 construction contracts
- 22 f. Corrective measures and procedures to regain projected schedule
- 23 g. Revisions to construction schedule
- 24 h. Progress, schedule, during succeeding Work period
- 25 i. Coordination of schedules
- 26 j. Review submittal schedules
- 27 k. Maintenance of quality standards
- 28 l. Pending changes and substitutions
- 29 m. Review proposed changes for:
- 30 1) Effect on construction schedule and on completion date
- 31 2) Effect on other contracts of the Project
- 32 n. Review Record Documents
- 33 o. Review monthly pay request
- 34 p. Review status of Requests for Information
- 35 6. Meeting Location
- 36 a. The City will establish a meeting location.
- 37 1) To the extent practicable, meetings will be held at the Site.

- 1 **1.5 SUBMITTALS [NOT USED]**
- 2 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**
- 3 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**
- 4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**
- 5 **1.9 QUALITY ASSURANCE [NOT USED]**
- 6 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**
- 7 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**
- 8 **1.12 WARRANTY [NOT USED]**

9 **PART 2 - PRODUCTS [NOT USED]**

10 **PART 3 - EXECUTION [NOT USED]**

11 **END OF SECTION**

12

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

13

1 **SECTION 01 32 16**
2 **CONSTRUCTION PROGRESS SCHEDULE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. General requirements for the preparation, submittal, updating, status reporting and
7 management of the Construction Progress Schedule

8 B. Deviations from this City of Denton Standard Specification

- 9 1. None.

10 C. Related Specification Sections include, but are not necessarily limited to:

- 11 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
12 2. Division 1 – General Requirements

13 **1.2 PRICE AND PAYMENT PROCEDURES**

14 A. Measurement and Payment

- 15 1. Work associated with this Item is considered incidental to the various items bid.
16 No separate payment will be allowed for this Item.

17 **1.3 REFERENCES**

18 A. Definitions

- 19 1. **Baseline Schedule** - Initial schedule submitted before work begins that will serve
20 as the baseline for measuring progress and departures from the schedule.
21 2. **Progress Schedule** - Monthly submittal of a progress schedule documenting
22 progress on the project and any changes anticipated.
23 3. **Schedule Narrative** - Concise narrative of the schedule including schedule
24 changes, expected delays, key schedule issues, critical path items, etc

25 B. Reference Standards

- 26 1. None

27 **1.4 ADMINISTRATIVE REQUIREMENTS**

28 A. Baseline Schedule

- 29 1. General
30 a. Prepare a baseline Schedule using approved software and the Critical Path
31 Method (CPM).
32 b. Review the draft baseline Schedule with the City to demonstrate understanding
33 of the work to be performed and known issues and constraints related to the
34 schedule.
35 c. Designate an authorized representative (Project Scheduler) responsible for
36 developing and updating the schedule and preparing reports.

37 B. Progress Schedule
38

- 1 1. Update the progress Schedule monthly.
- 2 2. Prepare the Schedule Narrative to accompany the monthly progress Schedule.
- 3 3. Change Orders
- 4 a. Incorporate approved change orders, resulting in a change of contract time, in
- 5 the baseline Schedule.
- 6 C. Responsibility for Schedule Compliance
- 7 1. Whenever it becomes apparent from the current progress Schedule and CPM Status
- 8 Report that delays to the critical path have resulted and the Contract completion
- 9 date will not be met, or when so directed by the City, make some or all of the
- 10 following actions at no additional cost to the City
- 11 a. Submit a Recovery Plan to the City for approval revised baseline Schedule
- 12 outlining:
- 13 1) A written statement of the steps intended to take to remove or arrest the
- 14 delay to the critical path in the approved schedule
- 15 2) Increase construction manpower in such quantities and crafts as will
- 16 substantially eliminate the backlog of work and return current Schedule to
- 17 meet projected baseline completion dates
- 18 3) Increase the number of working hours per shift, shifts per day, working
- 19 days per week, the amount of construction equipment, or any combination
- 20 of the foregoing, sufficiently to substantially eliminate the backlog of work
- 21 4) Reschedule activities to achieve maximum practical concurrency of
- 22 accomplishment of activities, and comply with the revised schedule
- 23 2. If no written statement of the steps intended to take is submitted when so requested
- 24 by the City, the City may direct the Contractor to increase the level of effort in
- 25 manpower (trades), equipment and work schedule (overtime, weekend and holiday
- 26 work, etc.) to be employed by the Contractor in order to remove or arrest the delay
- 27 to the critical path in the approved schedule.
- 28 a. No additional cost for such work will be considered.
- 29 D. The Contract completion time will be adjusted only for causes specified in this
- 30 Contract.
- 31 a. Requests for an extension of any Contract completion date must be
- 32 supplemented with the following:
- 33 1) Furnish justification and supporting evidence as the City may deem
- 34 necessary to determine whether the requested extension of time is entitled
- 35 under the provisions of this Contract.
- 36 a) The City will, after receipt of such justification and supporting
- 37 evidence, make findings of fact and will advise the Contractor, in
- 38 writing thereof.
- 39 2) If the City finds that the requested extension of time is entitled, the City's
- 40 determination as to the total number of days allowed for the extensions
- 41 shall be based upon the approved total baseline schedule and on all data
- 42 relevant to the extension.
- 43 a) Such data shall be included in the next updating of the Progress
- 44 schedule.
- 45 b) Actual delays in activities which, according to the Baseline schedule,
- 46 do not affect any Contract completion date shown by the critical path in
- 47 the network will not be the basis for a change therein.

- 1 2. Submit each request for change in Contract completion date to the City within 30
2 days after the beginning of the delay for which a time extension is requested but
3 before the date of final payment under this Contract.
 - 4 a. No time extension will be granted for requests which are not submitted within
5 the foregoing time limit.
 - 6 b. From time to time, it may be necessary for the Contract schedule or completion
7 time to be adjusted by the City to reflect the effects of job conditions, weather,
8 technical difficulties, strikes, unavoidable delays on the part of the City or its
9 representatives, and other unforeseeable conditions which may indicate
10 schedule adjustments or completion time extensions.
 - 11 1) Under such conditions, the City will direct the Contractor to reschedule the
12 work or Contract completion time to reflect the changed conditions and the
13 Contractor shall revise his schedule accordingly.
 - 14 a) No additional compensation will be made to the Contractor for such
15 schedule changes except for unavoidable overall contract time
16 extensions beyond the actual completion of unaffected work, in which
17 case the Contractor shall take all possible action to minimize any time
18 extension and any additional cost to the City.
 - 19 b) Available float time in the Baseline schedule may be used by the City
20 as well as by the Contractor.
 - 21 3. Float or slack time is defined as the amount of time between the earliest start date
22 and the latest start date or between the earliest finish date and the latest finish date
23 of a chain of activities on the Baseline Schedule.
 - 24 a. Float or slack time is not for the exclusive use or benefit of either the
25 Contractor or the City.
 - 26 b. Proceed with work according to early start dates, and the City shall have the
27 right to reserve and apportion float time according to the needs of the project.
 - 28 c. Acknowledge and agree that actual delays, affecting paths of activities
29 containing float time, will not have any effect upon contract completion times,
30 providing that the actual delay does not exceed the float time associated with
31 those activities.

32 E. Coordinating Schedule with Other Contract Schedules

- 33 1. Where work is to be performed under this Contract concurrently with or contingent
34 upon work performed on the same facilities or area under other contracts, the
35 Baseline Schedule shall be coordinated with the schedules of the other contracts.
 - 36 a. Obtain the schedules of the other appropriate contracts from the City for the
37 preparation and updating of Baseline schedule and make the required changes
38 in his schedule when indicated by changes in corresponding schedules.
- 39 2. In case of interference between the operations of different contractors, the City will
40 determine the work priority of each contractor and the sequence of work necessary
41 to expedite the completion of the entire Project.
 - 42 a. In such cases, the decision of the City shall be accepted as final.
 - 43 b. The temporary delay of any work due to such circumstances shall not be
44 considered as justification for claims for additional compensation.

45 1.5 SUBMITTALS

46 A. Baseline Schedule

- 47 1. Submit Schedule in native file format and pdf format.

- 1 a. Native file format shall be:
- 2 1) Microsoft Project
- 3 2. Submit draft baseline Schedule to City prior to the pre-construction meeting and
- 4 bring in hard copy to the meeting for review and discussion.
- 5 B. Progress Schedule
- 6 1. Submit progress Schedule in native file format and pdf format.
- 7 2. Submit progress Schedule monthly no later than the 25th day of the month.
- 8 C. Schedule Narrative
- 9 1. Submit the schedule narrative in pdf format.
- 10 2. Submit schedule narrative monthly no later than the 25th day of the month.
- 11 D. Submittal Process
- 12 1.
- 13 2. Contractor shall submit one (1) hard copy of documents to the Project Manager's
- 14 duly appointed representative.
- 15 3. Contractor shall submit documents via email to the Project Manager and their duly
- 16 appointed representative.
- 17 4. Once the project has been completed and Final Acceptance has been issued by the
- 18 City, no further progress schedules are required.

19 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

20 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

21 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

22 **1.9 QUALITY ASSURANCE**

- 23 A. The person preparing and revising the construction Progress Schedule shall be
- 24 experienced in the preparation of schedules of similar complexity.
- 25 B. Schedule and supporting documents addressed in this Specification shall be prepared,
- 26 updated and revised to accurately reflect the performance of the construction.
- 27 C. Contractor is responsible for the quality of all submittals in this section meeting the
- 28 standard of care for the construction industry for similar projects.

29 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

30 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

31 **1.12 WARRANTY [NOT USED]**

32 **PART 2 - PRODUCTS [NOT USED]**

33 **PART 3 - EXECUTION [NOT USED]**

34 **END OF SECTION**

Revision Log

DATE	NAME	SUMMARY OF CHANGE

1

1 **SECTION 01 32 33**
2 **PRECONSTRUCTION VIDEO**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Administrative and procedural requirements for:
7 a. Preconstruction Videos

8 B. Deviations from this City of Denton Standard Specification

- 9 1. None.

10 C. Related Specification Sections include, but are not necessarily limited to:

- 11 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
12 2. Division 1 – General Requirements

13 **1.2 PRICE AND PAYMENT PROCEDURES**

14 A. Measurement and Payment

- 15 1. Work associated with this Item is considered incidental to the various items bid.
16 No separate payment will be allowed for this Item.

17 **1.3 REFERENCES [NOT USED]**

18 **1.4 ADMINISTRATIVE REQUIREMENTS**

19 A. Preconstruction Video

- 20 1. Produce a preconstruction video of the site/alignment, including all areas in the
21 vicinity of and to be affected by construction.
22 a. Provide digital copy of video upon request by the City.
23 2. Retain a copy of the preconstruction video until the end of the maintenance surety
24 period.

25 **1.5 SUBMITTALS [NOT USED]**

26 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

27 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

28 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

29 **1.9 QUALITY ASSURANCE [NOT USED]**

30 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

31 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

32 **1.12 WARRANTY [NOT USED]**

33 **PART 2 - PRODUCTS [NOT USED]**

1 **PART 3 - EXECUTION [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 01 33 00**
2 **SUBMITTALS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. General methods and requirements of submissions applicable to the following
7 Work-related submittals:
8 a. Shop Drawings
9 b. Product Data (including Project Material Submittal Checklist submittals)
10 c. Samples
11 d. Mock Ups

12 B. Deviations from this City of Denton Standard Specification

- 13 1. None.

14 C. Related Specification Sections include, but are not necessarily limited to:

- 15 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
16 2. Division 1 – General Requirements

17 **1.2 PRICE AND PAYMENT PROCEDURES**

18 A. Measurement and Payment

- 19 1. Work associated with this Item is considered incidental to the various items bid.
20 No separate payment will be allowed for this Item.

21 **1.3 REFERENCES [NOT USED]**

22 **1.4 ADMINISTRATIVE REQUIREMENTS**

23 A. Coordination

- 24 1. Notify the City in writing, at the time of submittal, of any deviations in the
25 submittals from the requirements of the Contract Documents.
- 26 2. Coordination of Submittal Times
- 27 a. Prepare, prioritize and transmit each submittal sufficiently in advance of
28 performing the related Work or other applicable activities, or within the time
29 specified in the individual Work Sections, of the Specifications.
- 30 b. Contractor is responsible such that the installation will not be delayed by
31 processing times including, but not limited to:
- 32 a) Disapproval and resubmittal (if required)
33 b) Coordination with other submittals
34 c) Testing
35 d) Purchasing
36 e) Fabrication
37 f) Delivery
38 g) Similar sequenced activities
- 39 c. No extension of time will be authorized because of the Contractor's failure to
40 transmit submittals sufficiently in advance of the Work.

- 1 d. Make submittals promptly in accordance with approved schedule, and in such
2 sequence as to cause no delay in the Work or in the work of any other
3 contractor.

4 B. Submittal Numbering

- 5 1. When submitting shop drawings or samples, utilize a submittal cross-reference
6 identification numbering system in the following manner:
7 a. Use the applicable Specification Section Number.
8 b. For the next 2 digits number use numbers 01-99 to sequentially number each
9 initial separate item or drawing submitted under each specific Section number.
10 c. Last use a letter, A-Z, indicating the resubmission of the same drawing (i.e.
11 A=2nd submission, B=3rd submission, C=4th submission, etc.). A typical
12 submittal number would be as follows:

13 303-02-B

- 14
15
16 1) 303 is the Specification Section for Portland Cement Concrete Pavement
17 2) 02 is the second initial submittal under this Specification Section
18 3) B is the third submission (second resubmission) of that particular shop
19 drawing

20 C. Contractor Certification

- 21 1. Review shop drawings, product data and samples, including those by
22 subcontractors, prior to submission to determine and verify the following:
23 a. Field measurements
24 b. Field construction criteria
25 c. Catalog numbers and similar data
26 d. Conformance with the Contract Documents
27 2. Provide each shop drawing, sample and product data submitted by the Contractor
28 with a Certification Statement affixed including:
29 a. The Contractor's Company name
30 b. Signature of submittal reviewer
31 c. Certification Statement
32 1) "By this submittal, I hereby represent that I have determined and verified
33 field measurements, field construction criteria, materials, dimensions,
34 catalog numbers and similar data and I have checked and coordinated each
35 item with other applicable approved shop drawings."

36 D. Submittal Format

- 37 1. Fold shop drawings larger than 8 ½ inches x 11 inches to 8 ½ inches x 11 inches.
38 2. Bind shop drawings and product data sheets together.
39 3. Order
40 a. Cover Sheet
41 1) Description of Packet
42 2) Contractor Certification
43 b. List of items / Table of Contents
44 c. Product Data /Shop Drawings/Samples /Calculations

45 E. Submittal Content

- 46 1. The date of submission and the dates of any previous submissions

- 1 2. The Project title and number
- 2 3. Contractor identification
- 3 4. The names of:
- 4 a. Contractor
- 5 b. Supplier
- 6 c. Manufacturer
- 7 5. Identification of the product, with the Specification Section number, page and
- 8 paragraph(s)
- 9 6. Field dimensions, clearly identified as such
- 10 7. Relation to adjacent or critical features of the Work or materials
- 11 8. Applicable standards, such as ASTM or Federal Specification numbers
- 12 9. Identification by highlighting of deviations from Contract Documents
- 13 10. Identification by highlighting of revisions on resubmittals
- 14 11. An 8-inch x 3-inch blank space for Contractor and City stamps
- 15 F. Shop Drawings
- 16 1. As specified in individual Work Sections includes, but is not necessarily limited to:
- 17 a. Custom-prepared data such as fabrication and erection/installation (working)
- 18 drawings
- 19 b. Scheduled information
- 20 c. Setting diagrams
- 21 d. Actual shopwork manufacturing instructions
- 22 e. Custom templates
- 23 f. Special wiring diagrams
- 24 g. Coordination drawings
- 25 h. Individual system or equipment inspection and test reports including:
- 26 1) Performance curves and certifications
- 27 i. As applicable to the Work
- 28 2. Details
- 29 a. Relation of the various parts to the main members and lines of the structure
- 30 b. Where correct fabrication of the Work depends upon field measurements
- 31 1) Provide such measurements and note on the drawings prior to submitting
- 32 for approval.
- 33 G. Product Data
- 34 1. For submittals of product data for products included on the City's Product Material
- 35 Submittal Checklist, highlight each item selected for use on the Project.
- 36 2. For submittals of product data for products not included on the City's Product
- 37 Material Submittal Checklist, submittal data may include, but is not necessarily
- 38 limited to:
- 39 a. Standard prepared data for manufactured products (sometimes referred to as
- 40 catalog data)
- 41 1) Such as the manufacturer's product specification and installation
- 42 instructions
- 43 2) Availability of colors and patterns
- 44 3) Manufacturer's printed statements of compliances and applicability
- 45 4) Roughing-in diagrams and templates
- 46 5) Catalog cuts

- 1 6) Product photographs
- 2 7) Standard wiring diagrams
- 3 8) Printed performance curves and operational-range diagrams
- 4 9) Production or quality control inspection and test reports and certifications
- 5 10) Mill reports
- 6 11) Product operating and maintenance instructions and recommended
- 7 spare-parts listing and printed product warranties
- 8 12) As applicable to the Work
- 9 3. Submittals of product data for products not included on the City's Product Material
- 10 Submittal Checklist may be considered a Substitution in accordance with Section
- 11 01 25 00.
- 12 4. All deviations from City's Product Material Submittal Checklist shall require
- 13 approval by the Engineer of Record for the Project.

14 H. Samples

- 15 1. As specified in individual Sections, include, but are not necessarily limited to:
- 16 a. Physical examples of the Work such as:
- 17 1) Sections of manufactured or fabricated Work
- 18 2) Small cuts or containers of materials
- 19 3) Complete units of repetitively used products color/texture/pattern swatches
- 20 and range sets
- 21 4) Specimens for coordination of visual effect
- 22 5) Graphic symbols and units of Work to be used by the City for independent
- 23 inspection and testing, as applicable to the Work
- 24 I. Do not start Work requiring a shop drawing, sample or product data nor any material to
- 25 be fabricated or installed prior to the approval or qualified approval of such item.
- 26 1. Fabrication performed, materials purchased or on-site construction accomplished
- 27 which does not conform to approved shop drawings and data is at the Contractor's
- 28 risk.
- 29 2. The City will not be liable for any expense or delay due to corrections or remedies
- 30 required to accomplish conformity.
- 31 3. Complete project Work, materials, fabrication, and installations in conformance
- 32 with approved shop drawings, applicable samples, and product data.

33 J. Submittal Distribution

- 34 1. Electronic Distribution
- 35 a. Provide all submittals in electronic form via email to Project Manager and their
- 36 duly appointed representative.
- 37 b. Shop Drawings
- 38 1) Email submittal to Project Manager and their duly appointed representative.
- 39 2) Hard Copies
- 40 a) Not required
- 41 c. Product Data
- 42 1) Email submittal to Project Manager and their duly appointed representative.
- 43 2) Hard Copies
- 44 a) Not required
- 45 d. Samples
- 46 1) Distributed to the Project Manager

1 K. Submittal Review

- 2 1. The review of shop drawings, data and samples will be for general conformance
3 with the design concept and Contract Documents. This is not to be construed as:
4 a. Permitting any departure from the Contract requirements
5 b. Relieving the Contractor of responsibility for any errors, including details,
6 dimensions, and materials
7 c. Approving departures from details furnished by the City, except as otherwise
8 provided herein
- 9 2. The review and approval of shop drawings, samples or product data by the City
10 does not relieve the Contractor from his/her responsibility with regard to the
11 fulfillment of the terms of the Contract.
12 a. All risks of error and omission are assumed by the Contractor, and the City will
13 have no responsibility therefore.
- 14 3. The Contractor remains responsible for details and accuracy, for coordinating the
15 Work with all other associated work and trades, for selecting fabrication processes,
16 for techniques of assembly and for performing Work in a safe manner.
- 17 4. If the shop drawings, data or samples as submitted describe variations and show a
18 departure from the Contract requirements which City finds to be in the interest of
19 the City and to be so minor as not to involve a change in Contract Price or time for
20 performance, the City may return the reviewed drawings without noting an
21 exception.
- 22 5. Submittals will be returned to the Contractor under 1 of the following codes:
23 a. Code 1
24 1) "NO EXCEPTIONS TAKEN" is assigned when there are no notations or
25 comments on the submittal.
26 a) When returned under this code the Contractor may release the
27 equipment and/or material for manufacture.
- 28 b. Code 2
29 1) "EXCEPTIONS NOTED". This code is assigned when a confirmation of
30 the notations and comments IS NOT required by the Contractor.
31 a) The Contractor may release the equipment or material for manufacture;
32 however, all notations and comments must be incorporated into the
33 final product.
- 34 c. Code 3
35 1) "EXCEPTIONS NOTED/RESUBMIT". This combination of codes is
36 assigned when notations and comments are extensive enough to require a
37 resubmittal of the package.
38 a) This resubmittal is to address all comments, omissions and
39 non-conforming items that were noted.
40 b) Resubmittal is to be received by the City within 15 Calendar Days of
41 the date of the City's transmittal requiring the resubmittal.
- 42 d. Code 4
43 1) "NOT APPROVED" is assigned when the submittal does not meet the
44 intent of the Contract Documents.
45 a) The Contractor must resubmit the entire package revised to bring the
46 submittal into conformance.
47 b) It may be necessary to resubmit using a different manufacturer/vendor
48 to meet the Contract Documents.

- 1 6. Resubmittals
2 a. Handled in the same manner as first submittals
3 1) Corrections other than requested by the City
4 2) Marked with revision triangle or other similar method
5 a) At Contractor's risk if not marked
6 b. Submittals for each item will be reviewed no more than twice at the City's
7 expense.
8 1) All subsequent reviews will be performed at times convenient to the City
9 and at the Contractor's expense, based on the City's or City
10 Representative's then prevailing rates.
11 2) Provide Contractor reimbursement to the City within 30 Calendar Days for
12 all such fees invoiced by the City.
13 c. The need for more than 1 resubmission or any other delay in obtaining City's
14 review of submittals, will not entitle the Contractor to an extension of Contract
15 Time.
- 16 7. Partial Submittals
17 a. City reserves the right to not review submittals deemed partial, at the City's
18 discretion.
19 b. Submittals deemed by the City to be not complete will be returned to the
20 Contractor, and will be considered "Not Approved" until resubmitted.
21 c. The City may at its option provide a list or mark the submittal directing the
22 Contractor to the areas that are incomplete.
- 23 8. If the Contractor considers any correction indicated on the shop drawings to
24 constitute a change to the Contract Documents, then written notice must be
25 provided thereof to the City at least 7 Calendar Days prior to release for
26 manufacture.
- 27 9. When the shop drawings have been completed to the satisfaction of the City, the
28 Contractor may carry out the construction in accordance therewith and no further
29 changes therein except upon written instructions from the City.
- 30 10. Each submittal, appropriately coded, will be returned within 30 Calendar Days
31 following receipt of submittal by the City.
- 32 L. Mock ups
33 1. Mock Up units as specified in individual Sections, include, but are not necessarily
34 limited to, complete units of the standard of acceptance for that type of Work to be
35 used on the Project. Remove at the completion of the Work or when directed.
- 36 M. Qualifications
37 1. If specifically required in other Sections of these Specifications, submit a P.E.
38 Certification for each item required.
- 39 N. Request for Information (RFI)
40 1. Contractor Request for additional information
41 a. Clarification or interpretation of the contract documents
42 b. When the Contractor believes there is a conflict between Contract Documents
43 c. When the Contractor believes there is a conflict between the Drawings and
44 Specifications
45 1) Identify the conflict and request clarification
46 d. When the Contractor encounters an unknown condition in the field
47 2. Use the Request for Information (RFI) form provided by the City (attached).

3. Numbering of RFI
 - a. Prefix with "RFI" followed by series number, "-xxx", beginning with "01" and increasing sequentially with each additional transmittal.
4. Sufficient information shall be attached to permit a written response without further information.
5. The City will log each request and will review the request.
 - a. If review of the project information request indicates that a change to the Contract Documents is required, the City will issue a Field Order or Change Order, as appropriate.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

REQUEST FOR INFORMATION

1
2

Project:	RFI #:
Engineering Project No.:	Date Sent:
Sender:	Receiver:
Copies To:	

3

Subject:
Request:
Sender's Proposed Answer/Solution:

4
5
6

THE PROPOSED ANSWER/SOLUTION IS, IS NOT, INCLUDED IN THE CONTRACT.

7

Receiver's Response:

8

Response By:	Company:	Date:
---------------------	-----------------	--------------

9

DISTRIBUTION:

1 **SECTION 01 35 13**
2 **SPECIAL PROJECT PROCEDURES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. The procedures for special project circumstances that includes, but is not limited to:
7 a. Coordination with the Texas Department of Transportation
8 b. Work near High Voltage Lines
9 c. Confined Space Entry Program
10 d. Excavation Protection
11 e. Air Pollution Watch Days
12 f. Use of Explosives, Drop Weight, Etc.
13 g. Water Utilities Notification
14 h. Public Notification Prior to Beginning Construction
15 i. Coordination with United States Army Corps of Engineers
16 j. Coordination within Railroad permits areas
17 k. Dust Control
18 l. Employee Parking
19 m. Coordination with North Central Texas Council of Governments Clean
20 Construction Specification
21 n. Tree Protection

22 B. Deviations from this City of Denton Standard Specification

- 23 1. None.

24 C. Related Specification Sections include, but are not necessarily limited to:

- 25 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
26 2. Division 1 – General Requirements

27 **1.2 PRICE AND PAYMENT PROCEDURES**

28 A. Measurement and Payment

- 29 1. Coordination within Railroad permit areas
30 a. Measurement
31 1) Measurement for this Item will be by lump sum.
32 b. Payment
33 1) The work performed and materials furnished in accordance with this Item
34 will be paid for at the lump sum price bid for Railroad Coordination.
35 c. The price bid shall include:
36 1) Mobilization
37 2) Inspection
38 3) Safety training
39 4) Additional Insurance
40 5) Insurance Certificates

- 1 6) Other requirements associated with general coordination with Railroad,
2 including additional employees required to protect the right-of-way and
3 property of the Railroad from damage arising out of and/or from the
4 construction of the Project.
- 5 2. Railroad Flagmen
- 6 a. Measurement
- 7 1) Measurement for this Item will be per working day.
- 8 b. Payment
- 9 1) The work performed and materials furnished in accordance with this Item
10 will be paid for each working day that Railroad Flagmen are present at the
11 Site.
- 12 c. The price bid shall include:
- 13 1) Coordination for scheduling flagmen
- 14 2) Flagmen
- 15 3) Other requirements associated with Railroad
- 16 3. All other items
- 17 a. Work associated with these Items is considered incidental to the various Items
18 bid. No separate payment will be allowed for this Item.

19 **1.3 REFERENCES**

20 A. Reference Standards

- 21 1. Reference standards cited in this Specification refer to the current reference
22 standard published at the time of the latest revision date logged at the end of this
23 Specification, unless a date is specifically cited.
- 24 2. Health and Safety Code, Title 9. Safety, Subtitle A. Public Safety, Chapter 752.
25 High Voltage Overhead Lines.
- 26 3. North Central Texas Council of Governments (NCTCOG) – Clean Construction
27 Specification
- 28 4. Occupational Health and Safety Administration (OSHA) Standards – 29 CFR Part
29 1910.146 – Permit-Required Confined Spaces

30 **1.4 ADMINISTRATIVE REQUIREMENTS**

31 A. Coordination with the Texas Department of Transportation

- 32 1. When work in the right-of-way which is under the jurisdiction of the Texas
33 Department of Transportation (TxDOT):
- 34 a. Notify the Texas Department of Transportation prior to commencing any work
35 therein in accordance with the provisions of the permit
- 36 b. All work performed in the TxDOT right-of-way shall be performed in
37 compliance with and subject to approval from the Texas Department of
38 Transportation

39 B. Work near High Voltage Lines

- 40 1. Regulatory Requirements
- 41 a. All Work near High Voltage Lines (more than 600 volts measured between
42 conductors or between a conductor and the ground) shall be in accordance with
43 Health and Safety Code, Title 9, Subtitle A, Chapter 752.
- 44 2. Warning sign
- 45 a. Provide sign of sufficient size meeting all OSHA requirements.

- 1 3. Equipment operating within 10 feet of high voltage lines will require the following
2 safety features
3 a. Insulating cage-type of guard about the boom or arm
4 b. Insulator links on the lift hook connections for back hoes or dippers
5 c. Equipment must meet the safety requirements as set forth by OSHA and the
6 safety requirements of the owner of the high voltage lines
7 4. Work within 6 feet of high voltage electric lines
8 a. Notification shall be given to:
9 1) The power company (example: Denton Municipal Electric)
10 a) Maintain an accurate log of all such calls to power company and record
11 action taken in each case.
12 b. Coordination with power company
13 1) After notification coordinate with the power company to:
14 a) Erect temporary mechanical barriers, de-energize the lines, or raise or
15 lower the lines
16 c. No personnel may work within 6 feet of a high voltage line before the above
17 requirements have been met.
18 C. Confined Space Entry Program
19 1. Provide and follow approved Confined Space Entry Program in accordance with
20 OSHA 29 CFR Part 1910.146 requirements.
21 2. Confined Spaces include:
22 a. Manholes
23 b. All other confined spaces in accordance with OSHA's Permit Required for
24 Confined Spaces
25 D. Air Pollution Watch Days
26 1. General
27 a. Observe the following guidelines relating to working on City construction sites
28 on days designated as "AIR POLLUTION WATCH DAYS".
29 b. Typical Ozone Season
30 1) May 1 through October 31.
31 c. Critical Emission Time
32 1) 6:00 a.m. to 10:00 a.m.
33 2. Watch Days
34 a. The Texas Commission on Environmental Quality (TCEQ), in coordination
35 with the National Weather Service, will issue the Air Pollution Watch by 3:00
36 p.m. on the afternoon prior to the WATCH day.
37 b. Requirements
38 1) Begin work after 10:00 a.m. whenever construction phasing requires the
39 use of motorized equipment for periods in excess of 1 hour.
40 2) However, the Contractor may begin work prior to 10:00 a.m. if:
41 a) Use of motorized equipment is less than 1 hour, or
42 b) If equipment is new and certified by EPA as "Low Emitting", or
43 equipment burns Ultra Low Sulfur Diesel (ULSD), diesel emulsions, or
44 alternative fuels such as CNG.
45 E. TCEQ Air Permit
46 1. Obtain TCEQ Air Permit for construction activities per requirements of TCEQ.
47 F. Use of Explosives, Drop Weight, Etc.

- 1 1. When Contract Documents permit on the project the following will apply:
- 2 a. Public Notification
- 3 1) Submit notice to City and proof of adequate insurance coverage, 24 hours
- 4 prior to commencing.
- 5 2) Minimum 24-hour public notification in accordance with paragraph 1.4.H
- 6 of this Section.

7 G. Water Utilities Coordination

- 8 1. During the construction of this project, it may be necessary to deactivate, for a
- 9 period of time, existing lines. The Contractor shall be required to coordinate with
- 10 Water Utilities to determine the best times for deactivating and activating those
- 11 lines.
- 12 2. Coordinate any event that will require connecting to or the operation of an existing
- 13 City water line system with the City's representative.
- 14 a. If needed, obtain a hydrant water meter from Water Utilities for use during the
- 15 life of named project.
- 16 b. In the event that a water valve on an existing live system is required to be
- 17 turned off or on to accommodate the construction of the project is required,
- 18 coordinate this activity through the appropriate City representative.
- 19 1) Do not operate water line valves of existing water system.
- 20 a) Failure to comply will render the Contractor in violation of Texas Penal
- 21 Code Title 7, Chapter 28.03 (Criminal Mischief) and the Contractor
- 22 will be prosecuted to the full extent of the law.
- 23 b) In addition, the Contractor will assume all liabilities and
- 24 responsibilities as a result of these actions.

25 H. Public Notification Prior to Beginning Construction

- 26 1. Prior to beginning construction on any block in the project, on a block-by-block
- 27 basis, prepare and deliver a notice or flyer of the pending construction to the front
- 28 door of each residence or business that will be impacted by construction. The notice
- 29 shall be prepared as follows:
- 30 a. Post notice or flyer 7 days prior to beginning any construction activity on each
- 31 block in the project area.
- 32 1) Prepare flyer on the Contractor's letterhead and include the following
- 33 information:
- 34 a) Name of Project
- 35 b) Engineering Project Number (EPN)
- 36 c) Scope of Project (i.e. type of construction activity)
- 37 d) Actual construction duration within the block
- 38 e) Name of the contractor's foreman and phone number
- 39 f) Name of the City's inspector and phone number
- 40 g) City's after-hours phone number
- 41 2) A sample of the 'pre-construction notification' flyer is attached as Exhibit
- 42 A.
- 43 3) Submit schedule showing the construction start and finish time for each
- 44 block of the project to the inspector.
- 45 4) Deliver flyer to the City Inspector for review prior to distribution.
- 46 b. No construction will be allowed to begin on any block until the flyer is
- 47 delivered to all residents of the block.

48 I. Public Notification of Temporary Water Service Interruption during Construction

- 1 1. In the event it becomes necessary to temporarily shut down water service to
2 residents or businesses during construction, prepare and deliver a notice or flyer of
3 the pending interruption to the front door of each affected resident.
- 4 2. Prepared notice as follows:
 - 5 a. The notification or flyer shall be posted 24 hours prior to the temporary
6 interruption.
 - 7 b. Prepare flyer on the contractor's letterhead and include the following
8 information:
 - 9 1) Name of the project
 - 10 2) Date of the interruption of service
 - 11 3) Period the interruption will take place
 - 12 4) Name of the contractor's foreman and phone number
 - 13 5) Name of the City's inspector and phone number
 - 14 c. A sample of the temporary water service interruption notification is attached as
15 Exhibit B.
 - 16 d. Deliver a copy of the temporary interruption notification to the City inspector
17 for review prior to being distributed.
 - 18 e. No interruption of water service can occur until the flyer has been delivered to
19 all affected residents and businesses.
 - 20 f. Electronic versions of the sample flyers can be obtained from the Project
21 Construction Inspector.
- 22 J. Coordination with United States Army Corps of Engineers (USACE)
 - 23 1. At locations in the Project where construction activities occur in areas where
24 USACE permits are required, meet all requirements set forth in each designated
25 permit.
- 26 K. Coordination within Railroad Permit Areas
 - 27 1. At locations in the project where construction activities occur in areas where
28 railroad permits are required, meet all requirements set forth in each designated
29 railroad permit. This includes, but is not limited to, provisions for:
 - 30 a. Flagmen
 - 31 b. Inspectors
 - 32 c. Safety training
 - 33 d. Additional insurance
 - 34 e. Insurance certificates
 - 35 f. Other employees required to protect the right-of-way and property of the
36 Railroad Company from damage arising out of and/or from the construction of
37 the project. Proper utility clearance procedures shall be used in accordance
38 with the permit guidelines.
 - 39 2. Obtain any supplemental information needed to comply with the railroad's
40 requirements.
 - 41 3. Railroad Flagmen
 - 42 a. Submit receipts to City for verification of working days that railroad flagmen
43 were present on Site.
- 44 L. Dust Control
 - 45 1. Use acceptable measures to control dust at the Site.
 - 46 a. If water is used to control dust, capture and properly dispose of waste water.
 - 47 b. If wet saw cutting is performed, capture and properly dispose of slurry.

1 M. Employee Parking

- 2 1. Provide parking for employees at locations approved by the City.

3 N. Coordination with North Central Texas Council of Governments (NCTCOG) Clean
4 Construction Specification

5 1. Equipment Requirements

- 6 a. All construction equipment being used to perform work on the Contract shall
7 meet EPA emissions standards of Tier 3 or equivalent, or cleaner. Model Form
8 A.14. Schedule for Phase-In of Tier 1-Tier 4 Non-Road Engines is included in
9 Appendix A. Compliance may be achieved through the use of equipment
10 powered by an EPA-certified engine, through engine repowers, or through the
11 use of retrofits which have been verified by the EPA and/or California Air
12 Resources Board. A list of available retrofits is available online at EPA's
13 website "Verified Technologies List for Clean Diesel."
14 b. Equipment that meets one or more of the following conditions may be exempt
15 from these requirements:
16 1) Equipment powered by an engine that is less than or equal to ten (10) years
17 old.
18 2) Equipment that must be used to fulfill use or reporting requirements for a
19 grant program or other clean air initiative. Documentation of such
20 obligations must be submitted to City for verification.
21 3) Equipment that is designated as low-use equipment, which is defined as
22 any piece of construction equipment which is used for less than ten (10)
23 hours per week on a single public works contract. A Low-Use Exemption
24 Weekly Reporting Form will be required for all equipment for which this
25 exemption is claimed.
26 4) Equipment that is being used to address a critical or emergency public
27 works need, including, but not limited to, broken water mains or sanitary
28 sewer lines. This exemption is limited to work performed in a situation in
29 which the procurement of construction services is performed on an
30 emergency basis, as provided for by State law.

31 2. Operational Requirements

- 32 a. All diesel fuel used to perform work on the public works contract shall be
33 Ultra-Low Sulfur Diesel (ULSD) fuel which also complies with Texas Low
34 Emission Diesel (TxLED) program requirements. This may include TxLED-
35 compliant Biodiesel blends.
36 b. The Contractor shall limit idling of equipment to no more than five (5)
37 minutes, unless the idling is applicable to one or more of the following
38 exceptions:
39 1) is being used for emergency response purposes;
40 2) is idling as a necessary component of mechanical operation, maintenance,
41 or diagnostic purposes; or
42 3) is idling for the health or safety of the equipment operator.
43 c. To the greatest extent possible, Contractor shall stage equipment away from,
44 and minimize operation near, sensitive receptors including, but not limited to,
45 fresh air intakes, hospitals, schools, licensed day care facilities, and residences.

46 3. Reporting Requirements

- 1 a. On or before the day construction activity commences, the Contractor shall
- 2 submit to the City an inventory report containing identifying data for each piece
- 3 of equipment to be used on the worksite. A form for submitting such
- 4 information will be provided by the City. This inventory may be used by the
- 5 City to conduct site inspections and/or verify compliance with specification
- 6 elements.
- 7 b. If additional equipment is brought on-site after construction begins, the
- 8 Contractor shall provide this same inventory information to the City for the new
- 9 equipment on or before the day it begins work on-site.
- 10 c. Reports shall be provided for all equipment used on-site.
- 11 4. Enforcement Requirements
- 12 a. All construction equipment used at the Site is subject to inspection by the City
- 13 at random. Contractor is responsible for ensuring that all subcontractors meet
- 14 the requirements of this specification.
- 15 O. Tree Protection
- 16 1. Install tree protection in accordance with the Drawings, if applicable.
- 17 2. Coordinate with City Building Inspections prior to commencing and earthwork
- 18 activities to perform an initial tree protection inspection.

19 **1.5 SUBMITTALS**

- 20 A. Submittals shall be in accordance with Section 01 33 00.
- 21 B. All submittals shall be approved by the City prior to delivery.

22 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 23 A. Construction Notice Flyer
- 24 B. Notice of Temporary Water Service Interruption

25 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

26 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

27 **1.9 QUALITY ASSURANCE [NOT USED]**

28 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

29 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

30 **1.12 WARRANTY [NOT USED]**

31 **PART 2 - PRODUCTS [NOT USED]**

32 **PART 3 - EXECUTION [NOT USED]**

33

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END OF SECTION

2

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

3

EXHIBIT A

(To be printed on Contractor's Letterhead)

Date: _____

EPN No.: _____

Project Name:

Limits of Construction:

NOTICE OF CONSTRUCTION

THIS IS TO INFORM YOU THAT UNDER A CONTRACT WITH THE CITY OF DENTON, OUR COMPANY WILL WORK ON UTILITY LINES ON OR AROUND YOUR PROPERTY.

CONSTRUCTION WILL BEGIN APPROXIMATELY SEVEN DAYS FROM THE DATE OF THIS NOTICE.

IF YOU HAVE QUESTIONS ABOUT ACCESS, SECURITY, SAFETY OR ANY OTHER ISSUE, PLEASE CALL:

<CONTRACTOR'S SUPERINTENDENT> AT <TELEPHONE NO.>

OR

<CITY INSPECTOR> AT < TELEPHONE NO.>

PLEASE KEEP THIS FLYER HANDY WHEN YOU CALL

1

EXHIBIT B



2

3 Date: _____

4

5 EPN No.: _____

6

7 Project Name: _____

8

9

10 **NOTICE OF**
11 **TEMPORARY WATER SERVICE**
12 **INTERRUPTION**

10

11

12

13

14

15 **Due to utility improvements in your neighborhood, your water service will be**

16

interrupted on _____

17

between the hours of _____ **and** _____.

18

19

20 **IF YOU HAVE QUESTIONS ABOUT THIS DISRUPTION, PLEASE CALL:**

21

22

23 **<CONTRACTOR'S SUPERINTENDENT> AT <TELEPHONE NO.>**

24

25 **OR**

26

27 **<CITY INSPECTOR> AT < TELEPHONE NO.>**

28

29 **THIS SERVICE INTERRUPTION WILL BE AS SHORT AS POSSIBLE**

30

31 **Thank you,**

32

_____, **Contractor**

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SECTION 01 45 23
TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Testing and inspection services procedures and coordination
- B. Deviations from this City of Denton Standard Specification
 - 1. None
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered incidental to the various Items bid. No separate payment will be allowed for this Item.
 - a. In accordance with Article 13 of the General Conditions, Contractor is responsible for performing, coordinating, and payment of all inspections, tests, re-tests, or approvals.
 - b. In accordance with Article 13 of the General Conditions, City is responsible for performing and payment for first set additional independent testing chosen by the City to be performed.
 - 1) If the first independent test performed by the City fails, the Contractor is responsible for payment of subsequent testing until a passing test occurs.
 - a) Final acceptance will not be issued by City until all required payments for testing by Contractor have been paid in full.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Testing
 - 1. Complete testing in accordance with the Contract Documents.
 - 2. Coordination
 - a. When testing is required to be performed by the City, notify City, sufficiently in advance, when testing is needed.
 - b. When testing is required to be completed by the Contractor, notify City, sufficiently in advance, that testing will be performed.
 - 3. Distribution of Testing Reports
 - a. Electronic Distribution
 - 1) Provide all reports to Project Manager and their duly appointed representative electronically via email.

- 1 4. Provide Project Manager’s duly appointed representative with trip tickets for each
2 delivered load of Concrete or Lime material including the following information:
3 a. Name of pit
4 b. Date of delivery
5 c. Material delivered

6 B. Inspection

- 7 1. Inspection or lack of inspection does not relieve the Contractor from obligation to
8 perform work in accordance with the Contract Documents.

9 **1.5 SUBMITTALS**

- 10 A. Submittals shall be in accordance with Section 01 33 00.

11 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 12 A. Materials Testing Reports sealed by a Professional Engineer or Professional
13 Geoscientist licensed in the State of Texas.

14 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

15 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

16 **1.9 QUALITY ASSURANCE [NOT USED]**

17 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

18 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

19 **1.12 WARRANTY [NOT USED]**

20 **PART 2 - PRODUCTS [NOT USED]**

21 **PART 3 - EXECUTION [NOT USED]**

22

1

END OF SECTION

2

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

3

1 **SECTION 01 50 00**
2 **TEMPORARY FACILITIES AND CONTROLS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Provide temporary facilities and controls needed for the Work including, but not
7 necessarily limited to:
 - 8 a. Temporary utilities
 - 9 b. Sanitary facilities
 - 10 c. Storage Sheds and Buildings
 - 11 d. Dust control
 - 12 e. Temporary fencing of the construction site

13 B. Deviations from this City of Denton Standard Specification

- 14 1. None.

15 C. Related Specification Sections include, but are not necessarily limited to:

- 16 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
- 17 2. Division 1 – General Requirements

18 **1.2 PRICE AND PAYMENT PROCEDURES**

19 A. Measurement and Payment

- 20 1. Work associated with this Item is considered incidental to the various Items bid.
21 No separate payment will be allowed for this Item.

22 **1.3 REFERENCES [NOT USED]**

23 **1.4 ADMINISTRATIVE REQUIREMENTS**

24 A. Temporary Utilities

25 1. Obtaining Temporary Service

- 26 a. Make arrangements with utility service companies for temporary services.
- 27 b. Abide by rules and regulations of utility service companies or authorities
28 having jurisdiction.
- 29 c. Be responsible for utility service costs until Work is approved for Final
30 Acceptance.
 - 31 1) Included are fuel, power, light, heat and other utility services necessary for
32 execution, completion, testing and initial operation of Work.

33 2. Construction Water

- 34 a. Contractor to provide water required for and in connection with Work to be
35 performed and for specified tests of piping, equipment, devices or other use as
36 required for the completion of the Work.
- 37 b. Provide and maintain adequate supply of potable water for domestic
38 consumption by Contractor, if required.
- 39 c. Coordination
 - 40 1) Contact City 1 week before water for construction is desired

- 1 d. Metering and Payment for Construction Water
- 2 1) For water system improvements:
- 3 a) Obtain construction water meter from City to track water usage. Water
- 4 will be provided at no cost to Contractor.
- 5 2) For all other projects:
- 6 a) Obtain construction water meter from City for payment as billed by
- 7 City's established rates.
- 8 3. Electricity and Lighting
- 9 a. Provide and pay for electric powered service as required for Work, including
- 10 testing of Work.
- 11 1) Provide power for lighting, operation of equipment, or other use.
- 12 b. Electric power service includes temporary power service or generator to
- 13 maintain operations during scheduled shutdown.
- 14 4. Telephone
- 15 a. Provide emergency telephone service at Site for use by Contractor personnel
- 16 and others performing work or furnishing services at Site.
- 17 5. Temporary Heat and Ventilation
- 18 a. Provide temporary heat as necessary for protection or completion of Work.
- 19 b. Provide temporary heat and ventilation to assure safe working conditions.
- 20 B. Sanitary Facilities
- 21 1. Provide and maintain sanitary facilities for persons on Site.
- 22 a. Comply with regulations of State and local departments of health.
- 23 2. Enforce use of sanitary facilities by construction personnel at job site.
- 24 a. Enclose and anchor sanitary facilities.
- 25 b. No discharge will be allowed from these facilities.
- 26 c. Collect and store sewage and waste so as not to cause nuisance or health
- 27 problem.
- 28 d. Haul sewage and waste off-site at no less than weekly intervals and properly
- 29 dispose in accordance with applicable regulation.
- 30 3. Locate facilities near Work Site and keep clean and maintained throughout Project.
- 31 4. Remove facilities at completion of Project
- 32 C. Storage Sheds and Buildings
- 33 1. Provide adequately ventilated, watertight, weatherproof storage facilities with floor
- 34 above ground level for materials and equipment susceptible to weather damage.
- 35 2. Storage of materials not susceptible to weather damage may be on blocks off
- 36 ground.
- 37 3. Store materials in a neat and orderly manner.
- 38 a. Place materials and equipment to permit easy access for identification,
- 39 inspection and inventory.
- 40 4. Equip building with lockable doors and lighting, and provide electrical service for
- 41 equipment space heaters and heating or ventilation as necessary to provide storage
- 42 environments acceptable to specified manufacturers.
- 43 5. Fill and grade site for temporary structures to provide drainage away from
- 44 temporary and existing buildings.
- 45 6. Remove building from site prior to Final Acceptance.

- 1 D. Temporary Fencing
- 2 1. Provide and maintain for the duration or construction when required in contract
- 3 documents
- 4 E. Dust Control
- 5 1. Contractor is responsible for maintaining dust control through the duration of the
- 6 project.
- 7 a. Contractor remains on-call at all times
- 8 b. Must respond in a timely manner
- 9 F. Temporary Protection of Construction
- 10 1. Contractor or subcontractors are responsible for protecting Work from damage due
- 11 to weather.

12 **1.5 SUBMITTALS [NOT USED]**

13 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

14 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

15 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

16 **1.9 QUALITY ASSURANCE [NOT USED]**

17 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

18 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

19 **1.12 WARRANTY [NOT USED]**

20 **PART 2 - PRODUCTS [NOT USED]**

21 **PART 3 - EXECUTION [NOT USED]**

22 **3.1 INSTALLERS [NOT USED]**

23 **3.2 EXAMINATION [NOT USED]**

24 **3.3 PREPARATION [NOT USED]**

25 **3.4 INSTALLATION**

- 26 A. Temporary Facilities
- 27 1. Maintain all temporary facilities for duration of construction activities as needed.

- 1 **3.5 [REPAIR] / [RESTORATION]**
- 2 **3.6 RE-INSTALLATION**
- 3 **3.7 FIELD [or] SITE QUALITY CONTROL [NOT USED]**
- 4 **3.8 SYSTEM STARTUP [NOT USED]**
- 5 **3.9 ADJUSTING [NOT USED]**
- 6 **3.10 CLEANING [NOT USED]**
- 7 **3.11 CLOSEOUT ACTIVITIES**
 - 8 A. Temporary Facilities
 - 9 1. Remove all temporary facilities and restore area after completion of the Work, to a
 - 10 condition equal to or better than prior to start of Work.
- 11 **3.12 PROTECTION [NOT USED]**
- 12 **3.13 MAINTENANCE [NOT USED]**
- 13 **3.14 ATTACHMENTS [NOT USED]**

14 **END OF SECTION**

15

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

16

- 1 2) Implementation
- 2 3) Permitting fees
- 3 4) Final Stabilization

4 **1.3 REFERENCES**

5 A. Abbreviations and Acronyms

- 6 1. Notice of Intent: NOI
- 7 2. Notice of Termination: NOT
- 8 3. Storm Water Pollution Prevention Plan: SWPPP
- 9 4. Texas Commission on Environmental Quality: TCEQ
- 10 5. Notice of Change: NOC

11 A. Reference Standards

- 12 1. Reference standards cited in this Specification refer to the current reference
- 13 standard published at the time of the latest revision date logged at the end of this
- 14 Specification, unless a date is specifically cited.
- 15 2. Integrated Storm Management (iSWM) Technical Manual for Construction
- 16 Controls

17 **1.4 ADMINISTRATIVE REQUIREMENTS**

18 A. General

- 19 1. Contractor is responsible for resolution and payment of any fines issued associated
- 20 with compliance to Stormwater Pollution Prevention Plan.
- 21 2. As a condition of approval, applicants conducting land disturbing activities will
- 22 complete the online construction site survey. This survey can be found at
- 23 <https://www.surveymonkey.com/r/dentonconstruction>.
- 24 3. Refer to TCEQ website for further information about stormwater permits at
- 25 https://www.tceq.texas.gov/permitting/stormwater/construction/TXR15_AIR.html.

26 B. Construction Activities resulting in:

- 27 1. Less than 1 acre of disturbance
- 28 a. Provide erosion and sediment control in accordance with Section 31 25 14.
- 29 2. 1 to less than 5 acres of disturbance
- 30 a. Texas Pollutant Discharge Elimination System (TPDES) General Construction
- 31 Permit is required
- 32 b. Complete SWPPP in accordance with TCEQ requirements
- 33 1) Indicate City is a Secondary Operator
- 34 2) TCEQ Small Construction Site Notice Required under general permit
- 35 TXR150000
- 36 a) Post at job site
- 37 b) Prior to Preconstruction Meeting, send 1 copy to City Watershed
- 38 Protection Division, Watershed@cityofdenton.com, Joetta Dailey
- 39 (940) 349-7153 or Zach Peterson.(940) 349-7141.
- 40 3) Provide erosion and sediment control in accordance with Section 31 25 14.
- 41 4) Once the project has been completed and all the closeout requirements of
- 42 TCEQ have been met, send copy of signed Small Construction Site Notice
- 43 to Watershed Protection division, Watershed@cityofdenton.com, Joetta
- 44 Dailey (940) 349-7153 or Zach Peterson (940) 349-7141.

- 1 3. 5 acres or more of Disturbance
- 2 a. Texas Pollutant Discharge Elimination System (TPDES) General Construction
- 3 Permit is required
- 4 b. Complete SWPPP in accordance with TCEQ requirements
- 5 1) Prepare a TCEQ NOI form and submit to TCEQ along with required fee
- 6 a) Send copy to City Watershed Protection Division,
- 7 Watershed@cityofdenton.com, Joetta Dailey (940) 349-7153 or Zach
- 8 Peterson (940) 349-7141.
- 9 2) TCEQ Notice of Change required if making changes or updates to NOI
- 10 3) Provide erosion and sediment control in accordance with Section 31 25 14.
- 11 4) Once the project has been completed and all the closeout requirements of
- 12 TCEQ have been met a TCEQ Notice of Termination can be submitted.
- 13 a) Send copy to City Watershed Protection Division,
- 14 Watershed@cityofdenton.com, Joetta Dailey (940) 349-7153 or Zach
- 15 Peterson (940) 349-7141.
- 16 C. Sites adjacent to or encroaching into Environmentally Sensitive Areas (ESAs):
- 17 1. Provide tree protective fencing at the boundary of any identified onsite ESAs and
- 18 approved construction activities that would result in land disturbances.
- 19 2. Provide signs identifying the area as an ESA and prohibiting construction activity.

20 1.5 SUBMITTALS

21 A. SWPPP

- 22 1. Submit in accordance with Section 01 33 00, except as stated herein.
- 23 a. Prior to the Preconstruction Meeting, submit a draft copy of SWPPP to the City
- 24 as follows:
- 25 1) 1 copy to the Project Manager
- 26 a) Project Manager will forward to the City Watershed Protection
- 27 Department, Watershed@cityofdenton.com, Joetta Dailey (940) 349-
- 28 7153 or Zach Peterson (940) 349-7141.

29 B. Modified SWPPP

- 30 1. If the SWPPP is revised during construction, resubmit modified SWPPP to the City
- 31 in accordance with Section 01 33 00.

1 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

2 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

3 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

4 **1.9 QUALITY ASSURANCE [NOT USED]**

5 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

6 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

7 **1.12 WARRANTY [NOT USED]**

8 **PART 2 - PRODUCTS [NOT USED]**

9 **PART 3 - EXECUTION [NOT USED]**

10 **END OF SECTION**

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

11

1 **1.12 WARRANTY [NOT USED]**

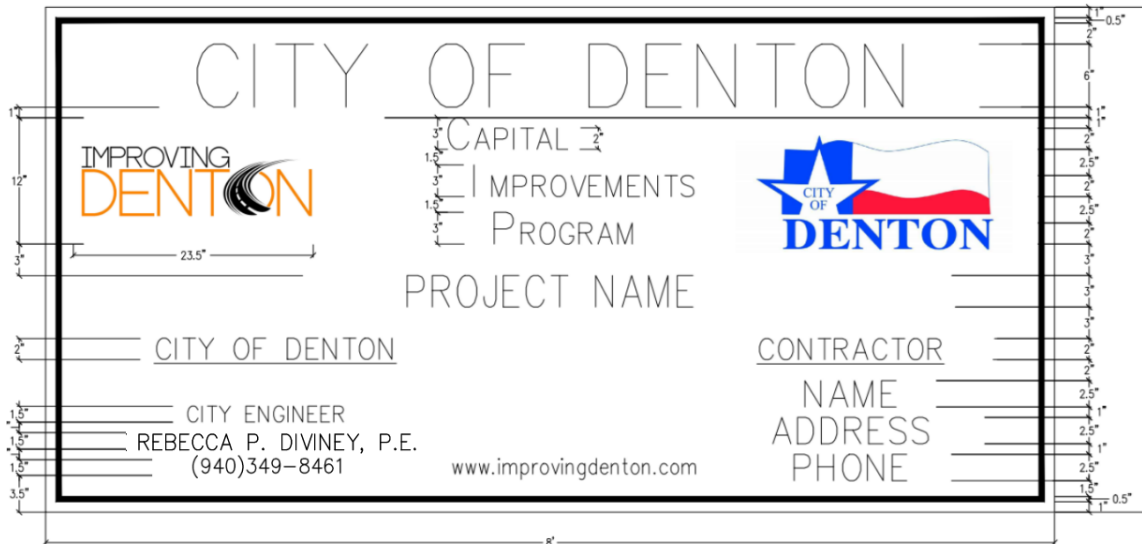
2 **PART 2 - PRODUCTS**

3 **2.1 OWNER-FURNISHED [or] OWNER-SUPPLIED PRODUCTS [NOT USED]**

4 **2.2 EQUIPMENT, PRODUCT TYPES, AND MATERIALS**

5 A. Design Criteria

- 6 1. Provide free standing Project Designation Sign as indicated below:



7



8 The flag shall resemble the Texas Flag. The background of
9 the stars and the "City of Denton" lettering shall be blue.
10 The lower bar of the flag shall be red, and the upper bar
11 shall be white. The dimensions, from the farthest ends, shall
12 be 12-inches vertically and 23.5-inches horizontally. The
13 flag shall appear in the dimensions shown. The contractor
14 may request a digital copy in either .jpg or .tif format.

15

- 16 2. The Project Designation Sign shall be placed at strategic points with lettering as
17 needed to adequately describe the work.
18 3. Signs shall be painted white with blue letters and symbols. Letter size shall conform
19 to dimensions shown on sign drawing. Exceptions or variations from the sign
20 shown above shall not be allowed.

21 B. Materials

22 1. Sign

- 23 a. Constructed of 3/4-inch fir plywood, grade A-C (exterior) or better

- 1 **2.3 ACCESSORIES [NOT USED]**
- 2 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

3 **PART 3 - EXECUTION**

- 4 **3.1 INSTALLERS [NOT USED]**
- 5 **3.2 EXAMINATION [NOT USED]**
- 6 **3.3 PREPARATION [NOT USED]**

7 **3.4 INSTALLATION**

- 8 A. General
 - 9 1. Provide vertical installation at extents of project.
 - 10 2. Signs shall be placed prior to beginning the Work and maintained until the end of
 - 11 the project.
 - 12 3. Relocate sign as needed, upon request of the City.
- 13 B. Mounting options
 - 14 a. Skids
 - 15 b. Posts
 - 16 c. Barricade

17 **3.5 -- 3.12 [NOT USED]**

18 **3.6 MAINTENANCE**

- 19 A. General
 - 20 1. Maintenance will include painting and repairs as needed or directed by the City.

21 **3.7 ATTACHMENTS [NOT USED]**

22 **END OF SECTION**

23

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

24

- 1 4. Deliver products or equipment in manufacturer's original unbroken cartons or other
2 containers designed and constructed to protect the contents from physical or
3 environmental damage.
 - 4 5. Clearly and fully mark and identify as to manufacturer, item and installation
5 location.
 - 6 6. Provide manufacturer's instructions for storage and handling.
- 7 B. Handling Requirements
- 8 1. Handle products or equipment in accordance with these Contract Documents and
9 manufacturer's recommendations and instructions.
- 10 C. Storage Requirements
- 11 1. Store materials in accordance with manufacturer's recommendations and
12 requirements of these Specifications.
 - 13 2. Make necessary provisions for safe storage of materials and equipment.
 - 14 a. Place loose soil materials and materials to be incorporated into Work in a
15 manner that prevents damage to any part of Work or existing facilities and that
16 maintains free access at all times to all parts of Work and to utility service
17 company installations in vicinity of Work.
 - 18 3. Keep materials and equipment neatly and compactly stored in locations that will
19 cause minimum inconvenience to other contractors, public travel, adjoining owners,
20 tenants and occupants.
 - 21 a. Arrange storage to provide easy access for inspection.
 - 22 4. Restrict storage to areas available on construction site for storage of material and
23 equipment as shown on Drawings, or approved by Project Manager or their duly
24 authorized representative.
 - 25 5. Provide off-site storage and protection when on-site storage is not adequate.
 - 26 a. Provide addresses of and access to off-site storage locations for inspection by
27 Project Manager or their duly authorized representative.
 - 28 6. Do not use lawns, grass plots or other private property for storage purposes without
29 written permission of owner or other person in possession or control of premises.
 - 30 7. Store in manufacturers' unopened containers.
 - 31 8. Neatly, safely and compactly stack materials delivered and stored along line of
32 Work to avoid inconvenience and damage to property owners and general public
33 and maintain at least 3 feet from fire hydrant.
 - 34 9. Keep public and private driveways and street crossings open.
 - 35 10. Repair or replace damaged lawns, sidewalks, streets or other improvements to
36 satisfaction of Project Manager or their duly authorized representative.
 - 37 a. Total length which materials may be distributed along route of construction at
38 one time is 1,000 linear feet, unless otherwise approved in writing by Project
39 Manager.

1 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

2 **1.12 WARRANTY [NOT USED]**

3 **PART 2 - PRODUCTS [NOT USED]**

4 **PART 3 - EXECUTION**

5 **3.1 -3.6 [NOT USED]**

6 **3.2 FIELD [or] SITE QUALITY CONTROL**

7 A. Tests and Inspections

- 8 1. Inspect all products or equipment delivered to the site prior to unloading.

9 B. Non-Conforming Work

- 10 1. Reject all products or equipment that are damaged, used or in any other way
11 unsatisfactory for use on the project.

12 **3.3 SYSTEM STARTUP [NOT USED]**

13 **3.4 ADJUSTING [NOT USED]**

14 **3.5 CLEANING [NOT USED]**

15 **3.6 CLOSEOUT ACTIVITIES [NOT USED]**

16 **3.7 PROTECTION**

- 17 A. Protect all products or equipment in accordance with manufacturer's written directions.

- 18 B. Store products or equipment in location to avoid physical damage to items while in
19 storage.

- 20 C. Protect equipment from exposure to elements and keep thoroughly dry if required by
21 the manufacturer.

22 **3.8 MAINTENANCE [NOT USED]**

23 **3.9 ATTACHMENTS [NOT USED]**

24 **END OF SECTION**

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 01 70 00
MOBILIZATION AND REMOBILIZATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mobilization and Demobilization

a. Mobilization

- 1) Transportation of Contractor’s personnel, equipment, and operating supplies to the Site
- 2) Establishment of necessary general facilities for the Contractor’s operation at the Site
- 3) Premiums paid for performance and payment bonds
- 4) Transportation of Contractor’s personnel, equipment, and operating supplies to another location within the designated Site
- 5) Relocation of necessary general facilities for the Contractor’s operation from 1 location to another location on the Site.

b. Demobilization

- 1) Transportation of Contractor’s personnel, equipment, and operating supplies away from the Site including disassembly
- 2) Site Clean-up
- 3) Removal of all buildings and/or other facilities assembled at the Site for this Contract

c. Mobilization and Demobilization do not include activities for specific items of work that are for which payment is provided elsewhere in the contract.

2. Remobilization

a. Remobilization for Suspension of Work specifically required in the Contract Documents or as required by City includes:

1) Demobilization

- a) Transportation of Contractor’s personnel, equipment, and operating supplies from the Site including disassembly or temporarily securing equipment, supplies, and other facilities as designated by the Contract Documents necessary to suspend the Work.
- b) Site Clean-up as designated in the Contract Documents

2) Remobilization

- a) Transportation of Contractor’s personnel, equipment, and operating supplies to the Site necessary to resume the Work.
- b) Establishment of necessary general facilities for the Contractor’s operation at the Site necessary to resume the Work.

3) No Payments will be made for:

- a) Mobilization and Demobilization from one location to another on the Site in the normal progress of performing the Work.
- b) Stand-by or idle time
- c) Lost profits

1 B. Deviations from this City of Denton Standard Specification

2 1. None.

3 C. Related Specification Sections include, but are not necessarily limited to:

4 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract

5 2. Division 1 – General Requirements

6 **1.2 PRICE AND PAYMENT PROCEDURES**

7 A. Measurement and Payment

8 1. Mobilization and Demobilization

9 a. Measurement

10 1) This Item will be measured by the lump sum as the work progresses.

11 b. Payment

12 1) For this Item, the adjusted Contract amount will be calculated as the total
13 Contract amount less the lump sum for mobilization. Mobilization shall be
14 made in partial payments as follows:

15 a) When 1% of the adjusted Contract amount for construction Items is
16 earned, 25% of the mobilization lump sum bid will be paid.

17 b) When 25% of the adjusted Contract amount for construction Items is
18 earned, 50% of the mobilization lump sum bid will be paid. Previous
19 payments under the Item will be deducted from this amount.

20 c) When 50% of the adjusted Contract amount for construction Items is
21 earned, 75% of the mobilization lump sum bid will be paid. Previous
22 payments under the Item will be deducted from this amount.

23 d) When 75% of the adjusted Contract amount for construction Items is
24 earned, 100% of the mobilization lump sum bid will be paid. Previous
25 payments under the Item will be deducted from this amount.

26 e) **A bid containing a total for “Mobilization” in excess of 10% of
27 total contract shall be considered unbalanced and a cause for
28 consideration of rejection.**

29 c. The price bid shall include:

30 1) Mobilization of equipment to Site

31 2) Performance Bond

32 3) Payment Bond

33 4) Maintenance Bond

34 5) Remobilization as identified in the Contract Documents

35 6) Demobilization

36 d. No payments will be made for standby, idle time, or lost profits associated this
37 Item.

38 2. Remobilization for suspension of Work not identified in the Contract Documents,
39 as required by City

40 a. Measurement and Payment

41 1) This shall be submitted as a Contract Claim in accordance with Article 11
42 of Section 00 72 00.

43 2) No payments will be made for standby, idle time, or lost profits associated
44 with this Item.

45 **1.3 REFERENCES [NOT USED]**

- 1 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**
- 2 **1.5 SUBMITTALS [NOT USED]**
- 3 **1.6 INFORMATIONAL SUBMITTALS [NOT USED]**
- 4 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**
- 5 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**
- 6 **1.9 QUALITY ASSURANCE [NOT USED]**
- 7 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**
- 8 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**
- 9 **1.12 WARRANTY [NOT USED]**

10 **PART 2 - PRODUCTS [NOT USED]**

11 **PART 3 - EXECUTION [NOT USED]**

12 **END OF SECTION**

13

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 01 71 23
CONSTRUCTION STAKING AND SURVEY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Requirements for construction staking to be provided by the Contractor.
 - 2. Requirements for coordination with City to allow performance of as-built survey at the Site.
- B. Deviations from this City of Denton Standard Specification
 - 1. None
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Construction Staking
 - a. Measurement and Payment
 - 1) Work associated with this Item is considered incidental to the various Items bid. No separate payment will be allowed for this Item.
 - 2. As-Built Survey
 - a. Measurement and Payment
 - 1) Work associated with this Item is considered incidental to the various Items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals, if required, shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Certificates
 - 1. Provide certificate certifying that elevations and locations of improvements are in conformance or non-conformance with requirements of the Contract Documents.
 - a. Certificate must be sealed by a registered professional land surveyor in the State of Texas.
- B. Field Quality Control Submittals
 - 1. Documentation verifying accuracy of field engineering work.
- C. As-built Survey Submittal:

- 1 1. AutoCAD (.dwg)
- 2 2. ESRI Shapefile (.shp)
- 3 3. CSV file (.csv), formatted with X and Y coordinates in separate columns
- 4 4. Include vertical and horizontal data tied to original project control and benchmarks,
- 5 and feature descriptions

6 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

7 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

8 **1.9 QUALITY ASSURANCE**

9 A. Construction Staking

- 10 1. Construction staking will be performed by the Contractor.
- 11 2. Coordination
- 12 a. It is the Contractor's responsibility to coordinate staking such that construction
- 13 activities are not delayed or negatively impacted.
- 14 3. General
- 15 a. Contractor is responsible for preserving and maintaining staking.
- 16 b. If in the opinion of the City, a sufficient number of stakes or markings have
- 17 been lost, destroyed or disturbed, by Contractor's neglect, such that the
- 18 contracted Work cannot take place, then the Contractor will be required to re-
- 19 stake the deficient areas.

20 B. As-built Survey

- 21 1. As-built Survey will be performed by the Contractor.
- 22 2. Coordination
- 23 a. Contractor to verify that control data established in the design survey and
- 24 required for construction remains intact.
- 25 b. It is the Contractor's responsibility to coordinate As-built Survey such that
- 26 construction activities are not delayed or negatively impacted.
- 27 c. Contractor shall restore or replace all necessary control data damaged during
- 28 construction operations.
- 29 d. For sewer mains and water lines 12-inch and smaller in diameter, if permitted
- 30 by City in writing, Contractor may physically measure depth and mark the
- 31 location during the progress of construction and perform As-built Survey after
- 32 the facility has been buried. The Contractor is responsible for the quality
- 33 control required to ensure accuracy if this approach is permitted.
- 34 3. General
- 35 a. As-built survey will be performed in order to maintain complete and accurate
- 36 logs of control and survey work as it progresses for Project Records.
- 37 b. The Contractor perform as-built survey to obtain construction features
- 38 including, but not limited to, the following:
- 39 1) All Utility Lines
- 40 a) Rim and flowline elevations and coordinates for each manhole or
- 41 junction structure
- 42 2) Water Lines
- 43 a) Top of pipe elevations and coordinates for water lines at the following
- 44 locations:
- 45 (1) Every 250 linear feet

- 1 (2) Horizontal and vertical points of inflection, curvature, etc. (All
- 2 Fittings)
- 3 (3) Cathodic protection test stations
- 4 (4) Sampling stations
- 5 (5) Meter boxes/vaults (All sizes)
- 6 (6) Fire lines
- 7 (7) Fire hydrants and valves
- 8 (8) Gate valves and Butterfly Valves
- 9 (9) Plugs, stubouts, dead-end lines
- 10 (10) Air Release valves (Manhole rim and vent pipe)
- 11 (11) Blow off valves (Manhole rim and valve lid)
- 12 (12) Pressure plane valves
- 13 (13) Cleaning wyes
- 14 (14) Casing pipe (each end)
- 15 b) Storm Sewer
- 16 (1) Top of pipe elevations and coordinates at the following locations:
- 17 (a) Every 250 linear feet
- 18 (b) Horizontal and vertical points of inflection, curvature, etc.
- 19 c) Sanitary Sewer
- 20 (1) Top of pipe elevations and coordinates for sanitary sewer lines at
- 21 the following locations:
- 22 (a) Every 250 linear feet
- 23 (b) Horizontal and vertical points of inflection, curvature, etc.
- 24 (c) Cleanouts
- 25 c. As-built survey will be performed in order to maintain complete and accurate
- 26 logs of control and survey work associated with meeting or exceeding the line
- 27 and grade required by these Specifications.
- 28 1) The Contractor remains fully responsible for the accuracy of the work and
- 29 the correction of it, as required.
- 30 2) Monitor line and grade continuously during construction.
- 31 3) Record deviation with respect to design line and grade once at each pipe
- 32 joint and submit daily records to City.
- 33 4) If the installation does not meet the specified tolerances, immediately notify
- 34 the City and correct the installation in accordance with the Contract
- 35 Documents.
- 36 d. Submit to the City copies of field notes, if requested, used to establish all lines
- 37 and grades and allow the City to check guidance system setup prior to
- 38 beginning each tunneling drive.

39 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

40 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

41 **1.12 WARRANTY [NOT USED]**

42 **PART 2 - PRODUCTS [NOT USED]**

43 **PART 3 - EXECUTION**

44 **3.1 INSTALLERS [NOT USED]**

1 **3.2 EXAMINATION [NOT USED]**

2 **3.3 PREPARATION [NOT USED]**

3 **3.4 APPLICATION**

4 **3.5 REPAIR / RESTORATION [NOT USED]**

5 **3.6 RE-INSTALLATION [NOT USED]**

6 **3.7 FIELD [or] SITE QUALITY CONTROL**

7 A. It is the Contractor's responsibility to maintain all stakes and control data in accordance
8 with this Specification.

9 B. Do not change or relocate stakes or control data without approval from the City.

10 **3.8 SYSTEM STARTUP [NOT USED]**

11 **3.9 ADJUSTING [NOT USED]**

12 **3.10 CLEANING [NOT USED]**

13 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

14 **3.12 PROTECTION [NOT USED]**

15 **3.13 MAINTENANCE [NOT USED]**

16 **3.14 ATTACHMENTS [NOT USED]**

17 **END OF SECTION**

18

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

19

1 **SECTION 01 74 23**
2 **CLEANING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Intermediate and final cleaning for Work not including special cleaning of closed
7 systems specified elsewhere

8 B. Deviations from this City of Denton Standard Specification

- 9 1. None.

10 C. Related Specification Sections include, but are not necessarily limited to:

- 11 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
12 2. Division 1 – General Requirements

13 **1.2 PRICE AND PAYMENT PROCEDURES**

14 A. Measurement and Payment

- 15 1. Work associated with this Item is considered incidental to the various Items bid.
16 No separate payment will be allowed for this Item.

17 **1.3 REFERENCES [NOT USED]**

18 **1.4 ADMINISTRATIVE REQUIREMENTS**

19 A. Scheduling

- 20 1. Schedule cleaning operations so that dust and other contaminants disturbed by
21 cleaning process will not fall on newly painted surfaces.
22 2. Schedule final cleaning upon completion of Work and immediately prior to final
23 inspection.

24 **1.5 SUBMITTALS [NOT USED]**

25 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

26 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

27 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

28 **1.9 QUALITY ASSURANCE [NOT USED]**

29 **1.10 STORAGE, AND HANDLING**

30 A. Storage and Handling Requirements

- 31 1. Store cleaning products and cleaning wastes in containers specifically designed for
32 those materials.

1 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

2 **1.12 WARRANTY [NOT USED]**

3 **PART 2 - PRODUCTS**

4 **2.1 OWNER-FURNISHED [or] OWNER-SUPPLIED PRODUCTS [NOT USED]**

5 **2.2 MATERIALS**

6 A. Cleaning Agents

- 7 1. Compatible with surface being cleaned
- 8 2. New and uncontaminated
- 9 3. For manufactured surfaces
- 10 a. Material recommended by manufacturer

11 **2.3 ACCESSORIES [NOT USED]**

12 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

13 **PART 3 - EXECUTION**

14 **3.1 INSTALLERS [NOT USED]**

15 **3.2 EXAMINATION [NOT USED]**

16 **3.3 PREPARATION [NOT USED]**

17 **3.4 APPLICATION [NOT USED]**

18 **3.5 REPAIR / RESTORATION [NOT USED]**

19 **3.6 RE-INSTALLATION [NOT USED]**

20 **3.7 FIELD [or] SITE QUALITY CONTROL [NOT USED]**

21 **3.8 SYSTEM STARTUP [NOT USED]**

22 **3.9 ADJUSTING [NOT USED]**

23 **3.10 CLEANING**

24 A. General

- 25 1. Prevent accumulation of wastes that create hazardous conditions.
- 26 2. Conduct cleaning and disposal operations to comply with laws and safety orders of
27 governing authorities.
- 28 3. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in
29 storm or sanitary drains or sewers.
- 30 4. Dispose of degradable debris at an approved solid waste disposal site.
- 31 5. Dispose of nondegradable debris at an approved solid waste disposal site or in an
32 alternate manner approved by City and regulatory agencies.

- 1 6. Transport and deposit vegetative material removed as a result of work operations
2 off-site at a legal site in accordance with all applicable federal, state, and local laws
3 and regulations.
- 4 a. Removed vegetation will not be allowed to remain in piles or mounds on the
5 easement or surrounding property.
- 6 7. Handle materials in a controlled manner with as few handlings as possible.
- 7 8. Thoroughly clean, sweep, wash and polish all Work and equipment associated with
8 this project.
- 9 9. Remove all signs of temporary construction and activities incidental to construction
10 of required permanent Work.
- 11 10. If project is not cleaned to the satisfaction of the City, the City reserves the right to
12 have the cleaning completed at the expense of the Contractor.
- 13 11. Do not burn on-site.

14 B. Intermediate Cleaning during Construction

- 15 1. Keep Work areas clean so as not to hinder health, safety or convenience of
16 personnel in existing facility operations.
- 17 2. At maximum weekly intervals, dispose of waste materials, debris and rubbish.
- 18 3. Confine construction debris daily in strategically located container(s):
19 a. Cover to prevent blowing by wind
20 b. Store debris away from construction or operational activities
21 c. Haul from site at a minimum of once per week
- 22 4. Vacuum clean interior areas when ready to receive finish painting.
23 a. Continue vacuum cleaning on an as-needed basis, until Final Acceptance.
- 24 5. Prior to storm events, thoroughly clean site of all loose or unsecured items, which
25 may become airborne or transported by flowing water during the storm.

26 C. Interior Final Cleaning

- 27 1. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other
28 foreign materials from sight-exposed surfaces.
- 29 2. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.
- 30 3. Wash and shine glazing and mirrors.
- 31 4. Polish glossy surfaces to a clear shine.
- 32 5. Ventilating systems
33 a. Clean permanent filters and replace disposable filters if units were operated
34 during construction.
35 b. Clean ducts, blowers and coils if units were operated without filters during
36 construction.
- 37 6. Replace all burned out lamps.
- 38 7. Broom clean process area floors.
- 39 8. Mop office and control room floors.

40 D. Exterior (Site or Right of Way) Final Cleaning

- 41 1. Remove trash and debris containers from site.
42 a. Re-seed areas disturbed by location of trash and debris containers.
- 43 2. Sweep roadway to remove all rocks, pieces of asphalt, concrete or any other object
44 that may hinder or disrupt the flow of traffic along the roadway.

- 1 3. Clean any interior areas including, but not limited to, vaults, manholes, structures,
- 2 junction boxes and inlets.
- 3 4. If no longer required for maintenance of erosion facilities, and upon approval by
- 4 City, remove erosion control from site.
- 5 5. Clean signs, lights, signals, etc.

6 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

7 **3.12 PROTECTION [NOT USED]**

8 **3.13 MAINTENANCE [NOT USED]**

9 **3.14 ATTACHMENTS [NOT USED]**

10 **END OF SECTION**

11

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

12

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION [NOT USED]**

5 **3.4 CLOSEOUT PROCEDURE**

6 A. Prior to requesting Final Inspection, submit:

- 7 1. Project Record Documents in accordance with Section 01 78 39
8 2. Operation and Maintenance Data, if required, in accordance with Section 01 78 23

9 B. Prior to requesting Final Inspection, perform final cleaning in accordance with Section
10 01 74 23.

11 C. Final Inspection

- 12 1. After final cleaning, provide notice to the Project Manager and their duly appointed
13 representative that the Work is completed.
14 a. City reserves the right to deny request for Final Inspection if City determines
15 that the entire Work is not sufficiently complete to warrant a Final Inspection
16 b. The City will make an initial Final Inspection with the Contractor present.
17 c. Upon completion of this inspection, the City will notify the Contractor, in
18 writing within 10 business days, of any particulars in which this inspection
19 reveals that the Work is defective or incomplete.
20 2. Upon receiving written notice from the City, immediately undertake the Work
21 required to remedy deficiencies and complete the Work to the satisfaction of the
22 City.
23 3. Upon completion of Work associated with the items listed in the City's written
24 notice, inform the City, that the required Work has been completed. Upon receipt
25 of this notice, the City, in the presence of the Contractor, will make a subsequent
26 Final Inspection of the project.
27 4. Provide all special accessories required to place each item of equipment in full
28 operation. These special accessory items include, but are not limited to:
29 a. Specified spare parts
30 b. Adequate oil and grease as required for the first lubrication of the equipment
31 c. Initial fill up of all chemical tanks and fuel tanks
32 d. Light bulbs
33 e. Fuses
34 f. Vault keys
35 g. Handwheels
36 h. Other expendable items as required for initial start-up and operation of all
37 equipment

38 D. Supporting Documentation

- 39 1. Coordinate with the City Project Representative to complete the following
40 additional forms:
41 a. Final Payment Request
42 b. Statement of Contract Time
43 c. Affidavit of Payment and Release of Liens

- 1 d. Consent of Surety to Final Payment
- 2 E. Letter of Final Acceptance
- 3 1. When City has deemed the Work has been completed, and upon receiving all
- 4 Supporting Documentation, in accordance with General Conditions, City will issue
- 5 Letter of Final Acceptance and release the final payment request for payment.
- 6 F. Warranty Inspection for Wastewater Mains
- 7 1. A second television inspection conforming to the standards laid out in Section 33
- 8 01 30 shall be started by the Contractor no sooner than 630 calendar days and
- 9 finished no later than 690 calendar days after the date of issuance of the Letter of
- 10 Final Acceptance for the project by the City of Denton.
- 11 2. The second inspection shall include a complete televised inspection of each
- 12 manhole interior constructed or installed on the project (including cored manholes).
- 13 a. Should the second inspection indicate repairs that need to be made, these will
- 14 be performed by the Contractor at no cost to the City.
- 15 3. Failure of the Contractor to perform the second inspection or to make repairs
- 16 indicated by the second inspection shall be sufficient grounds for the City to take
- 17 action through the terms of the Maintenance Bond for the project to perform the
- 18 second inspection and make any repairs indicated.

19 **3.5 REPAIR / RESTORATION [NOT USED]**

20 **3.6 RE-INSTALLATION [NOT USED]**

21 **3.7 FIELD [or] SITE QUALITY CONTROL [NOT USED]**

22 **3.8 SYSTEM STARTUP [NOT USED]**

23 **3.9 ADJUSTING [NOT USED]**

24 **3.10 CLEANING [NOT USED]**

25 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

26 **3.12 PROTECTION [NOT USED]**

27 **3.13 MAINTENANCE [NOT USED]**

28 **3.14 ATTACHMENTS [NOT USED]**

29 **END OF SECTION**

30

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

31

1 **SECTION 01 78 23**
2 **OPERATION AND MAINTENANCE DATA**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Product data and related information appropriate for City's maintenance and
7 operation of products furnished under Contract
8 2. Such products may include, but are not limited to:
9 a. Traffic Controllers
10 b. Irrigation Controllers (to be operated by the City)
11 c. Butterfly Valves

12 B. Deviations from this City of Denton Standard Specification

- 13 1. None.

14 C. Related Specification Sections include, but are not necessarily limited to:

- 15 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
16 2. Division 1 – General Requirements

17 **1.2 PRICE AND PAYMENT PROCEDURES**

18 A. Measurement and Payment

- 19 1. Work associated with this Item is considered incidental to the various Items bid.
20 No separate payment will be allowed for this Item.

21 **1.3 REFERENCES [NOT USED]**

22 **1.4 ADMINISTRATIVE REQUIREMENTS**

23 A. Schedule

- 24 1. Submit manuals in final form to the City within 30 calendar days of product
25 shipment to the project site.

26 **1.5 SUBMITTALS**

- 27 A. Submittals shall be in accordance with Section 01 33 00. All submittals shall be
28 approved by the City prior to delivery.

29 **1.6 INFORMATIONAL SUBMITTALS**

30 A. Submittal Form

- 31 1. Prepare data in form of an instructional manual for use by City personnel.
32 2. Format
33 a. Size: 8 ½ inches x 11 inches
34 b. Paper
35 1) 40 pound minimum, white, for typed pages
36 2) Holes reinforced with plastic, cloth or metal
37 c. Text: Manufacturer's printed data, or neatly typewritten

- 1 d. Drawings
- 2 1) Provide reinforced punched binder tab, bind in with text
- 3 2) Reduce larger drawings and fold to size of text pages.
- 4 e. Provide fly-leaf for each separate product, or each piece of operating
- 5 equipment.
- 6 1) Provide typed description of product, and major component parts of
- 7 equipment.
- 8 2) Provide indexed tabs.
- 9 f. Cover
- 10 1) Identify each volume with typed or printed title "OPERATING AND
- 11 MAINTENANCE INSTRUCTIONS".
- 12 2) List:
- 13 a) Title of Project
- 14 b) Identity of separate structure as applicable
- 15 c) Identity of general subject matter covered in the manual
- 16 3. Binders
- 17 a. Commercial quality 3-ring binders with durable and cleanable plastic covers
- 18 b. When multiple binders are used, correlate the data into related consistent
- 19 groupings.
- 20 4. Provide an electronic form of the O&M Manual.
- 21 B. Manual Content
- 22 1. Neatly typewritten table of contents for each volume, arranged in systematic order
- 23 a. Contractor, name of responsible principal, address and telephone number
- 24 b. A list of each product required to be included, indexed to content of the volume
- 25 c. List, with each product:
- 26 1) The name, address and telephone number of the subcontractor or installer
- 27 2) A list of each product required to be included, indexed to content of the
- 28 volume
- 29 3) Identify area of responsibility of each
- 30 4) Local source of supply for parts and replacement
- 31 d. Identify each product by product name and other identifying symbols as set
- 32 forth in Contract Documents.
- 33 2. Product Data
- 34 a. Include only those sheets which are pertinent to the specific product.
- 35 b. Annotate each sheet to:
- 36 1) Clearly identify specific product or part installed
- 37 2) Clearly identify data applicable to installation
- 38 3) Delete references to inapplicable information
- 39 3. Drawings
- 40 a. Supplement product data with drawings as necessary to clearly illustrate:
- 41 1) Relations of component parts of equipment and systems
- 42 2) Control and flow diagrams
- 43 b. Coordinate drawings with information in Project Record Documents to assure
- 44 correct illustration of completed installation.
- 45 c. Do not use Project Record Drawings as maintenance drawings.
- 46 4. Written text, as required to supplement product data for the particular installation:
- 47 a. Organize in consistent format under separate headings for different procedures.
- 48 b. Provide logical sequence of instructions of each procedure.

- 1 5. Copy of each warranty, bond and service contract issued
- 2 a. Provide information sheet for City personnel giving:
- 3 1) Proper procedures in event of failure
- 4 2) Instances which might affect validity of warranties or bonds
- 5 C. Manual for Materials and Finishes
- 6 1. Submit 5 hard copies and 1 digital copy of complete manual in final form.
- 7 2. Content, for architectural products, applied materials and finishes:
- 8 a. Manufacturer's data, giving full information on products
- 9 1) Catalog number, size, composition
- 10 2) Color and texture designations
- 11 3) Information required for reordering special manufactured products
- 12 b. Instructions for care and maintenance
- 13 1) Manufacturer's recommendation for types of cleaning agents and methods
- 14 2) Cautions against cleaning agents and methods which are detrimental to
- 15 product
- 16 3) Recommended schedule for cleaning and maintenance
- 17 3. Content, for moisture protection and weather exposure products:
- 18 a. Manufacturer's data, giving full information on products
- 19 1) Applicable standards
- 20 2) Chemical composition
- 21 3) Details of installation
- 22 b. Instructions for inspection, maintenance and repair
- 23 D. Manual for Equipment and Systems
- 24 1. Submit 5 hard copies and 1 digital copy of complete manual in final form.
- 25 2. Content, for each unit of equipment and system, as appropriate:
- 26 a. Description of unit and component parts
- 27 1) Function, normal operating characteristics and limiting conditions
- 28 2) Performance curves, engineering data and tests
- 29 3) Complete nomenclature and commercial number of replaceable parts
- 30 b. Operating procedures
- 31 1) Start-up, break-in, routine and normal operating instructions
- 32 2) Regulation, control, stopping, shut-down and emergency instructions
- 33 3) Summer and winter operating instructions
- 34 4) Special operating instructions
- 35 c. Maintenance procedures
- 36 1) Routine operations
- 37 2) Guide to "trouble shooting"
- 38 3) Disassembly, repair and reassembly
- 39 4) Alignment, adjusting and checking
- 40 d. Servicing and lubrication schedule
- 41 1) List of lubricants required
- 42 e. Manufacturer's printed operating and maintenance instructions
- 43 f. Description of sequence of operation by control manufacturer
- 44 1) Predicted life of parts subject to wear
- 45 2) Items recommended to be stocked as spare parts
- 46 g. As installed control diagrams by controls manufacturer
- 47 h. Each contractor's coordination drawings
- 48 1) As installed color coded piping diagrams

- 1 i. Charts of valve tag numbers, with location and function of each valve
- 2 j. List of original manufacturer's spare parts, manufacturer's current prices, and
- 3 recommended quantities to be maintained in storage
- 4 k. Other data as required under pertinent Sections of Specifications
- 5 3. Content, for each electric and electronic system, as appropriate:
- 6 a. Description of system and component parts
- 7 1) Function, normal operating characteristics, and limiting conditions
- 8 2) Performance curves, engineering data and tests
- 9 3) Complete nomenclature and commercial number of replaceable parts
- 10 b. Circuit directories of panelboards
- 11 1) Electrical service
- 12 2) Controls
- 13 3) Communications
- 14 c. As installed color coded wiring diagrams
- 15 d. Operating procedures
- 16 1) Routine and normal operating instructions
- 17 2) Sequences required
- 18 3) Special operating instructions
- 19 e. Maintenance procedures
- 20 1) Routine operations
- 21 2) Guide to "trouble shooting"
- 22 3) Disassembly, repair and reassembly
- 23 4) Adjustment and checking
- 24 f. Manufacturer's printed operating and maintenance instructions
- 25 g. List of original manufacturer's spare parts, manufacturer's current prices, and
- 26 recommended quantities to be maintained in storage
- 27 h. Other data as required under pertinent Sections of Specifications
- 28 4. Prepare and include additional data when the need for such data becomes apparent
- 29 during instruction of City's personnel.

30 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

31 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

32 **1.9 QUALITY ASSURANCE**

- 33 A. Provide operation and maintenance data by personnel with the following criteria:
- 34 1. Trained and experienced in maintenance and operation of described products
 - 35 2. Skilled as technical writer to the extent required to communicate essential data
 - 36 3. Skilled as draftsman competent to prepare required drawings

1 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

2 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

3 **1.12 WARRANTY [NOT USED]**

4 **PART 2 - PRODUCTS [NOT USED]**

5 **PART 3 - EXECUTION [NOT USED]**

6 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Work associated with the documenting the project and recording changes to project documents, including:
 - a. Record Drawings
- B. Deviations from this City of Denton Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered incidental to the various Items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Prior to submitting a request for Final Inspection, deliver Project Record Documents to Project Manager.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

- A. Accuracy of Records
 - 1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
 - 2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.
 - 3. To facilitate accuracy of records, make entries within 24 hours after receipt of information that the change has occurred.

4. Provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation and examination.

1.10 STORAGE AND HANDLING

A. Storage and Handling Requirements

1. Maintain the job set of Record Documents, which shall include the Drawings and the Project Manual, completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
2. In the event of loss of recorded data, use means necessary to again secure the data to the City's approval.
 - a. In such case, provide replacements to the standards originally required by the Contract Documents.

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED [OR] OWNER-SUPPLIED PRODUCTS [NOT USED]

2.2 RECORD DOCUMENTS

A. Job set

1. Promptly following receipt of the Notice to Proceed, secure from the City, at no charge to the Contractor, 1 complete set of all Documents comprising the Contract.

B. Final Record Documents

1. At a time nearing the completion of the Work and prior to Final Inspection, provide the City 1 complete set of all Final Record Drawings in the Contract.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 MAINTENANCE DOCUMENTS

A. Maintenance of Job Set

1. Immediately upon receipt of the job set, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET". The Job set shall include the Drawings and the Project Manual.

- 1 2. Preservation
- 2 a. Considering the Contract completion time, the probable number of occasions
- 3 upon which the job set must be taken out for new entries and for examination,
- 4 and the conditions under which these activities will be performed, devise a
- 5 suitable method for protecting the job set.
- 6 b. Do not use the job set for any purpose except entry of new data and for review
- 7 by the City, until start of transfer of data to final Project Record Documents.
- 8 c. Maintain the job set at the site of work.
- 9 3. Coordination with Construction Survey
- 10 a. At a minimum, in accordance with the intervals set forth in Section 01 71 23,
- 11 clearly mark any deviations from Contract Documents associated with
- 12 installation of the infrastructure.
- 13 4. Making entries on Drawings and Specifications
- 14 a. Record any deviations from Contract Documents on Drawings and in the
- 15 Specifications if applicable.
- 16 b. Use an erasable colored pencil (not ink or indelible pencil), clearly describe the
- 17 change by graphic line and note as required.
- 18 c. Date all entries.
- 19 d. Call attention to the entry by a "cloud" drawn around the area or areas affected.
- 20 e. In the event of overlapping changes, use different colors for the overlapping
- 21 changes.
- 22 5. Conversion of schematic layouts
- 23 a. In some cases on the Drawings, arrangements of conduits, circuits, piping,
- 24 ducts, and similar items, are shown schematically and are not intended to
- 25 portray precise physical layout.
- 26 1) Final physical arrangement is determined by the Contractor, subject to the
- 27 City's approval.
- 28 2) However, design of future modifications of the facility may require
- 29 accurate information as to the final physical layout of items which are
- 30 shown only schematically on the Drawings.
- 31 b. Show on the job set of Record Drawings, by dimension accurate to within 1
- 32 inch, the centerline of each run of items.
- 33 1) Final physical arrangement is determined by the Contractor, subject to the
- 34 City's approval.
- 35 2) Show, by symbol or note, the vertical location of the Item ("under slab", "in
- 36 ceiling plenum", "exposed", and the like).
- 37 3) Make all identification sufficiently descriptive that it may be related
- 38 reliably to the Specifications.
- 39 c. The City may waive the requirements for conversion of schematic layouts
- 40 where, in the City's judgment, conversion serves no useful purpose. However,
- 41 do not rely upon waivers being issued except as specifically issued in writing
- 42 by the City.
- 43 B. Final Project Record Documents
- 44 1. Transfer of data to Drawings and Specifications
- 45 a. Carefully transfer change data shown on the job set of Record Drawings and
- 46 Project Manual if applicable, to the corresponding final documents,
- 47 coordinating the changes as required.

- 1 b. Clearly indicate at each affected detail and other Drawing a full description of
- 2 changes made during construction, and the actual location of items.
- 3 c. Call attention to each entry by drawing a "cloud" around the area or areas
- 4 affected.
- 5 d. Make changes neatly, consistently and with the proper media to assure
- 6 longevity and clear reproduction.
- 7 2. Transfer of data to other Documents
- 8 a. If the Documents, other than Drawings, have been kept clean during progress of
- 9 the Work, and if entries thereon have been orderly to the approval of the City,
- 10 the job set of those Documents, other than Drawings, will be accepted as final
- 11 Record Documents.
- 12 b. If any such Document is not so approved by the City, secure a new copy of that
- 13 Document from the City at the City's usual charge for reproduction and
- 14 handling, and carefully transfer the change data to the new copy to the approval
- 15 of the City.

16 **3.5 REPAIR / RESTORATION [NOT USED]**

17 **3.6 RE-INSTALLATION [NOT USED]**

18 **3.7 FIELD [OR] SITE QUALITY CONTROL [NOT USED]**

19 **3.8 SYSTEM STARTUP [NOT USED]**

20 **3.9 ADJUSTING [NOT USED]**

21 **3.10 CLEANING [NOT USED]**

22 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

23 **3.12 PROTECTION [NOT USED]**

24 **3.13 MAINTENANCE [NOT USED]**

25 **3.14 ATTACHMENTS [NOT USED]**

26 **END OF SECTION**

27

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

28

- 1 9) Repair adjacent sidewalk or pavement damaged by the removal of steps
- 2 2. Removal of Fence
- 3 a. Measurement
- 4 1) Measured per linear foot of Removal of Fence.
- 5 b. Payment
- 6 1) The work performed and materials furnished in accordance with this item
- 7 and measured as provided under “Measurement” will be paid for at the unit
- 8 price bid per linear foot for Removal of Fence.
- 9 c. The price bid shall include:
- 10 1) Removal of all post types
- 11 2) Removal of all fence types
- 12 3) Removal of all gate types
- 13 4) Removal of post foundations
- 14 5) Loading
- 15 6) Unloading
- 16 7) Storing
- 17 8) Hauling
- 18 9) Disposal
- 19 10) Clean-up
- 20 3. Removal of Guardrail
- 21 a. Measurement
- 22 1) Measured per linear foot of Removal of Guardrail.
- 23 b. Payment
- 24 1) The work performed and materials furnished in accordance with this item
- 25 and measured as provided under “Measurement” will be paid for at the unit
- 26 price bid per linear foot for Removal of Guardrail.
- 27 c. The price bid shall include:
- 28 1) Removal of all post types
- 29 2) Removal of all guardrail types
- 30 3) Removal of post foundations
- 31 4) Removal of concrete mow strip
- 32 5) Removal of all end terminal types
- 33 6) Loading
- 34 7) Unloading
- 35 8) Storing
- 36 9) Hauling
- 37 10) Disposal
- 38 11) Clean-up
- 39 4. Removal of Mailbox
- 40 a. Measurement
- 41 1) Measured per each Removal of Mailbox.
- 42 b. Payment
- 43 1) The work performed and materials furnished in accordance with this item
- 44 and measured as provided under “Measurement” will be paid for at the unit
- 45 price bid per each for Removal of Mailbox.
- 46 c. The price bid shall include:
- 47 1) Removal of all post types
- 48 2) Removal of post foundations

- 1 3) Removal of all mailbox types
- 2 4) Removal of mailbox bank
- 3 5) Removal of all brick, concrete block, stone façade, or any other decorative
- 4 and structural material used to construct a mailbox
- 5 6) Temporary mailbox, mailbox bank, or other form of mail access
- 6 7) Coordination with USPS and property owner
- 7 8) Loading
- 8 9) Unloading
- 9 10) Storing
- 10 11) Hauling
- 11 12) Salvaging or disposal
- 12 13) Clean-up
- 13 5. Removal of Riprap
- 14 a. Measurement
- 15 1) Measured per square yard of Removal of Riprap
- 16 b. Payment
- 17 1) The work performed and materials furnished in accordance with this item
- 18 and measured as provided under “Measurement” will be paid for at the unit
- 19 price bid per square yard for Removal of Riprap.
- 20 c. The price bid shall include:
- 21 1) Removal of all rock at all sizes and types
- 22 2) Removal of concrete at all depths
- 23 3) Removal of reinforcing
- 24 4) Removal of grout
- 25 5) Removal of bedding material and filter fabric
- 26 6) Loading
- 27 7) Unloading
- 28 8) Storing
- 29 9) Hauling
- 30 10) Salvaging or disposal
- 31 11) Clean-up
- 32 6. Removal of Stormwater Structure
- 33 a. Measurement
- 34 1) Measured per each Removal of Stormwater Structure
- 35 b. Payment
- 36 1) The work performed and materials furnished in accordance with this item
- 37 and measured as provided under “Measurement” will be paid for at the unit
- 38 price bid per each for Removal of Stormwater Structure.
- 39 c. The price bid shall include:
- 40 1) Removal of all headwalls, wingwalls, and end treatments at all sizes and
- 41 types
- 42 2) Removal of concrete at all depths
- 43 3) Removal of reinforcing
- 44 4) Removal of grout
- 45 5) Removal of bedding material and filter fabric
- 46 6) Temporary shoring
- 47 7) Loading
- 48 8) Unloading

- 1 9) Storing
- 2 10) Hauling
- 3 11) Backfilling
- 4 12) Salvaging or disposal
- 5 13) Clean-up
- 6 7. Removal of Retaining Wall Less Than 4 Feet
- 7 a. Measurement
- 8 1) Measured per linear foot of Removal of Retaining Wall Less Than 4 Feet.
- 9 b. Payment
- 10 1) The work performed and materials furnished in accordance with this item
- 11 and measured as provided under “Measurement” will be paid for at the unit
- 12 price bid per linear foot for Removal of Retaining Wall Less Than 4 Feet.
- 13 c. The price bid shall include:
- 14 1) Removal of footings of all types and depths
- 15 2) Removal of wall
- 16 3) Removal of reinforcing
- 17 4) Shoring wall construction and design (if needed)
- 18 5) Loading
- 19 6) Unloading
- 20 7) Storing
- 21 8) Hauling
- 22 9) Salvaging or disposal
- 23 10) Clean-up
- 24 8. Removal of Retaining Wall Greater Than 4 Feet
- 25 a. Measurement
- 26 1) Measured per linear foot of Removal of Retaining Wall Greater Than 4
- 27 Feet.
- 28 b. Payment
- 29 1) The work performed and materials furnished in accordance with this item
- 30 and measured as provided under “Measurement” will be paid for at the unit
- 31 price bid per linear foot for Removal of Retaining Wall Greater Than 4
- 32 Feet.
- 33 c. The price bid shall include:
- 34 1) Removal of footings of all types and depths
- 35 2) Removal of wall
- 36 3) Removal of reinforcing
- 37 4) Shoring wall construction and design (if needed)
- 38 5) Loading
- 39 6) Unloading
- 40 7) Storing
- 41 8) Hauling
- 42 9) Salvaging or disposal
- 43 10) Clean-up

44 **1.3 REFERENCES**

45 A. Abbreviations and Acronyms

- 46 1. TMUTCD – Texas Manual on Uniform Traffic Control Devices

47 **1.4 ADMINISTRATIVE REQUIREMENTS**

1 A. Sequencing
2

- 1 1. Sidewalk Construction
- 2 a. Where existing sidewalks are to be closed during Paving Removal activities:
- 3 1) Utilize pedestrian/sidewalk detour route specified in the Drawings
- 4 a) If no detour route is provided, submit a pedestrian/sidewalk detour
- 5 route that has been signed and sealed by a registered professional
- 6 engineer to City for review.
- 7 2) The pedestrian/sidewalk detour route will be subsidiary to pertinent Traffic
- 8 Control items included with the project.
- 9 b. Install all sidewalk detours and closures in accordance with the TMUTCD,
- 10 State, and local guidelines.
- 11 c. Provide any traffic control devices in accordance with Section 34 71 13.

12 **1.5 SUBMITTALS**

- 13 A. Submittals shall be in accordance with Section 01 33 00.
- 14 B. All submittals shall be approved by the City prior to delivery.

15 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

16 A. Shop Drawings

- 17 1. Temporary Shoring Design
- 18 a. Submit a temporary shoring design for review and approval prior to removal of
- 19 retaining walls or any other removal activities requiring a shoring wall.
- 20 b. The design of a shoring wall is considered subsidiary to the appropriate bid
- 21 item.
- 22 c. Provide a signed and sealed shoring wall design by an engineer licensed in the
- 23 state of Texas for all shoring walls unless otherwise specified in the Drawings
- 24 or directed by City.

25 B. Informational Submittal

- 26 1. Equipment Information
- 27 a. Submittal for all major equipment to include:
- 28 1) Equipment name
- 29 2) Size
- 30 3) Intended use

31 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

32 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

33 **1.9 QUALITY ASSURANCE [NOT USED]**

34 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

35 **1.11 FIELD CONDITIONS [NOT USED]**

36 **1.12 WARRANTY [NOT USED]**

37 **PART 2 - PRODUCTS [NOT USED]**

38 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

1 **2.2 MATERIALS [NOT USED]**

2 **2.3 ACCESSORIES [NOT USED]**

3 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

4 **PART 3 - EXECUTION**

5 **3.1 INSTALLERS [NOT USED]**

6 **3.2 EXAMINATION [NOT USED]**

7 **3.3 PREPARATION**

8 A. Surface Preparation

- 9 1. Verify all removal limits prior to construction unless otherwise directed by the City.

10 **3.4 SITE DEMOLITION**

11 A. Disposal of materials

- 12 1. Accept ownership and dispose of all materials removed.
13 2. Dispose of all material in accordance with Federal, State, and local laws and
14 regulations.
15 3. The disposal of any material removed as part of Selective Site Demolition is
16 considered subsidiary to the applicable items.

17 B. Removal of Stairs

- 18 1. Sawing
19 a. Perform sawing activities for concrete paving and sidewalk in accordance with
20 Section 02 41 15.
21 2. Minimum Limits of Stair Removal
22 a. If adjacent stairs are to remain, remove stair to the nearest whole stair. Do not
23 saw cut an existing stair.
24 b. If stairs to be removed are adjacent to a sidewalk, remove stairs to the nearest
25 sidewalk joint.

26 C. Removal of Fence

- 27 1. Remove all fence components above and below ground.
28 2. Backfill holes with acceptable fill material.
29 3. Compact per Drawings.
30 4. Use caution in removing any fence material.
31 5. Coordinate with property owners as needed to maintain a fenced area at all times
32 especially when animals are kept within the fencing.
33 6. Contractor is responsible for maintaining fencing and installing temporary fencing
34 as needed during construction.
35 7. Contractor is responsible for providing fencing at all times.
36 8. Installing and removing temporary fencing when necessary is subsidiary to
37 Removal of Fence.

1 D. Removal of Guardrail

- 2 1. Remove rail elements in original lengths.
- 3 2. Remove fittings from the posts and the metal rail prior to removing the posts. Once
4 the fittings and metal railing is removed, remove the posts.
- 5 3. Remove and replace any guardrail to remain that is damaged during construction
6 activities at no cost to the City.
- 7 4. Completely remove posts and any paving material surrounding the posts.
- 8 5. Backfill any holes with acceptable fill material.

9 E. Removal of Mailbox

- 10 1. Advance Coordination:
 - 11 a. Coordinate with property owner prior to removal of mailbox.
 - 12 b. Coordinate with local post office prior to removal. Provide approach and access
13 space in accordance to post office requirements.
 - 14 c. Provide the City and the property owner with a written confirmation of the
15 timeframe.
- 16 2. For non-custom or decorative postal mailboxes, salvage existing materials for
17 reuse.
- 18 3. For all custom and/or decorative mailboxes:
 - 19 a. Replace the custom mailbox with a standard post office approved mailbox. No
20 custom mailboxes will be constructed unless specified in the Drawings or
21 directed by the City.
 - 22 b. If property owner wishes to remove or salvage a custom mailbox, determine an
23 agreed upon timeframe with the City, the Contractor, and the property owner
24 for removal.
- 25 4. The Contractor is responsible for providing a temporary mailbox during
26 construction for any mailbox that is proposed to be removed and relocated,
27 reinstalled, or replaced.
- 28 5. Maintain mailbox and/or mail delivery for duration of project. No separate pay will
29 be provided.

30 F. Removal of Riprap

- 31 1. Remove concrete riprap to the nearest joint.
- 32 2. Conform to concrete sawing requirements in Section 02 41 15.

33 G. Removal of Stormwater Structure

- 34 1. Remove entire structure or to the nearest joint as specified in the Drawings.
- 35 2. Removal includes all components of the stormwater structure including footings,
36 toe walls, and mitered RCP ends.
 - 37 a. In accordance with concrete sawing requirements in Section 02 41 15.
 - 38 b. In accordance with utility pipe removal requirements in Section 02 41 14.
- 39 3. Provide temporary erosion control protection for adjacent side slopes, drainage
40 channels, and ditches. Temporary erosion control is considered subsidiary to the
41 Removal of Stormwater Structures.
- 42 4. Provide temporary shoring, if required.

- 1 5. Repair any portion of remaining structure that is damaged as a result of removal
2 activities.
- 3 6. Do not use explosives to remove portions of the existing structure.
- 4 7. Do not use a demolition ball, other swinging weight, or impact equipment unless
5 approved in writing by City.
- 6 8. Use pneumatic or hydraulic tools for final removal of concrete at the removal
7 limits.
- 8 9. Use removal equipment that will not damage any remaining portion of the
9 stormwater structure.

10 H. Removal of Retaining Wall Less Than 4 Feet

- 11 1. Any decorative or landscape retaining wall within the City's right-of-way will not
12 be replaced unless required for grading purposes.
- 13 2. A retaining wall is required if the slope to tie back to existing ground within the
14 City's right-of-way is steeper than 4:1.
- 15 3. If a retaining wall is required:
16 a. Determine if a retaining wall is required before removing any decorative or
17 landscape retaining walls.
18 b. Request approval from City before removing decorative or landscape retaining
19 wall.
- 20 4. If a retaining wall is not required:
21 a. Remove any decorative or landscape retaining wall within the City's right-of-
22 way and re-grade to a maximum of 4:1 slope.
23 b. Do not replace the decorative or landscape retaining wall.
- 24 5. Remove wall to the nearest existing joint where possible. If not possible, obtain
25 approval from the City for removal limits.
- 26 6. In accordance with concrete sawing requirements in Section 02 41 15.
- 27 7. Removal includes all components of the retaining wall.
- 28 8. Do not use explosives to remove portions of the existing structure.
- 29 9. Do not use a demolition ball, other swinging weight, or impact equipment unless
30 approved in writing.
- 31 10. Use pneumatic or hydraulic tools for final removal of concrete at the removal
32 limits.
- 33 11. Use removal equipment that will not damage any remaining portion of the retaining
34 wall.
- 35 12. Construct an approved shoring wall when necessary to provide a safe environment
36 for workers and the travelling public.

37 I. Removal of Retaining Wall Greater Than 4 Feet

- 38 1. Remove wall to the nearest existing joint.
- 39 2. In accordance with concrete sawing requirements in Section 02 41 15.
- 40 3. Removal includes all components of the retaining wall including footings.
- 41 4. Do not use explosives to remove portions of the existing structure.
- 42 5. Do not use a demolition ball, other swinging weight, or impact equipment unless
43 approved in writing.

- 6. Use pneumatic or hydraulic tools for final removal of concrete at the removal limits.
- 7. Use removal equipment that will not damage any remaining portion of the retaining wall.
- 8. Construct an approved shoring wall when necessary to provide a safe environment for workers and the travelling public.

3.5 REPAIR

A. Repair the following at no cost to the City if any damage is caused due to Selective Site Demolition activities:

- 1. Adjacent concrete or asphalt pavement
- 2. Adjacent sidewalk
- 3. Adjacent curb or curb and gutter
- 4. Remaining portions of stormwater structures
- 5. Remaining portions of retaining walls
- 6. Subgrade or base material
- 7. Utility piping, structures, and appurtenances
- 8. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe.
- 9. Landscape beds or planters
- 10. Decorative hardscape or landscape features

3.6 RE-INSTALLATION [NOT USED]

3.7 SITE QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

SECTION 02 41 14

UTILITY REMOVAL AND ABANDONMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal, abandonment, or salvaging of the following utilities:
 - a. General Utility Items:
 - 1) Utility Line Abandonment by Grout Fill – Water, Sanitary Sewer, Stormwater
 - 2) Utility Line Removal, Separate Trench – Water, Sanitary Sewer, Stormwater
 - 3) Utility Line Removal, Same Trench – Water, Sanitary Sewer, Stormwater
 - 4) Utility Manhole Abandonment – Water, Sanitary Sewer, Stormwater
 - 5) Utility Manhole Removal – Water, Sanitary Sewer, Stormwater
 - 6) Plugging of Utility Lines – Water, Sanitary Sewer, Stormwater
 - 7) Utility Junction Structure Removal – Sanitary Sewer, Stormwater
 - b. Water Specific Items:
 - 1) Water Valve Removal
 - 2) Water Valve Removal and Salvage
 - 3) Water Valve Abandonment
 - 4) Fire Hydrant Removal and Salvage
 - 5) Water Meter Removal and Salvage
 - 6) Concrete Water Vault Removal
 - 7) Cathodic Test Station Abandonment
 - c. Stormwater Specific Items:
 - 1) Stormwater Inlet Removal
 - 2) Headwall/SET Removal
 - 3) Trench Drain Removal

B. Deviations from this City of Denton Standard Specification:

1. None.

C. Related Specification Sections include but are not limited to:

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 - General Requirements.
3. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.
4. Section 33 05 15 – Installation of Carrier Pipe in Casing or Tunnel Liner Plate.
5. Section 03 34 13 – Controlled Low Strength Material (CLSM).
6. Section 03 30 00 – Cast-In-Place Concrete.
7. Section 33 14 10 – Ductile Iron Pipe and Fittings.
8. Section 33 14 12 – Concrete Pressure Pipe, Bar-Wrapped Steel Cylinder Type.
9. Section 33 14 13 – Buried Steel Pipe

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1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

- 1. General Utility Items
 - a. Utility Line Abandonment by Grout Fill
 - 1) Measurement
 - a) Measured horizontally along the ground surface of existing utility line to be abandoned.
 - 2) Payment
 - a) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Grout Fill Utility Line” for:
 - (1) Various Sizes.
 - 3) The price bid shall include:
 - a) Dewatering (as required)
 - b) Disposal of sewage (as required)
 - c) Furnishing and installing low density cellular grout or CLSM
 - d) Water
 - e) Pavement Removal
 - f) Excavation
 - g) Hauling
 - h) Disposal of excess materials
 - i) Furnishing, placement, and compaction of backfill
 - j) Clean-up
 - b. Utility Line Removal, Separate Trench
 - 1) Measurement
 - a) Measured horizontally along the ground surface of existing utility line to be removed.
 - 2) Payment
 - a) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Remove Utility Line” for:
 - (1) Various Sizes.
 - 3) The price bid shall include:
 - a) Dewatering (as required)
 - b) Disposal of sewage (as required)
 - c) Pavement Removal
 - d) Excavation
 - e) Hauling
 - f) Disposal of excess materials
 - g) Furnishing, placement, and compaction of backfill
 - h) Clean-up
 - c. Utility Line Removal, Same Trench
 - 1) Measurement
 - a) This item is considered subsidiary to the proposed utility line being installed.
 - 2) Payment

- 1 a) The work performed and materials furnished in accordance with this
2 item are subsidiary to the unit price bid per linear foot of utility pipe
3 installed.
- 4 d. Utility Manhole Abandonment
- 5 1) Measurement
- 6 a) Measured per each manhole to be abandoned.
- 7 2) Payment
- 8 a) The work performed and materials furnished in accordance with this
9 item and measured as provided under “Measurement” will be paid for
10 at the unit price bid per each “Abandon Utility Manhole” for:
- 11 (1) Various diameters.
- 12 3) The price bid shall include:
- 13 a) Disposal of sewage (as required)
- 14 b) Removal and disposal of manhole cone
- 15 c) Removal and disposal of frame and cover
- 16 d) Cutting and plugging of existing utility lines
- 17 e) Concrete
- 18 f) Sand
- 19 g) Pavement removal
- 20 h) Excavation
- 21 i) Hauling
- 22 j) Disposal of excess materials
- 23 k) Furnishing, placement, and compaction of backfill
- 24 l) Surface restoration
- 25 m) Clean-up
- 26 e. Utility Manhole Removal
- 27 1) Measurement
- 28 a) Measured per each manhole to be removed.
- 29 2) Payment
- 30 a) The work performed and materials furnished in accordance with this
31 item and measured as provided under “Measurement” will be paid for
32 at the unit price bid per each “Remove Utility Manhole” for:
- 33 (1) Various diameters.
- 34 3) The price bid shall include:
- 35 a) Disposal of sewage (as required)
- 36 b) Removal and disposal of manhole
- 37 c) Removal and disposal of frame and cover
- 38 d) Cutting and plugging of existing utility lines
- 39 e) Pavement removal
- 40 f) Excavation
- 41 g) Hauling
- 42 h) Disposal of excess materials
- 43 i) Furnishing, placement, and compaction of backfill
- 44 j) Surface restoration
- 45 k) Clean-up
- 46 f. Plugging of Utility Lines
- 47 1) Measurement
- 48 a) Measurement for this item shall be by lump sum.
- 49 2) Payment

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- a) The work performed and the materials furnished in accordance with this item shall be paid for at the lump sum price bid for all “Utility Line Plugging”.

- 1 3) The price bid shall include:
 - 2 a) Furnishing and installing all utility line pressure plugs
 - 3 b) Furnishing and installing all utility line abandonment plugs
 - 4 c) Ductile iron fittings (for pressure plugs)
 - 5 d) Gaskets (for pressure plugs)
 - 6 e) Nuts and bolts (for pressure plugs)
 - 7 f) Pavement removal
 - 8 g) Excavation
 - 9 h) Hauling
 - 10 i) Disposal of excess material
 - 11 j) Furnishing, placement, and compaction of embedment
 - 12 k) Furnishing, placement, and compaction of backfill
 - 13 l) Disinfection (for pressure plugs)
 - 14 m) Testing (for pressure plugs)
 - 15 n) CLSM (for abandonment plugs)
 - 16 o) Clean-up
- 17 g. Utility Junction Structure Removal
 - 18 1) Measurement
 - 19 a) Measured per each junction structure to be removed.
 - 20 2) Payment
 - 21 a) The work performed and materials furnished in accordance with this
 - 22 item and measured as provided under “Measurement” will be paid for
 - 23 at the unit price bid per each “Remove Utility Junction Structure”.
 - 24 3) The price bid shall include:
 - 25 a) Disposal of sewage (as required)
 - 26 b) Removal and disposal of junction structure
 - 27 c) Removal and disposal of frames and covers
 - 28 d) Removal and disposal of hatches
 - 29 e) Cutting and plugging of existing utility lines
 - 30 f) Pavement removal
 - 31 g) Excavation
 - 32 h) Hauling
 - 33 i) Disposal of excess materials
 - 34 j) Furnishing, placement, and compaction of backfill
 - 35 k) Surface restoration
 - 36 l) Clean-up
- 37 2. Water Specific Items
 - 38 a. Water Valve Removal
 - 39 1) Measurement
 - 40 a) Measured per each water valve to be removed.
 - 41 2) Payment
 - 42 a) The work performed and materials furnished in accordance with this
 - 43 item and measured as provided under “Measurement” will be paid for
 - 44 at the unit price bid per each “Remove Water Valve” for:
 - 45 (1) Various sizes.
 - 46 3) The price bid shall include:
 - 47 a) Removal and disposal of valve
 - 48 b) Removal and disposal of valve box
 - 49 c) Removal and disposal of water sampling station (if required)

- 1 d) Removal and disposal of water manhole, frame, cover, and grade rings
- 2 (if required)
- 3 e) CLSM
- 4 f) Pavement removal
- 5 g) Excavation
- 6 h) Hauling
- 7 i) Disposal of excess materials
- 8 j) Furnishing, placement, and compaction of backfill
- 9 k) Clean-up
- 10 b. Water Valve Removal and Salvage
- 11 1) Measurement
- 12 a) Measured per each water valve to be removed and salvaged.
- 13 2) Payment
- 14 a) The work performed and materials furnished in accordance with this
- 15 item and measured as provided under "Measurement" will be paid for
- 16 at the unit price bid per each "Salvage Water Valve" for:
- 17 (1) Various sizes.
- 18 3) The price bid shall include:
- 19 a) Removal and salvage of valve
- 20 b) Removal and disposal of valve box
- 21 c) Removal and disposal of water sampling station (if required)
- 22 d) Removal and disposal of water manhole, frame, cover, and grade rings
- 23 (if required)
- 24 e) CLSM
- 25 f) Delivery to City
- 26 g) Pavement removal
- 27 h) Excavation
- 28 i) Hauling
- 29 j) Disposal of excess materials
- 30 k) Furnishing, placement, and compaction of backfill
- 31 l) Clean-up
- 32 c. Water Valve Abandonment
- 33 1) Measurement
- 34 a) Measured per each water valve to be abandoned.
- 35 2) Payment
- 36 a) The work performed and materials furnished in accordance with this
- 37 item and measured as provided under "Measurement" will be paid for
- 38 at the unit price bid per each "Abandon Water Valve" for:
- 39 (1) Various sizes.
- 40 3) The price bid shall include:
- 41 a) Abandonment of valve
- 42 b) Removal and disposal of valve box
- 43 c) Removal and disposal of water sampling station (if required)
- 44 d) CLSM
- 45 e) Pavement removal
- 46 f) Excavation
- 47 g) Hauling
- 48 h) Disposal of excess materials
- 49 i) Furnishing, placement, and compaction of backfill

- 1 j) Clean-up
- 2 d. Fire Hydrant Removal and Salvage
- 3 1) Measurement
- 4 a) Measured per each fire hydrant to be removed and salvaged.
- 5 2) Payment
- 6 a) The work performed and materials furnished in accordance with this
- 7 item and measured as provided under “Measurement” will be paid for
- 8 at the unit price bid per each “Salvage Fire Hydrant”.
- 9 3) The price bid shall include:
- 10 a) Removal of fire hydrant
- 11 b) Salvage of fire hydrant (if required)
- 12 c) Delivery to City (if required)
- 13 d) Disposal of fire hydrant (if required)
- 14 e) Pavement removal
- 15 f) Excavation
- 16 g) Hauling
- 17 h) Disposal of excess materials
- 18 i) Furnishing, placement, and compaction of backfill
- 19 j) Clean-up
- 20 e. Water Meter Removal and Salvage
- 21 1) Measurement
- 22 a) Measured per each water meter to be removed and salvaged.
- 23 2) Payment
- 24 a) The work performed and materials furnished in accordance with this
- 25 item and measured as provided under “Measurement” shall be paid for
- 26 at the unit price bid per each “Salvage Water Meter”.
- 27 3) The price bid shall include:
- 28 a) Coordination with City for City performed disconnection, removal, and
- 29 salvage of water meter
- 30 b) Removal of existing water meter box
- 31 c) Salvage of existing water meter lid and delivery to City
- 32 d) Pavement removal
- 33 e) Excavation
- 34 f) Hauling
- 35 g) Disposal of excess materials
- 36 h) Furnishing, placement, and compaction of backfill
- 37 i) Clean-up
- 38 f. Concrete Water Vault Removal
- 39 1) Measurement
- 40 a) Measured per each junction structure to be removed.
- 41 2) Payment
- 42 a) The work performed and materials furnished in accordance with this
- 43 item and measured as provided under “Measurement” will be paid for
- 44 at the unit price bid per each “Remove Concrete Water Vault”.
- 45 3) The price bid shall include:
- 46 a) Coordination with City for City performed disconnection, removal, and
- 47 salvage of water meter (if applicable)
- 48 b) Removal, salvage, and delivery of valves/meters to City (if applicable)

- 1 c) Removal and disposal of all piping, fittings, and other appurtenances (if
- 2 applicable)
- 3 d) Removal and disposal of manhole
- 4 e) Removal and disposal of vault
- 5 f) Removal and disposal of hatches
- 6 g) Cutting and plugging of existing utility lines
- 7 h) Pavement removal
- 8 i) Excavation
- 9 j) Hauling
- 10 k) Disposal of excess materials
- 11 l) Furnishing, placement, and compaction of backfill
- 12 m) Surface restoration
- 13 n) Clean-up
- 14 g. Cathodic Test Station Abandonment
- 15 1) Measurement
- 16 a) Measured per each cathodic test station to be abandoned.
- 17 2) Payment
- 18 a) The work performed and materials furnished in accordance with this
- 19 item and measured as provided under "Measurement" shall be paid for
- 20 at the unit price bid per each "Abandon Cathodic Test Station".
- 21 3) The price bid shall include:
- 22 a) Abandon cathodic test station
- 23 b) CLSM
- 24 c) Pavement removal
- 25 d) Excavation
- 26 e) Hauling
- 27 f) Disposal of excess materials
- 28 g) Furnishing, placement, and compaction of backfill
- 29 h) Clean-up
- 30 3. Stormwater Specific Items
- 31 a. Stormwater Inlet Removal
- 32 1) Measurement
- 33 a) Measured per each stormwater inlet to be removed.
- 34 2) Payment
- 35 a) The work performed and materials furnished in accordance with this
- 36 item and measured as provided under "Measurement" shall be paid for
- 37 at the unit price bid per each "Remove Storm Inlet".
- 38 3) The price bid shall include:
- 39 a) Removal and disposal of inlet
- 40 b) Pavement removal
- 41 c) Excavation
- 42 d) Hauling
- 43 e) Disposal of excess materials
- 44 f) Furnishing, placement, and compaction of backfill
- 45 g) Clean-up
- 46 b. Headwall/SET Removal
- 47 1) Measurement
- 48 a) Measured per each headwall or safety end treatment (SET) to be
- 49 removed.

- 1 2) Payment
- 2 a) The work performed and materials furnished in accordance with this
- 3 item and measured as provided under “Measurement” shall be paid for
- 4 at the unit price bid per each “Remove Headwall/SET”.
- 5 3) The price bid shall include:
- 6 a) Removal and disposal of Headwall/SET
- 7 b) Pavement removal
- 8 c) Excavation
- 9 d) Hauling
- 10 e) Disposal of excess materials
- 11 f) Furnishing, placement, and compaction of backfill
- 12 g) Clean-up
- 13 c. Trench Drain Removal
- 14 1) Measurement
- 15 a) Measured horizontally along the ground surface of existing trench drain
- 16 to be removed.
- 17 2) Payment
- 18 a) The work performed and materials furnished in accordance with this
- 19 item and measured as provided under “Measurement” shall be paid for
- 20 at the unit price bid per linear foot of “Remove Trench Drain”.
- 21 3) The price bid shall include:
- 22 a) Removal and disposal of trench drain
- 23 b) Pavement removal
- 24 c) Excavation
- 25 d) Hauling
- 26 e) Disposal of excess materials
- 27 f) Furnishing, placement, and compaction of backfill
- 28 g) Clean-up

29 **1.3 REFERENCES**

30 A. Abbreviations

- 31 1. CLSM – Controlled Low Strength Material

32 B. Definitions

- 33 1. Pressure Plug – Plugging of an existing pressurized pipeline to remain in service
- 34 with fitting, blind flange, or welded plug, as applicable.
- 35 2. Abandonment Plug – Plugging of an existing gravity or pressurized pipeline to be
- 36 abandoned with CLSM.

37 **1.4 ADMINISTRATIVE REQUIREMENTS**

38 A. Coordination

- 39 1. Contact Project Manager and Water Utilities for coordination of salvaged material
- 40 return.

41 **1.5 SUBMITTALS**

- 42 A. Submittals shall be in accordance with Section 01 33 00.

- 43 B. All submittals shall be approved by the City prior to delivery.

1 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

2 A. Special Procedure Submittals

- 3 1. Utility Abandonment by Grout Fill Plan:
4 a. Grout fill narrative
5 b. Grout port locations
6 c. Calculations demonstrating proposed volume of grout

7 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

8 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

9 **1.9 QUALITY ASSURANCE [NOT USED]**

10 **1.10 DELIVERY, STORAGE, AND HANDLING**

11 A. Delivery and Acceptance Requirements

- 12 1. Protect and salvage all materials such that no damage occurs during delivery to
13 City.

14 **1.11 FIELD CONDITIONS [NOT USED]**

15 **1.12 WARRANTY [NOT USED]**

16 **PART 2 - PRODUCTS [NOT USED]**

17 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

18 **2.2 MATERIALS [NOT USED]**

19 **2.3 ACCESSORIES [NOT USED]**

20 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

21 **PART 3 - EXECUTION**

22 **3.1 INSTALLERS [NOT USED]**

23 **3.2 EXAMINATION [NOT USED]**

24 **3.3 PREPARATION**

- 25 A. Coordinate with Water Utilities prior to abandonment of existing water or sanitary
26 sewer lines to determine whether all existing services have been removed.

27 **3.4 REMOVAL, SALVAGE, AND ABANDONMENT**

28 A. General Utility Items

- 29 1. Utility Line Abandonment by Grout Fill
30 a. Excavate and backfill in accordance with Section 33 05 05.
31 b. Dewater existing line to be grouted.
32 c. Dispose of any sewage from existing line to be grouted for sanitary sewer lines.

- 1 d. Fill line with Low Density Cellular Grout in accordance with Section 33 05 15
- 2 or CLSM in accordance with Section 03 34 13.
- 3 e. Dispose of any excess material.
- 4 2. Utility Line Removal, Separate Trench
- 5 a. Excavate and backfill in accordance with Section 33 05 05.
- 6 b. Dewater existing line to be removed.
- 7 c. Dispose of any sewage from existing line to be removed for sanitary sewer
- 8 lines.
- 9 d. Cut any service, lateral, or main connections prior to removal.
- 10 e. Remove existing utility line and properly dispose of as approved by City.
- 11 3. Utility Manhole Abandonment
- 12 a. Excavate and backfill in accordance with Section 33 05 05.
- 13 b. Remove and dispose of existing frame, cover, grade rings, and manhole cone
- 14 section.
- 15 c. Cut and plug existing service, lateral, and main lines with 2000 psi concrete in
- 16 accordance with Section 03 30 00.
- 17 d. Backfill manhole with utility sand in accordance with Section 33 05 05.
- 18 4. Utility Manhole Removal
- 19 a. Excavate and backfill in accordance with Section 33 05 05.
- 20 b. Remove and dispose of existing frame, cover, and grade rings.
- 21 c. Dispose of any sewage from existing manhole for sanitary sewer manholes.
- 22 d. Demolish and remove entire concrete manhole.
- 23 e. Plug existing service, lateral, and main lines with abandonment plugs.
- 24 5. Plugging of Utility Lines
- 25 a. Water Line Pressure Plugs
- 26 1) Ductile Iron and PVC C900 Water Lines
- 27 a) Excavate, embed, and backfill in accordance with Section 33 05 05.
- 28 b) Plug line with MJ Plug with mechanical restraint and blocking in
- 29 accordance with Section 33 14 10.
- 30 2) Concrete Pressure Pipe, Bar Wrapped, Steel Cylinder Type Water Lines
- 31 a) Excavate, embed, and backfill in accordance with Section 33 05 05.
- 32 b) Plug line using:
- 33 (1) Fabricated plug restrained by welding in accordance with Section
- 34 33 14 12; or
- 35 (2) Blind flange in accordance with Section 33 14 12.
- 36 3) Buried Steel Water Lines
- 37 a) Excavate, embed, and backfill in accordance with Section 33 05 05.
- 38 b) Plug line using:
- 39 (1) Fabricated plug restrained by welding in accordance with Section
- 40 33 14 13; or
- 41 (2) Blind flange in accordance with Section 33 14 13.
- 42 b. Utility Line Abandonment Plugs
- 43 1) Excavate and backfill in accordance with Section 33 05 05.
- 44 2) Dispose of any sewage for sanitary sewer lines.
- 45 3) Install bulkhead sufficient to retain CLSM plug before it has cured.
- 46 4) Backfill trench adjacent to pipe plug with CLSM to top of pipe.
- 47 5) Plug minimum 2 feet of existing pipe with CLSM in accordance with
- 48 Section 03 34 14.

- 1 a) Pressure plugs may be used for water line abandonment plugs as an
2 acceptable alternative.
- 3 6. Utility Junction Structure Removal
- 4 a. Excavate and backfill in accordance with Section 33 05 05.
- 5 b. Remove and dispose of existing frame, cover, hatch, and grade rings.
- 6 c. Dispose of any sewage from existing manhole for sanitary sewer manholes.
- 7 d. Demolish and remove entire concrete structure.
- 8 e. Plug existing service, lateral, and main lines with abandonment plugs.
- 9 B. Water Items
- 10 1. Water Valve Removal
- 11 a. Excavate and backfill in accordance with Section 33 05 05.
- 12 b. Remove and dispose of valve box.
- 13 c. Remove and dispose of valve bonnet, wedge, and stem.
- 14 d. Fill valve body with CLSM in accordance with Section 03 34 13.
- 15 2. Water Valve Removal and Salvage
- 16 a. Excavate and backfill in accordance with Section 33 05 05.
- 17 b. Remove and dispose of valve box.
- 18 c. Remove valve bonnet, wedge, and stem, and deliver to the City as directed by
19 City Inspector.
- 20 d. Protect salvaged materials from damage.
- 21 e. Fill valve body with CLSM in accordance with Section 03 34 13.
- 22 3. Water Valve Abandonment
- 23 a. Excavate and backfill in accordance with Section 33 05 05.
- 24 b. Remove the top 2 feet of the valve stack and any valve extensions.
- 25 c. Fill the remaining valve stack with CLSM in accordance with Section 03 34 13.
- 26 4. Fire Hydrant Removal and Salvage
- 27 a. Excavate and backfill in accordance with Section 33 05 05.
- 28 b. Remove fire hydrant.
- 29 c. Install abandonment plug on fire hydrant lead line.
- 30 d. Deliver salvaged fire hydrant to the City as directed by City.
- 31 e. Protect salvaged materials from damage.
- 32 5. Water Meter Removal and Salvage
- 33 a. Coordinate with City to have City remove and salvage water meter.
- 34 1) Contractor shall not remove water meter.
- 35 b. Remove and dispose of curb stop, and meter boxes.
- 36 c. Remove and salvage meter box lid and deliver to City as directed by City
37 Inspector.
- 38 d. Crimp abandoned service lines.
- 39 e. Backfill in accordance with Section 33 05 05.
- 40 6. Concrete Water Vault Removal
- 41 a. Excavate and backfill in accordance with Section 33 05 05.
- 42 b. Coordinate with City to have City remove and salvage water meter if
43 applicable.
- 44 1) Contractor shall not remove water meter.
- 45 c. Remove and salvage valve, if applicable.
- 46 d. Remove and salvage vault lid.
- 47 e. Remove and salvage test stations.

- 1 f. Protect salvaged materials from damage.
- 2 g. Remove and dispose of piping and other appurtenances.
- 3 h. Deliver salvaged material to City as directed by City Inspector.
- 4 i. Demolish and remove entire concrete water vault.
- 5 j. Plug existing service and main lines with abandonment plugs.
- 6 k. Dispose of excess materials.
- 7 7. Cathodic Test Station Abandonment
- 8 a. Excavate and backfill in accordance with Section 33 05 05.
- 9 b. Remove top 2 feet of the cathodic test station stack and contents.
- 10 c. Fill any remaining voids with CLSM in accordance with Section 03 34 13.

11 C. Stormwater Items

- 12 1. Stormwater Inlet Removal
- 13 a. Excavate and backfill in accordance with Section 33 05 05.
- 14 b. Demolish and remove entire concrete inlet.
- 15 c. Plug existing lateral and main lines with abandonment plugs.
- 16 2. Headwall/SET Removal
- 17 a. Excavate and backfill in accordance with Section 33 05 05.
- 18 b. Demolish and remove concrete headwall/SET.
- 19 c. Plug existing lateral and main lines with abandonment plugs.
- 20 3. Trench Drain Removal
- 21 a. Excavate and backfill in accordance with Section 33 05 05.
- 22 b. Remove and dispose of existing pipe.

- 23 **3.5 REPAIR [NOT USED]**
- 24 **3.6 RE-INSTALLATION [NOT USED]**
- 25 **3.7 FIELD QUALITY CONTROL [NOT USED]**
- 26 **3.8 SYSTEM STARTUP [NOT USED]**
- 27 **3.9 ADJUSTING [NOT USED]**
- 28 **3.10 CLEANING [NOT USED]**
- 29 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 30 **3.12 PROTECTION [NOT USED]**
- 31 **3.13 MAINTENANCE [NOT USED]**
- 32 **3.14 ATTACHMENTS [NOT USED]**

33 **END OF SECTION**

34

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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1

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard for “Remove Concrete Pavement.”
- c. The price bid shall include:
 - 1) Sawing and breaking the material
 - 2) Removal of monolithic concrete curb and concrete pavement
 - 3) Loading
 - 4) Unloading
 - 5) Storing
 - 6) Hauling
 - 7) Salvaging or disposing
 - 8) Repair adjacent pavement damaged by the removal of concrete
2. Remove Concrete Curb and Gutter
 - a. Measurement
 - 1) Measured per linear foot of “Remove Curb and Gutter.”
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Remove Curb and Gutter.”
 - c. The price bid shall include:
 - 1) Sawing and breaking the material
 - 2) Removal of concrete curb and gutter
 - 3) Cleaning
 - 4) Loading
 - 5) Unloading
 - 6) Storing
 - 7) Hauling
 - 8) Salvaging or disposing
 - 9) Repair adjacent pavement and curb and gutter damaged by the removal of curb and gutter
3. Remove Concrete Valley Gutter
 - a. Measurement
 - 1) Measured per square yard of “Remove Concrete Valley Gutter.”
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard for “Remove Concrete Valley Gutter.”
 - c. The price bid shall include:
 - 1) Sawing and breaking the material
 - 2) Removal of concrete valley gutter
 - 3) Cleaning
 - 4) Loading
 - 5) Unloading
 - 6) Storing
 - 7) Hauling
 - 8) Salvaging or disposing
 - 9) Repair adjacent pavement damaged by the removal of concrete valley gutter

- 1 4. Remove Sidewalk
- 2 a. Measurement
- 3 1) Measured per square foot of “Remove Sidewalk.”
- 4 b. Payment
- 5 1) The work performed and materials furnished in accordance with this item
- 6 and measured as provided under “Measurement” will be paid for at the unit
- 7 price bid per square foot for “Remove Sidewalk.”
- 8 c. The price bid shall include:
- 9 1) The removal of integral sidewalk walls
- 10 2) The removal of landscape walls adjacent to sidewalk less than 3 feet in
- 11 height
- 12 3) Sawing and breaking the material
- 13 4) Cleaning
- 14 5) Loading
- 15 6) Unloading
- 16 7) Storing
- 17 8) Hauling
- 18 9) Salvaging or disposing
- 19 10) Repair to adjacent curb or curb and gutter damaged by the removal of
- 20 sidewalk
- 21 5. Remove Curb Ramp
- 22 a. Measurement
- 23 1) Measured per each of “Remove Curb Ramp.”
- 24 b. Payment
- 25 1) The work performed and materials furnished in accordance with this item
- 26 and measured as provided under “Measurement” will be paid for at the unit
- 27 price bid per each for “Remove Curb Ramp” for:
- 28 a) Various types.
- 29 c. The price bid shall include:
- 30 1) Removal of curb ramp, curb ramp curbs, flares, and detectable warning tiles
- 31 2) Sawing and breaking the material
- 32 3) Loading
- 33 4) Unloading
- 34 5) Storing
- 35 6) Hauling
- 36 7) Salvaging or disposing
- 37 8) Repair to adjacent curb, curb and gutter, or sidewalk damaged by the
- 38 removal of curb ramp
- 39 6. Remove Asphalt Pavement
- 40 a. Measurement
- 41 1) Measured per square yard from gutter edge to gutter edge or edge to edge
- 42 of existing asphalt pavement for all thicknesses.
- 43 b. Payment
- 44 1) The work performed and materials furnished in accordance with this item
- 45 and measured as provided under “Measurement” will be paid for at the unit
- 46 price bid per square yard for “Remove Asphalt Pavement.”
- 47 c. The price bid shall include:
- 48 1) Sawing

- 1 2) Breaking the material
- 2 3) Removal of asphalt pavement
- 3 4) Loading
- 4 5) Unloading
- 5 6) Storing
- 6 7) Hauling
- 7 8) Salvaging or disposing
- 8 9) Repair adjacent pavement damaged by the removal of asphalt
- 9 7. Remove Driveway
- 10 a. Measurement
- 11 1) Measured per square foot of "Remove Driveway."
- 12 b. Payment
- 13 1) The work performed and materials furnished in accordance with this item
- 14 and measured as provided under "Measurement" will be paid for at the unit
- 15 price bid per square foot for "Remove Driveway" for:
- 16 a) Various pavement types (gravel, concrete, asphalt, pavers).
- 17 c. The price bid shall include:
- 18 1) Sawing
- 19 2) Breaking the material
- 20 3) Removal of driveway material
- 21 4) Loading
- 22 5) Unloading
- 23 6) Storing
- 24 7) Hauling
- 25 8) Salvaging or disposing
- 26 9) Repair adjacent pavement damaged by the removal of the driveway
- 27 8. Remove Brick Pavers
- 28 a. Measurement
- 29 1) Measured per square foot of "Remove Brick Pavers."
- 30 b. Payment
- 31 1) The work performed and materials furnished in accordance with this item
- 32 and measured as provided under "Measurement" will be paid for at the unit
- 33 price bid per square foot for "Remove Brick Pavers."
- 34 c. The price bid shall include:
- 35 1) Full-depth removal of bricks and any brick base material to existing
- 36 subgrade.
- 37 2) Sawing
- 38 3) Breaking the material
- 39 4) Removal of brick pavers
- 40 5) Cleaning
- 41 6) Loading
- 42 7) Unloading
- 43 8) Storing
- 44 9) Hauling
- 45 10) Disposal
- 46 11) Salvage and delivery to City, if required
- 47 12) Repair adjacent pavement damaged by the removal of bricks
- 48 9. Remove Permeable Pavers

- 1 a. Measurement
2 1) Measured per square foot of “Remove Permeable Pavers.”
3 b. Payment
4 1) The work performed and materials furnished in accordance with this item
5 and measured as provided under “Measurement” will be paid for at the unit
6 price bid per square foot for “Remove Permeable Pavers.”
7 c. The price bid shall include:
8 1) Full-depth removal of any permeable pavers and paver base material to
9 existing subgrade or compacted soil.
10 2) Sawing
11 3) Breaking the material
12 4) Removal of permeable pavers
13 5) Cleaning
14 6) Loading
15 7) Unloading
16 8) Storing
17 9) Hauling
18 10) Disposal
19 11) Salvage and delivery to City, if required
20 12) Repair adjacent pavement damaged by the removal of permeable pavers
21 10. Wedge Milling
22 a. Measurement
23 1) Measured per square yard of “Wedge Milling.”
24 b. Payment
25 1) The work performed and materials furnished in accordance with this item
26 and measured as provided under “Measurement” will be paid for at the unit
27 price bid per square yard for “Wedge Milling.”
28 c. The price bid shall include:
29 1) Milling
30 2) Rolling
31 3) Sweeping and cleaning remaining pavement
32 4) Cleaning
33 5) Surface treatments as specified in the Drawings
34 6) Loading
35 7) Unloading
36 8) Storing
37 9) Hauling
38 10) Salvaging or disposing
39 11) Repair to adjacent pavement damaged by wedge milling
40 11. Surface Milling
41 a. Measurement
42 1) Measured square yard of “Surface Milling.”
43 b. Payment
44 1) The work performed and materials furnished in accordance with this item
45 and measured as provided under “Measurement” will be paid for at the unit
46 price bid per square yard for “Surface Milling.”
47 c. The price bid shall include:
48 1) Milling

- 1 2) Rolling
- 2 3) Sweeping and cleaning remaining pavement
- 3 4) Cleaning
- 4 5) Surface treatments as specified in the Drawings
- 5 6) Loading
- 6 7) Unloading
- 7 8) Storing
- 8 9) Hauling
- 9 10) Salvaging or disposing
- 10 11) Repair to adjacent pavement damaged by surface milling
- 11 12. Butt Joint Milling
- 12 a. Measurement
- 13 1) Measured per linear foot of "Butt Milling."
- 14 b. Payment
- 15 1) The work performed and materials furnished in accordance with this item
- 16 and measured as provided under "Measurement" will be paid for at the unit
- 17 price bid per linear feet for "Butt Milling."
- 18 c. The price bid shall include:
- 19 1) Milling
- 20 2) Rolling
- 21 3) Sweeping and cleaning remaining pavement
- 22 4) Cleaning
- 23 5) Surface treatments as specified in the Drawings
- 24 6) Loading
- 25 7) Unloading
- 26 8) Storing
- 27 9) Hauling
- 28 10) Salvaging or disposing
- 29 11) Repair to adjacent pavement damaged by butt milling
- 30 13. Pavement Pulverization
- 31 a. Measurement
- 32 1) Measured per square yard of "Pavement Pulverization."
- 33 b. Payment
- 34 1) The work performed and materials furnished in accordance with this item
- 35 and measured as provided under "Measurement" will be paid for at the unit
- 36 price bid per square yard for "Pavement Pulverization."
- 37 c. The price bid shall include:
- 38 1) Pulverization
- 39 2) Base undercutting
- 40 3) Mixing and compaction
- 41 4) Surface treatments as specified in the Drawings
- 42 5) Sweeping and cleaning remaining pavement
- 43 6) Temporary removal and stockpiling of pulverized material
- 44 7) Loading
- 45 8) Unloading
- 46 9) Storing
- 47 10) Hauling
- 48 11) Salvaging or disposing

- 1 12) Repair to adjacent pavement damaged by pavement pulverization
2 14. Obliterate Abandoned Road
3 a. Measurement
4 1) Measured per square yard of “Obliterate Abandoned Road.”
5 b. Payment
6 1) The work performed and materials furnished in accordance with this item
7 and measured as provided under “Measurement” will be paid for at the unit
8 price bid per square yard for “Obliterate Abandoned Road.”
9 c. The price bid shall include:
10 1) Salvaging and replacing topsoil
11 2) Furnishing and installing any new topsoil
12 3) Removal of abandoned structures within the roadway
13 4) Scarifying, mixing, and shaping abandoned roadway
14 5) Sodding
15 6) Removal of any material or items specified under Obliterate
16 7) Loading
17 8) Unloading
18 9) Storing
19 10) Hauling
20 11) Salvaging or disposing
21 12) Clean-up
22 15. Pavement Removal for Utility Trenching
23 a. Measurement
24 1) This item is considered subsidiary to the installation of water, wastewater,
25 or stormwater piping.
26 b. Payment
27 1) The work performed and materials furnished in accordance with this item
28 are subsidiary to the unit price bid per linear foot of water, wastewater, or
29 stormwater piping installed.

30 1.3 REFERENCES

- 31 A. Abbreviations
32 1. HMA – Hot-mix Asphalt
33 B. Reference Standards
34 1. Reference standards cited in this Section refer to the current reference standard
35 published at the time of the latest revision date logged at the end of this Section
36 unless a date is specifically cited.
37 2. Texas Manual on Uniform Traffic Control Devices (TMUTCD).

38 1.4 ADMINISTRATIVE REQUIREMENTS

- 39 A. Sequencing
40 1. Sidewalk Construction
41 a. Where existing sidewalks are to be closed during Paving Removal activities:
42 1) Utilize pedestrian/sidewalk detour route specified in the Drawings
43 a) If no detour route is provided, submit a pedestrian/sidewalk detour
44 route that has been signed and sealed by a registered professional
45 engineer to the City for review.

- 1 b. The pedestrian/sidewalk detour route will be subsidiary to pertinent Traffic
- 2 Control items included with the project.
- 3 c. Install all sidewalk detours and closures in accordance with the TMUTCD,
- 4 State, and local guidelines.
- 5 d. Provide any traffic control devices in accordance with Section 34 71 13.
- 6 2. Pavement Removal
- 7 a. Install traffic control devices prior to removal of pavement per the Drawings.
- 8 b. If no traffic control plan is provided, submit a traffic control plan that has been
- 9 signed and sealed by a registered professional engineer to the City for review.
- 10 B. Pre-removal Meeting
- 11 1. Hold a preinstallation meeting prior to performing any tasks included under Paving
- 12 Removal. Invite the City and appropriate representatives. The following items will
- 13 be reviewed and discussed at the meeting:
- 14 a. All removal limits for any pavement to be removed
- 15 b. Concrete paving removal method

16 **1.5 SUBMITTALS**

- 17 A. Submittals shall be in accordance with Section 01 33 00.
- 18 B. All submittals shall be approved by the City prior to delivery.

19 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 20 A. Informational Submittal:
- 21 1. Equipment Information
- 22 a. Submittal for all major equipment to include:
- 23 1) Equipment name
- 24 2) Size
- 25 3) Intended use

26 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

27 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

28 **1.9 QUALITY ASSURANCE [NOT USED]**

29 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

30 **1.11 FIELD CONDITIONS [NOT USED]**

31 **1.12 WARRANTY [NOT USED]**

32 **PART 2 - PRODUCTS [NOT USED]**

33 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

34 **2.2 MATERIALS [NOT USED]**

35 **2.3 ACCESSORIES [NOT USED]**

36 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION**

5 A. Site Preparation

- 6 1. Mark all pavement removal limits prior to construction.
- 7 2. City will review and provide direction to Contractor, regarding proposed limits
8 prior to saw cutting, milling, or any other pavement removal activities.
- 9 3. For maintenance projects, the City will mark the limits of Paving Removal prior to
10 construction.

11 **3.4 PAVEMENT REMOVAL**

12 A. Sawing

- 13 1. Full-depth saw cut all pavement to be removed.
- 14 2. Make a clean, smooth cut producing a groove 1/8 inch to 1/4 inch wide and full
15 depth.
- 16 3. Any saw cut wider than 1/4 inch will not be accepted.
- 17 4. Re-saw pavement edge after pavement is removed as many times as necessary to
18 provide a smooth, neat, straight pavement edge free from chips or gouges.
19 Contractor to re-saw a minimum of one time.
- 20 5. If a saw cut falls within 5 feet of an existing joint, pavement edge, or edge of gutter,
21 remove paving to the nearest joint, pavement edge, or gutter edge.
- 22 6. Minimize dust and residue from entering the atmosphere by using water, vacuums,
23 or other approved dust reducing measures.
- 24 7. Utilize erosion control measures to prevent dust and residue from entering the
25 storm drain system in accordance with Section 31 25 14.
- 26 8. Use care to prevent fracturing or spalling of adjacent existing pavement. Repair any
27 damage done to the existing pavement due to saw cutting or pavement removal in
28 accordance with Sections 32 01 17 or 32 01 29 at no cost to the City.

29 B. Remove Concrete Paving

- 30 1. Saw Cut
- 31 a. In accordance with this Section.
- 32 2. Minimum Limits of Removal
- 33 a. Parallel to the Centerline
- 34 1) Minimum cut along street path is:
 - 35 a) 5 feet in total length
 - 36 b) 1 foot from the edge of the trench
- 37 b. Perpendicular to the Center Line – Multiple Lanes
- 38 1) Remove full panel of one lane width if trench or repairs are contained
39 within the lane.
- 40 2) For locations where two or more lanes are affected, remove the full width
41 of affected lanes.

- 1 3) Maintain minimum gutter width of 2 feet from back of curb at all times.
2 c. Perpendicular to the Center Line – Single Lane
3 1) General:
4 a) 1 foot from the edge of the trench
5 b) Minimum gutter width is 2 feet from back of curb.
6 c) Remove curb if trench edge or repair is closer than 2 feet from back of
7 curb.
8 2) Concrete alley or residential street less than 30 feet wide:
9 a) Remove pavement from centerline to back of curb. Curb will be
10 considered subsidiary to removal of pavement.
11 3) Concrete alley or residential street greater than 30 feet wide:
12 a) Maintain a minimum of 10 feet from center line or gutter to trench edge
13 or repair.
14 b) Remove pavement starting at the centerline if trench edge or repair is
15 less than 10 feet from centerline.
16 c) If the trench edge or repair is within 10 feet of the back of curb, remove
17 pavement from trench edge or repair to back of curb. Curb will be
18 considered subsidiary to removal of pavement.
19 3. Construction
20 a. A drop hammer or guillotine-style concrete breaker is not allowed without prior
21 approval by City.
22 b. Pavement removal method to be discussed and approved by City during the
23 pre-removal Meeting.
24 c. Preferred method:
25 1) Saw cut sections of the concrete pavement.
26 2) Vertically lift concrete pavement section in whole pieces in a way that does
27 not damage existing features.
28 d. If pavement can't be removed utilizing the preferred method, utilize a
29 jackhammer to break-up concrete and remove using a front-end loader or
30 backhoe.
31 C. Remove Concrete Curb and Gutter
32 1. Saw Cut
33 a. In accordance with this Section
34 2. Minimum Limits of Removal
35 a. Minimum width of 2-feet from back of curb
36 b. Minimum length of 30-inches
37 c. Removal shall be to the nearest construction joint (not necessarily centered on
38 the trench)
39 D. Remove Concrete Valley Gutter
40 1. Saw Cut
41 a. In accordance with this Section
42 2. Minimum Limits of Removal
43 a. Minimum width of 5 feet
44 b. Remove from gutter edge to gutter edge or from centerline to gutter edge
45 c. Remove concrete in accordance with Remove Concrete Paving
46 E. Remove Sidewalk and Curb Ramp

- 1 1. Saw Cut
- 2 a. In accordance with Sawing
- 3 2. Minimum Limits of Sidewalk Removal
- 4 a. Minimum sidewalk removal width and length of 5 feet
- 5 b. Remove to the nearest sidewalk joint if nearest sidewalk joint is within 3 feet of
- 6 specified removal limits.
- 7 c. Remove to the edge of sidewalk if the edge of sidewalk is within 5 feet of
- 8 specified removal limits.
- 9 d. Remove curb ramp to the nearest joint. Do not saw cut and leave in place any
- 10 portion of the existing curb ramp unless specified in the Drawings.
- 11 F. Remove Asphalt Paving
- 12 1. Saw Cut
- 13 a. In accordance with this Section
- 14 b. Protect asphalt edges to prevent spalling or damage.
- 15 c. If damage or spalling occurs, obtain direction from the City for repairs, if
- 16 necessary.
- 17 2. Minimum Limits of Removal
- 18 a. Parallel to the Centerline
- 19 1) Minimum cut along the street path is:
- 20 a) 5 feet in total length
- 21 b) 1 foot from the edge of the trench if the trench width is wider than 5
- 22 feet
- 23 b. Perpendicular to the Center Line – Multiple Lanes
- 24 1) If the trench or repairs occur between the center line and the inside lane
- 25 line, remove the full lane width.
- 26 2) If the trench or repairs occur between the gutter edge and the outside lane,
- 27 remove from the lane line to the gutter edge.
- 28 3) If the trench or repairs occur between two lanes, remove half-lane-width to
- 29 half-lane-width.
- 30 c. Perpendicular to the Center Line – Single Lane
- 31 1) General:
- 32 a) 2 feet from the edge of the trench
- 33 b) Minimum width from repair to gutter edge is 10 feet.
- 34 c) Remove pavement to gutter edge if distance from trench or repair to
- 35 gutter edge is less than 10 feet
- 36 2) Concrete alley or residential street less than 30 feet wide:
- 37 a) Remove pavement from centerline to gutter edge.
- 38 3) Concrete alley or residential street greater than 30 feet wide:
- 39 a) Maintain a minimum of 10 feet from center line or gutter edge to trench
- 40 edge or repair.
- 41 b) Remove pavement starting at the center line if trench edge or repair is
- 42 less than 10 feet from centerline.
- 43 c) Remove pavement from trench edge or repair to gutter if distance from
- 44 trench edge or repair to the face of curb is less than 10 feet.
- 45 3. Construction
- 46 a. Utilize a milling machine to remove pavement where possible in accordance
- 47 with this Section.

- 1 b. Obtain approval prior to construction to utilize alternative equipment for
2 asphalt pavement removal.
- 3 G. Remove Driveway
- 4 1. Saw Cut
- 5 a. In accordance with this Section
- 6 2. Minimum Limits of Removal
- 7 a. If the driveway is concrete, remove to nearest driveway joint.
- 8 1) Only driveway joints required by City design standards are considered, and
9 existing patches will not be considered as joints.
- 10 H. Remove Brick Pavers and Permeable Pavers
- 11 1. Saw Cut
- 12 a. In accordance with Sawing
- 13 b. Saw cut 2 feet beyond the limits of the pavers if the adjacent pavement is
14 concrete or asphalt.
- 15 2. Remove pavers to the limits specified in the Drawings.
- 16 3. If salvaging pavers for re-use, remove, palletize and either deliver to specified
17 location in Drawings or stockpile for re-use on the Project.
- 18 I. Milling
- 19 1. General
- 20 a. Mill surfaces to the depth specified in the Drawings.
- 21 b. Milled surface should be rough. If necessary, grind or mill the surface again to
22 make the surface rough.
- 23 c. If the milled surface is going to be opened to traffic:
- 24 1) Install a temporary transition section.
- 25 2) An acceptable transition is 2 inches over 5 feet.
- 26 3) A different transition may be approved by City prior to opening the milled
27 surface to traffic.
- 28 d. Remove excess material and clean milled surfaces
- 29 e. Stockpiling of milled material will not be permitted within the right of way
30 unless otherwise approved by City.
- 31 2. Milling Equipment
- 32 a. Provide equipment that meets the following criteria.
- 33 1) Power operated milling machine capable of removing the specified
34 pavement thickness in maximum of two passes
- 35 2) Self-propelled with sufficient power, traction, and stability to maintain
36 accurate depth of cut and slope
- 37 3) Able to immediately remove material cut from the surface of the roadway
38 and discharge the cuttings into a truck utilizing an integral loading and
39 reclaiming system
- 40 4) Equipped with a dust control system
- 41 5) Equipped with a manual system that provides uniform varying depths of cut
42 while the machine is in motion.
- 43 3. Wedge and Surface Milling
- 44 a. Only used for roadway maintenance. Only utilized with prior approval by City
45 or as specified in Drawings.

- 1 b. Wedge Mill existing asphalt or concrete from the gutter edge at a minimum
- 2 depth of 2 inches and transition to match the existing pavement within a 5 foot
- 3 width.
- 4 c. Surface Mill existing asphalt to the depth specified on Drawings.
- 5 d. Provide a uniform milled surface free from gouges, ridges, oil film, and other
- 6 irregularities.
- 7 e. Wedge milling includes the portion of HMA pavement that covers the existing
- 8 concrete curb and gutter. This depth is estimated to vary from 2 inches to the
- 9 full height of the curb. This additional depth would be milled prior to milling
- 10 the minimum 2 inches previously specified.
- 11 f. Perform wedge or surface milling operations in a continuous manner for the
- 12 length specified in the Drawings.
- 13 4. Butt Joint Milling
- 14 a. Butt joint will be full width of overlay operation
- 15 b. Typical locations for butt joints are at the beginning and ending of streets where
- 16 asphalt paving is removed or where a street is being overlaid. Butt joints may
- 17 be required in other locations as specified in the Drawings.
- 18 c. Butt joints at a minimum of 20 feet wide (perpendicular to the center line) for
- 19 the width specified in the Drawings.
- 20 d. Taper the butt joint from 2 inches to 0 inches adjacent to existing pavement at
- 21 the start or end of the project limits or as specified in the Drawings.
- 22 e. Provide a temporary asphalt transition in accordance with this Section.
- 23 J. Pavement Pulverization
- 24 1. Pulverization
- 25 a. Pulverize the existing pavement to a depth of 8 inches. In accordance with
- 26 Section 32 11 33.
- 27 b. Temporarily remove and stockpile pulverized material.
- 28 c. After temporary removal, cut subgrade or base material down 2 inches.
- 29 2. Cement Application
- 30 a. Use 3.5 percent Portland cement
- 31 b. In accordance with Section 32 11 33.
- 32 3. Mixing
- 33 a. In accordance with Section 32 11 33
- 34 4. Compaction
- 35 a. In accordance with Section 32 11 33
- 36 5. Finishing
- 37 a. In accordance with Section 32 11 33
- 38 6. Curing
- 39 a. In accordance with Section 32 11 33
- 40 7. If the existing pavement has a combination of 10 inches of HMA pavement and
- 41 crushed stone or gravel
- 42 a. 2 inch cutting is not required
- 43 b. Pulverize existing pavement 2 inches deep
- 44 c. Temporarily remove and stockpile pulverized material
- 45 K. Obliterating Abandoned Roadway
- 46 1. Strip and windrow existing topsoil before shaping operations

- 1 2. Remove asphalt or concrete pavement in accordance with this Section.
- 2 3. Remove any abandoned structures within the roadway unless otherwise specified in
- 3 the Drawings.
- 4 4. Scarify and mix the abandoned roadbed with soil and blade to produce a smooth,
- 5 uniform appearance.
- 6 5. Fill, cut, and shape the abandoned road to blend into the surrounding terrain.
- 7 6. Eliminate or re-align existing ditches as appropriate to maintain positive drainage.
- 8 7. Cover disturbed areas with topsoil after shaping operations.
- 9 8. Install sod within the limits of disturbance after topsoil is installed.
- 10

1 L. Disposal, Salvaging, and Recycling Removed Pavement

- 2 1. Contractor is responsible for any material removed during Paving Removal
3 activities.
4 2. Dispose of all material in accordance with Federal, State, and local laws and
5 regulations.
6 3. The disposal, salvaging, and recycling of any material removed as part of Paving
7 Removal is considered subsidiary to the applicable items.
8 4. Contractor is encouraged, but not required, to salvage and recycle as much material
9 as possible. Any recycled material used on a City project shall be in accordance
10 with the requirements of the appropriate Section based on the intended use.

11 **3.5 REPAIR**

12 A. Repair the following items to remain if any damage is caused due to pavement removal
13 activities at no cost to the City:

- 14 1. Adjacent concrete or asphalt pavement
15 2. Adjacent sidewalk
16 3. Adjacent curb or curb and gutter
17 4. Subgrade or base material
18 5. Utility piping, structures, and appurtenances
19 6. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe
20 7. Landscape beds or planters
21 8. Sod
22 9. Decorative hardscape or landscape features
23 10. Decorative/stamped concrete
24 11. Sidewalk
25 12. Curb ramps
26 13. Traffic control signage
27 14. Pavement markings
28 15. Retaining walls

29 **3.6 RE-INSTALLATION [NOT USED]**

30 **3.7 SITE QUALITY CONTROL [NOT USED]**

31 **3.8 SYSTEM STARTUP [NOT USED]**

32 **3.9 ADJUSTING [NOT USED]**

33 **3.10 CLEANING [NOT USED]**

34 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

35 **3.12 PROTECTION [NOT USED]**

36

1 **3.13 MAINTENANCE [NOT USED]**

2 **3.14 ATTACHMENTS [NOT USED]**

3 **END OF SECTION**

4

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

5

1 **SECTION 03 00 00**
2 **CONCRETE AND CONCRETE REINFORCING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
 - 6 1. Material requirements for concrete and concrete reinforcing.
- 7 B. Deviations from this City of Denton Standard Specification:
 - 8 1. None.
- 9 C. Related Specification Sections include but are not limited to:
 - 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
 - 11 Contract.
 - 12 2. Division 1 - General Requirements.
 - 13 3. Section 03 30 00 – Cast-in-Place Concrete
 - 14 4. Section 03 80 00 – Modifications to Existing Concrete Structures
 - 15 5. Section 31 37 00 – Riprap
 - 16 6. Section 32 05 16 – Aggregates for Exterior Improvements
 - 17 7. Section 32 13 13 – Concrete Paving
 - 18 8. Section 32 13 16 – Decorative Concrete Paving
 - 19 9. Section 32 16 00 – Curbs, Gutters, Sidewalks, and Driveways
 - 20 10. Section 32 32 00 – Retaining Walls
 - 21 11. Section 33 05 61 – Cast-in-Place Concrete Manholes
 - 22 12. Section 33 42 11 – Stormwater Pipe and Boxes
 - 23 13. Section 33 42 23 – Stormwater Headwalls, Wingwalls, and End Treatments
 - 24 14. Section 33 42 30 – Stormwater Junction Boxes
 - 25 15. Section 33 42 33 – Stormwater Curb Inlets and Area Drains
 - 26 16. Section 41 14 00 – Batching Equipment

27 **1.2 PRICE AND PAYMENT PROCEDURES**

- 28 A. Measurement and Payment
 - 29 1. Measurement
 - 30 a. Concrete and concrete reinforcing materials, equipment, tools, testing, and
 - 31 incidentals are subsidiary to the installation of various items.
 - 32 2. Payment
 - 33 a. The work performed and materials furnished in accordance with this item are
 - 34 subsidiary to the unit prices bid for various items which require the use of
 - 35 concrete and concrete reinforcing, and will not be measured or paid for
 - 36 separately.

1 **1.3 REFERENCES**

2 A. Reference Standards

- 3 1. Reference standards cited in this Section refer to the current reference standard
4 published at the time of the latest revision date logged at the end of this Section
5 unless a date is specifically cited.
- 6 2. American Concrete Institute (ACI):
7 a. 211, Proportioning of Concrete Mixes
8 b. 301, Specifications for Structural Concrete
9 c. 318, Building Code Requirements for Structural Concrete
- 10 3. ASTM International (ASTM):
11 a. A36, Standard Specification for Carbon Structural Steel
12 b. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for
13 Concrete Reinforcement
14 c. A675, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special
15 Quality, Mechanical Properties
16 d. A955, Standard Specification for Deformed and Plan Stainless Steel Bars for
17 Concrete Reinforcement
18 e. A996, Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for
19 Concrete Reinforcement
20 f. A1064, Standard Specification for Carbon-Steel Wire and Welded Wire
21 Reinforcement, Plain and Deformed, for Concrete
22 g. C33, Standard Specification for Concrete Aggregates
23 h. C94, Standard Specification for Ready-Mixed Concrete
24 i. C150, Standard Specification for Portland Cement
25 j. C260, Standard Specification for Air-Entraining Admixtures for Concrete
26 k. C494, Standard Specification for Chemical Admixtures for Concrete
27 l. C1116, Standard Specification for Fiber-Reinforced Concrete
28 m. C1399, Standard Test Method for Obtaining Average Residual-Strength of
29 Fiber-Reinforced Concrete
- 30 4. Texas Department of Transportation (TxDOT) Departmental Material
31 Specifications (DMS)
32 a. DMS-4515, Multiple Piece Tie Bars for Concrete Pavements
33 b. DMS-4550, Fibers for Concrete
34 c. DMS-4600, Hydraulic Cement
35 d. DMS-4610, Fly Ash
36 e. DMS-4640, Chemical Admixtures for Concrete
37 f. DMS-4650, Hydraulic Cement Concrete Curing Materials and Evaporation
38 Retardants
39 g. DMS-6100, Epoxies and Adhesives
- 40 5. TxDOT Test Procedures:
41 a. Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate
42 b. Tex-409-A, Free Moisture and Water Absorption in Aggregate for Concrete
43 c. Tex-470-A, Optimized Aggregate Gradation for Hydraulic Cement Concrete
44 Mix Designs
45 d. Tex-425-A, Determining Moisture Content in Fine Aggregate by the “Speedy”
46 Moisture Method

47 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to delivery.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Shop Drawing

6 1. Concrete Mix Design – Submit a design of the concrete mix at least 4 weeks prior
7 to the start of construction activities requiring concrete unless approved otherwise
8 by the City. Provide the mix design in accordance with the class of concrete or
9 concrete mix design specified in the Drawings including:

10 a. Concrete Material Source Information

- 11 1) Concrete supplier name
- 12 2) Project name and address
- 13 3) Contractor name
- 14 4) Mixture Identification Number

15 b. Design Requirements and Design Summary Including:

- 16 1) The combined aggregate gradation, source, and material testing results in
17 accordance with Section 32 05 16.
- 18 2) Maximum slump
- 19 3) Concrete intended use (sidewalk, roadway, etc) and class designation
- 20 4) Design water to cement (w/c) ratio
- 21 5) Design Target Strength
- 22 6) 7-Day and 28-Day compressive strengths in accordance with ACI 301 and
23 318
- 24 7) Batch weights, specific gravity, and type/class information for:
 - 25 a) Cement
 - 26 b) Supplementary cementing materials (if used)
 - 27 c) Coarse Aggregate
 - 28 d) Fine Aggregate
 - 29 e) Water
- 30 8) Chemical admixtures – Type and amount used
- 31 9) Product Data for all chemical admixtures, cement, and fly ash used.
- 32 c. Statement from the concrete supplier verifying concrete has been tested and
33 handled in accordance with ASTM C94.

34 2. Product Data

- 35 a. Provide electronic product data from each manufacturer that is supplying curing
36 compounds, evaporation retardant, joint fillers, or chemical additives to be used
37 on the project.
- 38 b. Product data sheets for all products other than epoxy to include:
 - 39 1) Manufacturer name
 - 40 2) Date
 - 41 3) Material description
 - 42 4) Point of delivery
 - 43 5) Data and test results as required in this Section
 - 44 6) Material Safety Data Sheets (if applicable, required for Epoxy and Curing
45 Compounds)
 - 46 7) Manufacturer Recommended Storing Data (if applicable)

- 1 8) Application Recommendations (if applicable)
- 2 9) Manufacturer's Recommended Storage and Handling instructions
- 3 c. Epoxy Product Data Sheet Additional Requirements:
- 4 1) Resin or hardener components
- 5 2) Brand name
- 6 3) Name of manufacturer
- 7 4) Lot or batch number
- 8 5) Temperature range for storage
- 9 6) Date of manufacture
- 10 7) Expiration date
- 11 8) Quantity contained
- 12 d. Fiber Reinforcing Submittal Requirements
- 13 1) Product data sheet
- 14 2) Letter of certification stating compliance with the requirements of this
- 15 Section and other applicable standards.
- 16 3) Report that provides test results for Fiber Testing in accordance with DMS-
- 17 4550, Fibers for Concrete
- 18 4) Delivery, storage, and handling instructions
- 19 5) Dosage requirements to provide concrete reinforcing in accordance with the
- 20 requirements of this Section and any other applicable related Sections.
- 21 6) Installation and mixing instructions
- 22 7) Provide the City with test results in accordance with this Section and DMS-
- 23 4550, Fibers for Concrete.
- 24 B. Informational Submittals
- 25 1. Source Locations
- 26 a. Provide the location of all material sources

27 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

28 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

29 **1.9 QUALITY ASSURANCE [NOT USED]**

30 **1.10 DELIVERY, STORAGE, AND HANDLING**

31 A. Storage and Handling Requirements

- 32 1. Secure and maintain a location to store the material in accordance with Section 01
- 33 66 00.

34 B. Storage and Stockpiling

- 35 1. Cement and Supplementary Cementitious Material (SCM)
- 36 a. Store all cement and SCM in weatherproof enclosures to protect them from
- 37 dampness or absorption of moisture.
- 38 2. Steel Reinforcement
- 39 a. Store reinforcement above ground surface on skids, platforms, or other support.
- 40 b. Protect reinforcement from mechanical damage and surface deterioration
- 41 caused by exposure to conditions that could cause rust.

42 **1.11 FIELD CONDITIONS [NOT USED]**

43 **1.12 WARRANTY [NOT USED]**

1 **PART 2 - PRODUCTS**

2 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

3 **2.2 MATERIALS**

4 A. Concrete Production Materials

5 1. Cementitious Material

6 a. Defined as the cement and supplementary cementing materials used in concrete.

7 b. Cement

8 1) Furnish cement Type I, II, or I/II in accordance with ASTM C150 Portland
9 Cement.

10 2) Provide cement from sources that are in accordance with DMS-4600 and
11 listed on TxDOT's Material Producer List (MPL) entitled "Hydraulic
12 Cement".

13 c. Supplementary Cementing Materials (SCM)

14 1) Fly Ash

15 a) Refer to DMS – 4610 for types of Fly Ash

16 b) Acceptable Fly Ash includes:

17 (1) Class C and Class F

18 (2) Ultra-Fine (UFFA)

19 (3) Modified Class F (MFFA)

20 c) Provide fly ash in accordance with DMS-4610 and from sources listed
21 on TxDOT's MPL entitled "Fly Ash".

22 d) Refer to Table 2 for Concrete Classes and Mix Design Options.

23 2) Other SCMs

24 a) No other SCM will be approved for use.

25 2. Water

26 a. Provide mixing water and curing water free from oils, acids, organic matter, or
27 other deleterious substances.

28 b. Provide water from municipal supplies approved by the Texas Department of
29 Health.

30 c. Obtain approval from the City if using water not approved by the Texas
31 Department of Health prior to construction.

32 1) If approved to use water from a non-pre-approved source, water testing
33 may be required. The City will request tests and provide minimum criteria.

34 3. Aggregate

35 a. General

36 1) Recycled crushed concrete pavement may be used as coarse or fine
37 aggregate in Class A, B, E, and P concrete.

38 2) A maximum of 20 percent of the fine aggregate may consist of recycled
39 crushed concrete pavement.

40 b. Fine aggregate

41 1) In accordance with Section 32 05 16

42 c. Coarse Aggregates

43 1) Provide coarse aggregate consisting of clean, tough, durable fragments in
44 accordance with Section 32 05 16.

45 2) Provide coarse aggregates that meet the gradation shown in Table 1 when
46 tested in accordance with Tex-401-A.

- 3) Select aggregate gradation based on the allowable grade for the appropriate concrete class shown in shown in Table 1.

Table 1
Coarse Aggregate Gradation Chart

Aggregate Grade No. ¹	Maximum Nominal Size	Percent Passing on Each Sieve								
		2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8
1	2"	100	80-100	50-85		20-40			0-5	
2(467)	1-1/2"		100	95-100		35-70		10-30	0-5	
3	1-1/2"		100	95-100		60-90	25-60		0-5	
4 (57)	1"			100	95-100		25-60		0-10	0-5
5 (67)	3/4"				100	90-100		20-55	0-10	0-5
6 (7)	1/2"					100	90-100	40-70	0-15	0-5
7	3/8"						100	70-95	0-25	
8	3/8"						100	95-100	20-65	0-10

1. Corresponding ASTM C33 gradation shown in parentheses

4. Chemical Admixtures

a. General

- 1) Only water reducing and air-entraining admixtures are allowed.
- 2) Provide admixtures in accordance with DMS-4640, Chemical Admixtures for concrete.
- 3) Do not use Type C, E, F, or G admixtures in Class S bridge deck concrete.
- 4) Do not use chemical admixtures containing calcium chloride in any concrete.

b. Water Reducing Admixture

- 1) Provide water-reducing admixtures in accordance with ASTM C494. Types A, D, F, and G will be allowed.
 - a) ASTM C494, Types "A" and "F":
 - (1) Improves quality of concrete at lower cement content
 - (2) Increase slump without increasing water-cement ratio
 - b) ASTM C494, Types "D" and "G":
 - (1) Maintains workability during hot weather placement

c. Air-Entraining Admixture

- 1) Provide air-entraining admixtures in accordance with ASTM C260.
- 2) Maintain a total air content between 4 and 6 percent.
- 3) Do not exceed the manufacturer's recommended dosage.

B. Concrete Placement Materials

- 1 1. Reinforcing Steel
- 2 a. Provide type, size, grade, and quantity of steel reinforcement as specified in the
- 3 Drawings.
- 4 b. Provide Grade 60 or above steel bar reinforcing unless otherwise indicated in
- 5 the Drawings.
- 6 c. Provide reinforcement free from dirt, loose rust, painting, oil, or other foreign
- 7 material.
- 8 d. Provide corrosion protection if specified in the Drawings.
- 9 e. Provide deformed reinforcing steel in accordance with one of the following:
- 10 1) New Billet Steel in accordance with ASTM A615, Grades 60, 75, or 80
- 11 2) Axle Steel in accordance with ASTM A996, Type A, Grade 60
- 12 a) Provide as straight bars only and do not bend them.
- 13 3) Rail Steel in accordance with ASTM A996 Type R, Grade 60.
- 14 a) Rail steel only allowed in concrete pavement. Provide as straight bars
- 15 only and do not bend them.
- 16 f. Provide bars in accordance with the size and weight requirements for
- 17 reinforcing in ASTM A615.
- 18 g. Twisted bars are not considered deformed and will not be accepted by the City.
- 19 h. Steel Wire Reinforcement will not be accepted by the City.
- 20 i. Spiral Reinforcement
- 21 1) Provide smooth or deformed wire conforming to ASTM A1064.
- 22 2) Provide bars in accordance with ASTM A615, ASTM A996 Type A, or
- 23 ASTM A675 Grade 80 meeting dimensional requirements of ASTM A615.
- 24 j. Bending
- 25 1) Bend all bars cold in a shape true to the shapes specified in the Drawings.
- 26 2) Bend all bars used for stirrups and ties around a pin having a diameter at
- 27 least two times the minimum thickness of the bar.
- 28 3) Perform all other bends in accordance with the latest code of Standard
- 29 Practice of Reinforcing Steel Institute.
- 30 4) Bend stainless reinforcing steel in accordance with ASTM A955.
- 31 2. Fiber Reinforcing.
- 32 a. General
- 33 1) Use fiber reinforcing only when using Class A or B concrete when
- 34 specified in the Drawings. Do not use for structures or roadway paving.
- 35 2) Refer to Table 2 for concrete classes.
- 36 b. Material
- 37 1) Provide fibers in accordance with ASTM C1116, including alkali-proof,
- 38 non-absorptive synthetic fibers, resistant to deterioration due to long-term
- 39 exposure to moisture or substances present in admixtures, and do not
- 40 contribute to nor interfere with the air entrainment of the concrete.
- 41 2) Provide macrosynthetic fibers for reinforcing. Do not use natural, steel,
- 42 glass, or any other type without prior approval by the City.
- 43 3) Provide fibers that meet a minimum average residual strength of 115 psi
- 44 when tested in accordance with ASTM C1399 with the following
- 45 modifications:
- 46 a) Initial deflection for the initial crack of 0.02000 inches.
- 47 b) Sample tolerance of average residual strength not below 10 percent of
- 48 the specified required value.
- 49 c. Length and Size

- 1) Provide fibers minimum 2 inches in length.
 - d. Testing
 - 1) The use of fiber reinforcing does not change the strength or fresh concrete requirements per this specification.
 - e. Rejection
 - 1) Any concrete installed with fiber reinforcing that is non-compliant with the requirements of this Section or other applicable related Sections will be removed and replaced at no cost to the City.
3. Tie Bars
- a. Refer to pertinent Sections and City standard details for specific uses and installation requirements for Multiple Piece Tie Bars and Single Piece Tie Bars.
 - b. Install bars in accordance with the size, type, and location specified in the Drawings.
 - c. Provide straight deformed steel tie bars in accordance with ASTM A615.
 - d. Install tie bars per the size and spacing specified in the Drawings.
 - e. Do not bend or use bent tie bars. Tie bars should remain straight.
 - f. Multiple Piece Tie Bars
 - 1) Provide multiple piece tie bars in accordance with DMS-4515, Multiple Piece Tie Bars for Concrete Pavements.
4. Dowel Bars
- a. General
 - 1) Install bars in accordance with the size, type, and location shown on the Drawings.
 - 2) Refer to pertinent Sections and City standard details for uses and installation requirements.
 - b. Dowel Bars
 - 1) Provide smooth, straight dowel bars free of burrs with a yield strength of at least 60 kilo-pound per square inch (ksi) as specified in the Drawings.
 - 2) Provide steel in accordance with ASTM A615 or meet the physical requirements of ASTM A36 for smooth bars that are larger than 3/8 inch in diameter.
 - 3) Coat dowels with a thin film of grease, wax, silicone, or other approved de-bonding material.
 - 4) Designate smooth bars by diameter in inches.
 - c. Dowel Caps
 - 1) Provide dowel caps on the lubricated end of each dowel bar used in an expansion joint.
 - 2) Provide dowel caps filled with a soft compressible material with enough range of movement to allow complete closure of expansion joint.
 - 3) Provide dowel caps to the length specified in the Drawings. The cap should have sufficient length to allow at least a 1.25-inch gap between the end of the bar and the edge of the cap.
 - 4) Provide caps for dowel bars with an internal diameter sufficient to permit the cap to freely slip over the bar, but do not have an internal diameter that exceeds the bar diameter by more 1/8 inch.
5. Reinforcement Supporting Devices
- a. Use reinforcement supporting devices for construction of sidewalks, driveways, roadways, crosswalks, and any other concrete paving operation.

- 1 b. Provide positioning and supporting devices (baskets and chairs) capable of
2 securing and holding the reinforcing steel in proper position before and during
3 paving.
4 c. Do not allow construction personnel to walk on the reinforcement bars. Replace
5 any broken chairs prior to concrete placement.
6 d. Provide supporting devices (baskets and chairs) made of plastic or non-rusting
7 metal.
8 1) Supporting devices to show no visible indications of deterioration after
9 immersion in a 5-percent solution of sodium hydroxide for 120-hours.
10 2) Provide the City with test results or product data sheets proving devices are
11 in accordance with the requirements of this Section if requested.
- 12 6. Epoxy
13 a. Provide Type 3, Class C epoxy in accordance with DMS-6100.
14 b. City to approve all epoxy and adhesive products prior to use. Submit a Product
15 Data Sheet in accordance with this Section.
16 c. Do not use damaged or previously opened containers.
17 d. Do not use any material showing evidence of crystallization, lumps, skinning,
18 extreme thickening, or settling of pigments that cannot be readily dispersed
19 with normal agitation.
20 e. Follow sound environmental practices when disposing of epoxy and adhesive
21 wastes.
22 f. Dispose of all empty containers separately. Completely empty and mix the
23 epoxy before disposal.
- 24 7. Evaporation Retardant
25 a. Provide evaporation retardant in accordance with DMS-4650.
- 26 8. Curing
27 a. The use of mats, plastic, or film to be approved by the City prior to use.
28 b. Provide membrane curing compounds in accordance with this specification and
29 DMS-4650.
30 1) Provide curing material in accordance with the requirements of DMS-4650
31 unless otherwise specified in the Drawings or by the City.
32 2) Provide a curing compound that does not react deleteriously with concrete
33 or its compounds.
34 3) Curing compound to produce a firm, continuous uniform moisture-
35 impermeable film free from pinholes and adhere to surface of damp
36 concrete.
37 4) The City may reject any concrete not cured properly due to improperly
38 applied curing compound or faulty materials.
39 5) The City may reject the curing compound based on visual or odor defects.
40 6) Curing compound to be delivered to the job site in the manufacturer's
41 original containers only, with original label containing the following:
42 a) Manufacturer's name
43 b) Trade name of the material
44 c) Batch number or symbol with which test samples may be correlated
- 45 C. Concrete Mix Design
46 1. General
47 a. Furnish mix designs using ACI 211 or Tex-470-A.

- 1 b. Maintain mix design and maximum water to cement ratio once mix design is
- 2 approved by City.
- 3 c. Do not place concrete until the mix design has been approved by the City. The
- 4 City may require any concrete placed prior to approval to be removed and
- 5 replaced at no cost to the City.
- 6 d. Perform mix design proportioning by absolute volume method unless otherwise
- 7 approved.
- 8 e. Perform cement replacement using equivalent weight method unless otherwise
- 9 approved.
- 10 f. Do not exceed specified water to cement ratios listed in Table 2 for concrete
- 11 classes when designing the mixture.
- 12 g. Provide a mix design after the trial batch tests are complete in accordance with
- 13 the requirements in this Section.
- 14 2. Cementitious Material
- 15 a. Do not exceed 700 pounds of cementitious material per cubic yard of concrete
- 16 unless otherwise specified or approved by the City.
- 17 b. Use cement of the same type and from the same source for monolithic
- 18 placements.
- 19 3. Concrete Classes
- 20 a. General
- 21 1) Provide concrete mix designs in accordance with the requirements shown in
- 22 Table 2 for the class of concrete specified in the Drawings.
- 23 2) Refer to the Drawings and the General Usage column on Table 2 for
- 24 concrete class information.
- 25 b. Class P Concrete
- 26 1) Use air entraining admixture.
- 27 2) Class P1 Concrete
- 28 a) Use Class P1 concrete for machine paved concrete roadways and
- 29 alleyways unless otherwise specified in the Drawings or directed by
- 30 City.
- 31 3) Class P2 Concrete
- 32 a) Provide Class P2 concrete for hand poured concrete roadways,
- 33 driveways, alleyways, and all other hand poured, vehicular trafficked
- 34 concrete pavement unless otherwise specified in the Drawings.
- 35 c. High Early Strength Concrete (HES)
- 36 1) Use air entraining admixture.
- 37 2) Provide HES concrete in accordance with the requirements of Table 2.
- 38 3) Use HES concrete only when specified in the Drawings or when directed
- 39 by City.
- 40 4) HES may be approved for use when a roadway or driveway needs to be
- 41 opened to traffic quickly.
- 42 5) Perform tests at 24 hours to verify compressive strength of HES concrete is
- 43 minimum 3,200 psi.
- 44 6) Maximum coarse aggregate size is 1-1/2 inches.

1
2

Table 2
Concrete Classes

Class of Concrete	Design Strength ¹ , Min f'c (psi)	Maximum Water to Cementitious Material Ratio	Coarse Aggregate Grades ^{2,3}	Cement Types	Mix Design Options	General Usage ⁴
A	3,000	0.60	1 – 4, 8	Only Cement Types I, II, I/II are allowed	1 and 2	Sidewalks and sidewalk walls
B	2,000	0.60	2 – 7			Traffic signal controller foundations, small roadside signs, and anchors, blocking, utility pipe encasement
C ⁵	3,600	0.45	1 – 6		1 – 4	Culverts (except top slab of direct traffic culverts)
D	750 to 1,200	0.60	1 – 4		1	Concrete base material for trench repair. Only Type II cement is allowed.
E	3,000	0.50	2 – 5		1 – 4	Seal concrete
F ⁵	Note 6	0.45	2 – 5		Note 6	Drilled shafts, bridge substructure, bridge railing, railroad structures, retaining wall (cast-in-place), and concrete traffic barrier (cast-in-place)
H ⁵	Note 6	0.45	3 – 6		1 – 4	Precast concrete
S ⁵	4,000	0.45	2 – 5		1 – 4	Riprap, bridge slabs, top slabs of direct traffic culverts, approach slabs, headwalls, wingwalls, cast-in-place inlets and manholes
P1 ⁸	4,000	0.50	2 – 3		1 – 4	Machine poured concrete pavement, monolithic curbs, non-monolithic curb and curb & gutter
P2 ⁸	4,500	0.45	2 – 3		1 – 4	Hand poured concrete pavement, monolithic curbs, driveways, and decorative concrete pavement
HES ⁸	4,500	0.45	2 – 3		Note 7	Concrete pavement and concrete pavement repair

1. Design strength must be attained within 56 days.

2. Do not use Grade 1 coarse aggregate except in foundations with 4 inch minimum clear spacing between reinforcing steel bars unless otherwise specified on the Drawings or approved by the City. Do not use Grade 1 aggregate in drilled shafts.
3. Use Grade 8 aggregate in extruded curbs unless otherwise approved by the City or specified on the Drawings.
4. For information only.
5. Structural concrete classes.
6. As shown on the Drawings.
7. Mix design options do not apply. 700 pounds of cementitious material per cubic yard limit does not apply.
8. For machine poured concrete, use a minimum cementitious material content of 517 pounds per cubic yard. For hand poured concrete, use a minimum cementitious material content of 564 pounds per cubic yard.

4. Slump

- a. Provide concrete with a slump in accordance with Table 3 unless otherwise specified in the Drawings.
- b. Request approval to exceed the slump limits listed in Table 3 with the mix design submittal as part of the Action Submittal.
- c. Do not exceed maximum slump during production of the mix design or during concrete placement.
- d. Any concrete placed with a slump exceeding the limits shown in Table 3 will be rejected and removed and replaced at no cost to the City.

Table 3
Concrete Pavement Slump Requirements

Concrete Use ¹	Slump Range ² , Inch
Walls (over 9 inches thick), caps, columns, piers, approach slabs	3 – 5
Bridge slabs, top slabs of direct traffic culverts	3 – 5
Inlets, manholes, walls (less than 9 inches thick), bridge railing, culverts, concrete traffic barrier	4 – 6
Precast concrete	4 – 9
Underwater concrete placements	6 – 8
Drilled shafts, slurry displaced and underwater drilled shafts	Note 3
Machine Poured Paving (Class P1 Concrete)	1.5 – 3
Hand Poured Paving (Class P2 and HES Concrete)	3 – 4
Curb, gutter, curb and gutter, sidewalk, driveways, riprap, small roadside sign foundations, concrete pavement repair, concrete repair, concrete base material for trench repair.	2 – 4

1. For information only.
2. For fiber reinforced concrete, perform slump before addition of fibers.
3. As shown on the Drawings.

5. Mix Design Options

- a. **Option 1:** Replace 20 to 35 percent of the cement with Class F fly ash
- b. **Option 2:** Replace 35 to 50 percent of the cement with MFFA.
- c. **Option 3:** Replace 35 to 50 percent of the cement with a combination of Class F fly ash, MFFA, or UFFA. No more than 35 percent may be fly ash.
- d. **Option 4:** Replace 35 to 50 percent of the cement with a combination of Class C fly ash and at least 6 percent UFFA. No more than 35 percent may be Class C fly ash.

6. Trial Batch Production and Testing
 - a. Trial Batch
 - 1) Produce a trial batch of the mix design in accordance with the requirements of the concrete class specified in the Drawings, using the same materials proposed for the project.
 - 2) Perform testing and provide the results verifying the concrete mix design is in accordance with the requirements of this Section. Testing to include:
 - a) Fresh concrete tests for air content and slump
 - b) Strength testing at 7 days and 28 days
 - 3) Do not modify the mix design after the City has approved it.
 - 4) Submit a new mix design if a change is made to concrete supplier.

Table 4
Concrete Discharge Times

Fresh Concrete Temperature, Degrees Fahrenheit	Max Time After Batching for Concrete Not Containing Type B or D Admixtures, Minimum	Max Time After Batching for Concrete Containing Type B or D Admixtures ² , Minimum
90 and Above	45	75
Between 75 and 90	60	90
Below 75	90	120

1. Admixture Types are defined in DMS-4640
2. Concrete must contain at least the minimum manufacturer's recommended dosage of Type B or D admixture.
3. Batching can occur at a commercial concrete site or at a batch plant.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

- A. Concrete Mix Design and Verification
 1. Any concrete installed using a non-conforming mix design is subject to removal and replacement at no cost to the City.
- B. Concrete Production Acceptance
 1. During production and placement of concrete, perform testing to verify the concrete is in accordance with the requirements in this Section for admixtures, mix design, slump, and compressive strength.
- C. Concrete Placement Acceptance
 1. General
 - a. If concrete is suspected of having foreign material, City may reject at any time and the concrete may be removed and replaced at no cost to the City.
 - b. Acceptance will be based on attaining the strength and the fresh concrete tests.
 2. Placement Sampling
 - a. Perform all fresh and hardened concrete testing at the frequency shown on Table 5.
 - b. If any test comes back as non-conforming, stop production and placement of concrete until the reason has been determined and resolved.

- 1 c. Any concrete that was placed is subject to further testing and removal and
 2 replacement at no cost to the City.

Table 5
Testing Frequencies

Concrete Placements	Frequency
Bridge Deck Placements	Test the first 3 loads, then every 60 cubic yards or a fraction thereof specified by the City.
All Other Structural Class Concrete Placements	One test every 60 cubic yards or a fraction thereof per class per day as specified by the City
Non-Structural Class Concrete Placements	One test every 180 cubic yards or a fraction thereof as specified by the City

- 5 3. Testing of Fresh Concrete
 6 a. Sample and test fresh concrete for properties listed in Table 6.
 7 b. Take the sample at the time of discharge from the delivery truck.
 8 c. Concrete that is exhibiting segregation, excessive bleeding, or has a slump
 9 below the minimum allowed per concrete type (per Table 3) after addition of all
 10 water withheld will be rejected. Contractor will remove and replace at no cost
 11 to the City.

Table 6
Fresh Concrete Tests

Tests	Test Methods
Slump	Tex-415-A
Temperature	Tex-422-A
Air Content ¹	Tex-414-A, Tex-416-A, or ASTM C457

1. Only required when air-entraining admixtures are used.

- 14 1. Concrete Strength Test
 15 a. General
 16 1) Perform strength testing for all projects containing more than 60 cubic
 17 yards of concrete.
 18 2) Provide trained technicians during concrete paving to cast test cylinders in
 19 accordance with ASTM C31.
 20 3) Refer to Table 2 for required strength for each concrete class.
 21 b. Sampling
 22 1) Collect 4 test cylinders from a representative portion of concrete being
 23 placed for every 150-cubic yards, with no less than two sets of cylinders
 24 taken from any one day's paving activities.
 25 2) After the cylinders have been cast by trained technicians, transport samples
 26 to the lab and test in accordance with ASTM C31 and ASTM C39. Provide
 27 test results to the City.
 28 3) Test the 4 cylinders per the following:
 29 a) 1 of the cylinders tested at 7 days,
 30 b) 2 cylinders tested at 28 days, and
 31 c) 1 cylinder held and tested at 56 days, if necessary.
 32

- 1 c. Acceptance
2 1) If the 28-day test results for the cylinders taken indicate deficient strength,
3 the Contractor may, at their own expense, core the pavement in question
4 and have the cores tested by another approved laboratory, in accordance
5 with ASTM C42 and ACI 318 protocol.
6 2) Average of the 28-day test results of all cores within a designated area must
7 meet 100 percent of the minimum specified strength.
8 3) If any individual cylinder or core results in less than 90 percent of design
9 strength, additional cores will be taken to identify the limits of the non-
10 compliant concrete at no cost to the City.
11 4) All concrete considered non-compliant will be removed and replaced at no
12 cost to the City.
- 13 2. Cracked Concrete Acceptance Policy
14 a. If cracks greater than 0.025-inches exist in concrete pavement upon completion
15 of the project and prior to the termination of the maintenance period, the City
16 may require corrective action that could include removal and replacement at no
17 cost to the City depending on the cause of the cracking.
18 b. Corrective Actions:
19 1) The City will determine whether the following options are viable. The City
20 will evaluate each crack greater than 0.025-inches during the final
21 inspection and prior to the end of the maintenance period.
22 2) Routing and Sealing:
23 a) Perform the routing and sealing work as directed by the Project
24 Inspector, at no cost to the City, regardless of the cause of the cracking.
25 3) If routing and sealing is not a viable solution due to the cause of the
26 cracking, or the size, remove and replace the concrete.
27 4) If the cause of the cracking is determined to be due to deficient subgrade,
28 remove and replace the subgrade with flexible base or another approved
29 subgrade within the limits of the deficient concrete.
- 30 3. Aggregate Moisture Testing
31 a. Perform testing and provide results in accordance with 32 05 16.
32 b. City may request this test to be performed at any time.
- 33 D. Non-Conforming Work
34 1. Concrete Mix Design and Production Materials
35 a. The City may reject the mix design if not in accordance with the requirements
36 of this Section.
37 1) Any concrete installed using a non-conforming mix design will be subject
38 to removal and replacement at no cost to the City.
39 b. If the trial batch fails to meet the requirements specified in this Section, the
40 Contractor will produce test results for trial batches until the trial batch meets
41 the requirements specified herein at no cost to the City.
42 c. The City may perform verification testing on all materials to verify the
43 conformance of the mixture.

44 **PART 3 - EXECUTION**

45 **3.1 INSTALLERS [NOT USED]**

1 **3.2 EXAMINATION [NOT USED]**

2 **3.3 PREPARATION [NOT USED]**

3 **3.4 INSTALLATION**

4 A. Batching Equipment

- 5 1. Batching equipment shall be in accordance with the requirements of Section 41 14
6 00.

7 B. Refer to the following Sections for all installation requirements:

- 8 1. Section 03 30 00 Cast-in-Place Concrete
9 2. Section 03 80 00 Modifications to Existing Concrete Structures
10 3. Section 31 37 00 for Riprap
11 4. [Section 32 13 13 for Concrete Paving](#)
12 5. Section 32 13 16 for Decorative Concrete Paving
13 6. [Section 32 16 00 for Curbs, Gutters, Sidewalks, and Driveways](#)
14 7. [Section 32 32 00 for Retaining Walls](#)
15 8. Section 33 05 61 for Cast-in-Place Concrete Manholes
16 9. Section 33 42 11 for Stormwater Pipe and Boxes
17 10. Section 33 42 23 for Stormwater Headwalls, Wingwalls, and End Treatments
18 11. Section 33 42 30 for Stormwater Junction Boxes
19 12. Section 33 42 33 for Stormwater Curb Inlets and Area Drains

20 **3.5 REPAIR [NOT USED]**

21 **3.6 RE-INSTALLATION [NOT USED]**

22 **3.7 SITE QUALITY CONTROL [NOT USED]**

23 **3.8 SYSTEM STARTUP [NOT USED]**

24 **3.9 ADJUSTING [NOT USED]**

25 **3.10 CLEANING [NOT USED]**

26 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

27 **3.12 PROTECTION [NOT USED]**

28 **3.13 MAINTENANCE [NOT USED]**

29

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 03 30 00**
2 **CAST-IN-PLACE CONCRETE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Cast-in-place concrete, including formwork, reinforcement, concrete materials,
7 mixture design, and placement procedures.

8 B. Deviations from this City of Denton Standard Specification:

- 9 1. None.

10 C. Related Specification Sections include but are not limited to:

- 11 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
12 Contract.
13 2. Division 1 - General Requirements.
14 3. Section 03 00 00 – Concrete and Concrete Reinforcing.
15 4. Section 32 01 29 – Rigid Paving Repair.
16 5. Section 32 05 16 – Aggregates for Exterior Improvements.
17 6. Section 32 13 13 – Concrete Paving.
18 7. Section 41 14 00 – Batching Equipment.

19 **1.2 PRICE AND PAYMENT PROCEDURES**

20 A. Measurement and Payment

21 1. Measurement

- 22 a. Cast-in-place concrete materials, equipment, tools, testing, and incidentals are
23 subsidiary to the installation of structures or item being installed.

24 2. Payment

- 25 a. The work performed and materials furnished in accordance with this item are
26 subsidiary to the unit prices bid for various items which require the use of cast-
27 in-place concrete.

28 **1.3 REFERENCES**

29 A. Abbreviations and Acronyms

- 30 1. HPC – High Performance Concrete
31 2. PSI – Pounds per square inch

32 B. Definitions

- 33 1. Substructure

- 1 a. Structures that are below ground, partially below ground, or retain earth.
2 Substructures could include: footings, columns, caps, abutments, piers, culverts,
3 retaining walls, headwalls, wingwalls, riprap, other bridge substructure
4 elements, and other concrete structures as indicated, or not included as a
5 superstructure.
- 6 2. Superstructure
- 7 a. Structures that are elevated above ground. Superstructures could include: bridge
8 slabs, decks, flat slabs, slab and girder units, approach slabs, or other bridge
9 superstructure elements as indicated.

10 C. Reference Standards

- 11 1. Reference standards cited in this Section refer to the current reference standard
12 published at the time of the latest revision date logged at the end of this Section
13 unless a date is specifically cited.
- 14 2. American Association of State Highway and Transportation Officials (AASHTO).
- 15 3. American Concrete Institute (ACI):
16 a. ACI 207 – Mass Concrete.
- 17 4. Texas Department of Transportation, Standard Specifications for Construction and
18 Maintenance of Highways, Streets, and Bridges (TxDOT):
19 a. Item 420 – Concrete Substructures.
20 b. Item 422 – Concrete Superstructures.
21 c. Item 426 – Post-Tensioning.
22 d. Item 441 – Steel Structures.
23 e. Item 448 – Structural Field Welding.
- 24 5. Texas Department of Transportation (TxDOT) Departmental Material
25 Specifications (DMS):
26 a. DMS-4650 – Hydraulic Cement Concrete Curing Materials and Evaporation
27 Retardants.
28 b. DMS-4675 – Cementitious Grouts and Mortars for Miscellaneous Applications.
29 c. DMS-6100 – Epoxies and Adhesives.
30 d. DMS-6160 – Water Stops, Nylon-Reinforced Neoprene Sheet, and Elastometric
31 Pads.
32 e. DMS-6310 – Joint Sealants and Fillers.

33 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

34 **1.5 SUBMITTALS**

- 35 A. Submittals shall be in accordance with Section 01 33 00.
- 36 B. All submittals shall be approved by the City prior to delivery.

37 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

38 A. Shop Drawings

- 39 1. Concrete Mix Design
40 a. In accordance with Section 03 00 00.
- 41 2. Product Data
42 a. Provide a product data sheet from each manufacturer supplying the following in
43 accordance with Section 03 00 00:

- 1) Curing compounds
 - 2) Evaporation retardant
 - 3) Joint fillers
 - 4) Chemical additives
 - 5) Epoxy
 - 6) Fiber reinforcing
 - 7) Bond breaker material
3. Curing Method, Equipment, and Materials
 - a. Provide the method of curing, list of materials, and list of equipment to be used for review. Obtain approval prior to placing concrete.
 - b. If different methods, equipment, or materials will be used in various locations, provide each method, equipment, and material used at each location using cast-in-place concrete.
 4. Heat Control Plan
 - a. Provide a heat control plan for monolithic placements specified as mass concrete in the Drawings.
 - b. Develop using TxDOT's ConcreteWorks software, or another approved method in accordance with ACI 207.
 - 1) Use historical temperature ranges for the anticipated time of the mass placement.
 - 2) Re-create plan if the work schedule shifts by more than one month.
 - c. Provide a heat control plan including the following applicable elements:
 - 1) Selection of concrete ingredients including aggregates, gradation, and cement types to minimize heat of hydration;
 - 2) Use of ice or other concrete cooling ingredients;
 - 3) Use of liquid nitrogen dosing systems;
 - 4) Controlling rate or time of concrete placement;
 - 5) Use of insulation or supplemental external heat to control heat loss;
 - 6) Use of supplementary cementing materials;
 - 7) Use of a cooling system to control the core temperature; or
 - 8) Variation of the duration formwork remains in place.
- B. Informational Submittals:
1. Source Locations
 - a. Location of all material sources
 1. Testing Laboratory
 - a. Submit for review and approval the following information for each testing laboratory used on the project:
 - 1) Testing Laboratory Name
 - 2) Location
 - 3) Tests performed
 - a) Summary of each test performed at each lab, if multiple labs are used.
 - 4) ACI Certification
 - a) All labs and Contractor personnel performing concrete testing must be ACI certified.
 2. Falsework and Forms Drawings
 - a. Submit Drawings for falsework and forms for the following items:
 - 1) Vertical forms for piers and single column bents;

- 1 2) Load supporting forms for caps and tie-beams;
- 2 3) Form attachments for bridges to be widened; and
- 3 4) Other items specified in the Drawings or by the city.
- 4 b. Design and construct falsework to safely carry the maximum anticipated loads
- 5 and to provide the necessary rigidity.
- 6 c. Use AASHTO's Guide Design Specifications for Bridge Temporary Works and
- 7 Construction Handbook for Bridge Temporary works for falsework and shoring
- 8 information.
- 9 d. Provide design calculations when requested and show all essential details of
- 10 proposed forms, falsework, and bracing signed and sealed by a licensed
- 11 professional engineer in the state of Texas.
- 12 e. The Contractor is responsible for the design and safety of all falsework and
- 13 forms.
- 14 f. Account for the weight of materials and live loading when designing forms.
- 15 3. Equipment Information
- 16 a. Submittal for all major equipment including:
- 17 1) Equipment name and description
- 18 2) Size
- 19 3) Intended use

20 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

21 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

22 **1.9 QUALITY ASSURANCE [NOT USED]**

23 **1.10 DELIVERY, STORAGE, AND HANDLING**

- 24 A. Secure and maintain a location to store the material in accordance with Section 01 66
- 25 00.
- 26 B. Storage and Stockpiling
- 27 1. Cement and Supplementary Cementitious Material
- 28 a. In accordance with Section 03 00 00.
- 29 2. Steel Reinforcement
- 30 a. In accordance with Section 03 00 00.
- 31 3. Chemical Admixture, Epoxy, Curing Compound, and Other Materials
- 32 a. Follow manufacturer's instructions regarding storage and application at
- 33 temperatures of material.
- 34 4. Epoxy
- 35 a. In accordance with Section 32 13 13.

36 **1.11 FIELD CONDITIONS**

- 37 A. Weather Conditions
- 38 1. In accordance with Sections 03 00 00 and 32 13 13.
- 39 2. Do not place concrete in contact with any material coated with frost or with a
- 40 temperature of 32 degrees Fahrenheit or lower.
- 41 3. Do not place concrete when the ambient temperature in the shade is below 40
- 42 degrees Fahrenheit and falling unless approved.

4. Place concrete when the ambient temperature in the shade is at least 35 degrees Fahrenheit and rising or above 40 degrees Fahrenheit.

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-SUPPLIED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Concrete Production Materials

1. Concrete Class

- a. As specified in the Drawings or in accordance with the usage stated in Section 03 00 00.

2. Provide cementitious materials, water, aggregate, chemical admixtures, reinforcing materials, and evaporation retardant in accordance with Sections 03 00 00 and 32 13 13.

B. Concrete in Water

1. Design the mix in accordance with Section 03 00 00 with a minimum cement content of 650 pounds per cubic yard for concrete to be placed under water. Include an anti-washout admixture in the mix design as necessary.

C. Grout, Mortar, and Epoxy

1. Provide grout in accordance with DMS-4675.

2. For use with Anchor Bolts or Dowels

- a. Provide grout, epoxy, or epoxy mortar as the binding agent unless otherwise specified in the Drawings.

- b. Neat Epoxy

- 1) Provide a Type 3 epoxy in accordance with DMS-6100.

- c. Epoxy Mortar

- 1) Provide a Type 8 epoxy in accordance with DMS-6100.

D. Jointing Materials

1. Joint Fillers

- a. Provide in accordance with Section 32 13 13 and DMS-6310.

- b. Superstructures

- 1) Provide joint materials in accordance with TxDOT Standard Specification Item 422

2. Joint Sealants

- a. Provide in accordance with Section 32 13 73.

E. Waterstops

1. Provide rubber or polyvinyl chloride (PVC) waterstops in accordance with DMS-6160 unless otherwise specified in the Drawings.

F. Curing

1. Provide membrane curing compounds in accordance with Section 03 00 00 and DMS-4650.

- 1 2. Cotton Mats
- 2 a. Provide cotton mats consisting of a filling material of cotton “bat” or “bats” (at
- 3 least 12 ounces per square yard) completely covered with unsized cloth (at least
- 4 6 ounces per square yard) stitched longitudinally with continuous parallel rows
- 5 of stitching spaced at less than 4 inches or tuft both longitudinally and
- 6 transversely at intervals less than 3 inches.
- 7 b. Provide cotton mats free from tears and in good general condition.
- 8 c. Provide a flap at least 6 inches wide consisting of 2 thicknesses of the covering
- 9 and extending along 1 side of the mat.
- 10 d. When using cotton mats, provide a layer of polyethylene sheeting on top of the
- 11 cotton mats.
- 12 3. Burlap Mats
- 13 a. Provide burlap material which complies with AASHTO M 182, Class 3 (10
- 14 ounces per square yard) with the following additions:
- 15 1) Do not use burlap fabricated from bags.
- 16 2) Do not use burlap containing any water-soluble ingredient.
- 17 b. Provide burlap only previously used for curing concrete.
- 18 c. Provide burlap mats free from contamination with any substance foreign to the
- 19 concrete curing process, such as grease or oil.
- 20 d. Concrete will be rejected if cured with contaminated burlap mats.
- 21 e. When using burlap mats, provide a layer of polyethylene sheeting on top of the
- 22 burlap mats.
- 23 4. Polyethylene Sheeting
- 24 a. Provide polyethylene sheeting a minimum of 4 millimeters thick and free from
- 25 visible defects.
- 26 b. Provide only clear or opaque white sheeting when the ambient temperature
- 27 during curing exceeds 90 degrees Fahrenheit, or when applicable to control
- 28 temperature during mass pours.
- 29 5. Burlap-Polyethylene Mats
- 30 a. Provide mats made from burlap impregnated on one side with a film of opaque
- 31 white pigmented polyethylene.
- 32 b. Provide laminated mats with a minimum of one layer of an impervious material
- 33 such as polyethylene, vinyl plastic, or other acceptable material (either as a
- 34 solid sheet or impregnated into another fabric)
- 35 c. Provide mats free of visible defects.

36 G. Formwork Materials

- 37 1. Timber Forms
- 38 a. Provide properly seasoned, good-quality lumber free from imperfections that
- 39 compromise the material strength or impair the finished surface of the concrete.
- 40 b. Provide timber or lumber in accordance with the requirements for species and
- 41 grade in the submitted falsework and form drawings.
- 42 c. Maintain forms or form lumber to maintain a good, clean condition.
- 43 d. Do not use any split, warped, bulged, or marred lumber, or any lumber with
- 44 defects that will produce inferior work.
- 45 e. Provide form lining for all formed surfaces except:
- 46 1) The inside of culvert barrels, inlets, manholes, and box girders;
- 47 2) Surfaces that are subsequently covered by backfill materials, or are
- 48 completely enclosed; and

- 1 3) Any surface formed by a single finished board or by plywood.
2 f. Provide form lining of an approved type, such as Masonite or plywood. Do not
3 provide thin membrane sheeting, such as polyethylene sheets, for form lining.
4 g. Use plywood a minimum of 3/4 inch thick. Place the grain of the face plies on
5 plywood forms parallel to the span between the supporting studs or joists unless
6 otherwise indicated on the submitted falsework and form drawings.
7 h. Use plywood for forming exposed surfaces in accordance with the requirements
8 for B-B Plyform Class 1 or Class 2 Exterior of the US Department of
9 Commerce Voluntary Product Standard PS 1.
10 i. Space studs and joists so the facing form material remains in true alignment
11 under the imposed loads.
12 j. Space wales close enough to hold forms securely to the designated lines and
13 scabbed at least 4 feet on each side of joints to provide continuity. Place a row
14 of wales near the bottom of each placement.
15 k. Place facing material with parallel and square joints, securely fastened to
16 supporting studs.
17 l. Place forms with the form panels symmetrical (long dimensions set in the same
18 direction) for surfaces exposed to view and receiving only an ordinary surface
19 finish.
20 m. Make molding for chamfer strips or other materials that will not split when
21 nailed and can be maintained to a true line without warping.
22 n. Fill forms at all sharp corners and edges with triangular chamfer strips
23 measuring 3/4 inches on the sides unless otherwise specified in the Drawings.
24 o. Remove metal and wooden spreaders separating the forms as the concrete is
25 being placed.
26 p. Provide adequate clean-out openings for narrow walls and other locations
27 where access to the bottom of the forms is not readily available.
- 28 2. Metal Forms
29 a. Requirements for timber forms also apply to metal forms. Metal forms do not
30 require lining unless otherwise specified in the Drawings or by the City.
31 b. Use form metal thick enough to maintain the true shape without warping or
32 bulging.
33 c. Countersink all bolt and rivet heads on the facing sides.
34 d. Design clamps, pins, or other connecting devices to hold the forms rigidly
35 together and to allow removal without damage to the concrete.
36 e. Use metal forms that present a smooth surface and line up properly.

37 H. Repair Materials

- 38 1. In accordance with Section 32 01 29.

39 **2.3 ACCESSORIES [NOT USED]**

40 **2.4 SOURCE QUALITY CONTROL**

41 A. Tests and Inspections

- 42 1. Material Source Testing and Submittals
43 a. Perform in accordance with Sections 03 00 00 and 32 13 13.

- 1 **PART 3 - EXECUTION**
- 2 **3.1 INSTALLERS [NOT USED]**
- 3 **3.2 EXAMINATION [NOT USED]**
- 4

1 **3.3 PREPARATION**

2 A. Hauling

- 3 1. Deliver concrete to the Site in accordance with Sections 41 14 00 and 03 00 00.
4 2. Maintain concrete delivery and placement rates to prevent cold joints and in
5 accordance with Section 03 00 00.
6 3. Any concrete not placed within the time limits specified under Section 03 00 00
7 will be rejected.
8 4. Protect concrete transported by conveyors from sun and wind to prevent loss of
9 slump and workability. Shade or wrap the pipes the concrete is pumped through, if
10 necessary.
11 a. Wrap pipes in wet burlap.
12 5. Adding Water or Chemical Admixtures
13 a. Water may be added to the truck until the slump test is conducted. Once the
14 slump test is conducted, the addition of water or admixtures is not permitted
15 unless the slump is too low or otherwise permitted.
16 b. When water or air entraining admixture is added, turn the drum or blades at
17 least 30 additional revolutions at mixing speed to ensure thorough and uniform
18 mixing of the concrete.
19 c. When water is added, do not exceed the approved mix design water to
20 cementitious material ratio.
21 d. Do not add water or chemical admixtures after any concrete has been
22 discharged.

23 B. Transport and Discharging

- 24 1. Arrange discharging equipment, such as chutes, troughs, conveyors, pipes, and
25 vertical downspouts, to prevent segregation of the concrete material.
26 2. Keep all transporting and discharging equipment clean and free from hardened
27 concrete coatings.
28 3. Discharge water used for cleaning clear of the concrete.
29 4. Discharging Time
30 a. In accordance with Section 03 00 00.

31 C. Concrete Temperature

- 32 1. Place concrete according to the following temperature limits for the classes of
33 concrete defined in Section 03 00 00.
34 a. Class C, F, or H
35 1) Concrete temperature at time of placement is between 50 and 95 degrees
36 Fahrenheit.
37 b. Class S Culvert Top Slabs
38 1) Concrete temperature at time of placement is between 50 and 85 degrees
39 Fahrenheit.
40 c. Class A and B
41 1) Concrete temperature at time of placement is greater than 50 degrees
42 Fahrenheit.
43 d. Mass Concrete
44 1) Concrete temperature at time of placement is between 50 and 75 degrees
45 Fahrenheit.

1 D. Surface Preparation

- 2 1. Thoroughly wet all forms and adjacent hardened concrete prior to placing concrete.
- 3 2. Remove any remaining puddles of excess water before placing concrete.
- 4 3. Provide surfaces in a moist, saturated surface-dry condition when concrete is placed
- 5 on them.
- 6 4. Ensure the subgrade or foundation is moist before placing concrete on grade.

7 **3.4 INSTALLATION**

8 A. Superstructure Construction

- 9 1. Construct all superstructures in accordance with TxDOT Standard Specification
- 10 Item 422.

11 B. Schedule Restrictions

12 1. Reducing Schedule Restrictions

- 13 a. The Contractor may request to perform additional testing to reduce the schedule
- 14 restrictions required. At the time of request, the City will provide additional
- 15 testing requirements based on the site conditions.
- 16 b. If the Contractor does not perform additional strength testing, the 7-day lab-
- 17 cured tests will be used for strength determination unless otherwise specified in
- 18 the Drawings.

19 2. Setting Forms

- 20 a. Attain at least 3,000 psi compressive strength before erecting forms on concrete
- 21 footings supported by piling or drilled shafts, or on individual drilled shafts.
- 22 b. Erect forms on spread footings and culvert footings after the concrete has aged
- 23 at least 2 curing days.
- 24 c. Place concrete only after the forms and reinforcing steel have been inspected.
- 25 d. Support tie beam or cap forms by falsework on previously placed tie beams
- 26 only if the tie beam concrete has attained a compressive strength of 3,000 psi
- 27 and the member is properly supported.
- 28 e. Maintain curing as required until completion of the curing period.
- 29 f. Place superstructure forms or falsework on the substructure only if the
- 30 substructure concrete has attained a minimum compressive strength of 3,000
- 31 psi.

32 3. Placement of Superstructure Members

- 33 a. Place superstructure members or precast substructure members only after the
- 34 substructure concrete has attained a compressive strength of 3,000 psi.

35 4. Opening to Traffic

- 36 a. Direct traffic culverts may be opened to traffic when the design strength
- 37 specified in the Drawings or in Section 03 00 00 has been reached and after the
- 38 curing period has ended.
- 39 b. Obtain approval before opening direct traffic culverts to the traveling public.

40 5. Post-Tensioned Construction

- 41 a. Ensure strength requirements specified in the Drawings for structural element
- 42 designed to be post-tensioned are met for stressing and staged loading of
- 43 structural elements.
- 44

1 C. Falsework and Forms

2 1. Falsework

- 3 a. Provide falsework design and materials in accordance with TxDOT Standard
4 Specification Item 420.

5 2. Forms

- 6 a. Provide formwork design and materials in accordance with TxDOT Standard
7 Specification Item 420.
8 b. Provide bond-breaking layer on timber and metal forms.

9 D. Drains

- 10 1. Install and construct weep holes and roadway drains as specified in the Drawings.

11 E. Placing Reinforcement and Post-Tensioning

- 12 1. Place reinforcement in accordance with Section 03 00 00.
13 2. Do not weld reinforcing steel supports to other reinforcing steel unless specified in
14 the Drawings.
15 3. Place post-tensioning ducts, anchorages, and other hardware in accordance with the
16 approved prestressing details and TxDOT Standard Specification Item 426. Keep
17 ducts free of obstructions until all post-tensioning operations are complete.

18 F. Joints

19 1. Expansion Joints

- 20 a. Construct joints and devices in accordance with the Drawings.
21 b. Use light wire or nails to anchor any preformed fiber joint material to the
22 concrete on 1 side of the joint.
23 c. Ensure finished joints are in accordance with the Drawings with the concrete
24 sections completely separated by the specified opening or joint material.
25 d. Remove all concrete within the joint opening immediately after form removal
26 and again where necessary after surface finishing.

27 2. Construction Joints

- 28 a. Make construction joints of the type and at the locations specified in the
29 Drawings.
30 b. Additional joints in other members are not permitted without approval.
31 c. Place approved additional joints using details specified in the Drawings.
32 d. Make construction joints square and normal to the forms unless otherwise
33 specified in the Drawings or by the City.
34 e. Use bulkheads in the forms for all vertical joints.
35 f. Thoroughly roughen the top surface of a concrete placement terminating at a
36 horizontal construction joint as soon as possible after initial set is attained.
37 g. Thoroughly clean the hardened concrete surface of all loose material, laitance,
38 dirt, and foreign matter, and saturate with water.
39 h. Remove all free water and moisten the surface before concrete or bonding grout
40 is placed against it.
41 i. Ensure the surface of the existing concrete is in a saturated surface-dry
42 condition immediately before placing subsequent concrete.
43 1) A saturated surface-dry condition is achieved when the surface remains
44 damp when exposed to sunlight for 15 minutes.
45

- 1 j. Wet the existing concrete by ponding water on the surface for 24 hours before
2 placing subsequent concrete.
- 3 1) Use high-pressure water blasting if ponding is not possible to achieve a
4 saturated surface-dry condition 15 to 30 minutes before placing the
5 concrete.
- 6 k. Draw forms tight against the existing concrete.
- 7 l. Bonding agents are not required unless otherwise specified in the Drawings or
8 by the City.
- 9 m. Coat the joint surface with bonding mortar, grout, epoxy, or other material if a
10 bonding agent is required.
- 11 n. Provide Type V epoxy in accordance with DMS-6100 for bonding fresh
12 concrete to hardened concrete.
- 13 o. Place the bonding epoxy on a clean, dry surface, and place the fresh concrete
14 while the epoxy is still tacky.
- 15 p. Place bonding mortar or grout on a surface in a saturated surface-dry condition,
16 and place the concrete before the bonding mortar or grout dries.
- 17 q. Place other bonding agents in accordance with the manufacturer's
18 recommendations.

19 G. Placing Concrete

20 1. General

- 21 a. Minimize segregation while placing concrete.
- 22 b. Produce and place a uniform, dense compact mass of concrete.
- 23 c. Ensure concrete free-falls no more than 5 feet except in the case of drilled
24 shafts, thin walls such as culverts, or as allowed by other items.
- 25 d. Fill the forms by depositing concrete as close to final position as possible. Do
26 not deposit large quantities of concrete in one location and move the concrete to
27 fill the forms.
- 28 e. Remove any hardened concrete splatter ahead of the plastic concrete.
- 29 f. Deposit concrete in layers no more than 36 inches deep unless otherwise
30 permitted.
- 31 g. Avoid cold joints in monolithic placement. Sequence successive layers or
32 adjacent portions of concrete so they can be vibrated into a homogeneous mass
33 with the previously placed concrete before it sets.
- 34 h. Re-Vibration
- 35 1) When re-vibrating between adjacent or successive placements of concrete,
36 verify approved time lapse between adjacent or successive placements with
37 the City.
- 38 2) The timeframe between adjacent or successive placements will be subject
39 to approval by the City.
- 40 3) General accepted timeframes include:
 - 41 a) No more than 1 hour to elapse
 - 42 b) If the concrete contains at least the minimum recommended dosage of
43 Type B or D admixture, the City may approve 1.5 hours to elapse.

44 2. In Cold Weather

- 45 a. Provide and install recording thermometers, maturity meters, or other suitable
46 temperature measuring devices capable of determining the temperature of the
47 concrete to verify all concrete is in accordance with the following temperature
48 limits:

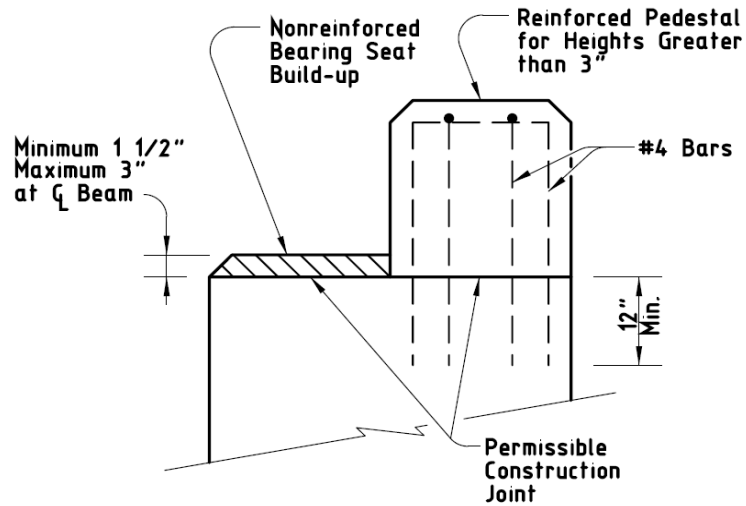
- 1) Maintain the temperature at all surfaces of concrete in bents, piers, culvert walls, retaining walls, parapets, wingwalls, top slabs of non-direct traffic culverts, and other similar formed concrete at or above 40 degrees Fahrenheit for 72 hours from the time of placement.
 - 2) Maintain the temperature of all other concrete, including the bottom slabs (footings) of culverts placed on or in the ground above 32 degrees Fahrenheit for 72 hours from the time of placement.
 - b. Use coverings, insulated forms, artificial heating, or other means until all requirements for curing have been satisfied. Do not apply heat directly to concrete surfaces.
 - c. Plan for cold weather and have all necessary heating and covering material ready for use. If any concrete is damaged due to poor planning, remove and replace concrete at no cost to the City.
 - d. In accordance with ambient temperature requirements of this Section and Section 03 00 00.
3. In Hot Weather
 - a. Keep the concrete at or below the maximum temperature at the time of placement.
 - b. To control the concrete temperature, use ice, liquid nitrogen, shade, or water on aggregate stockpiles.
 4. In Water
 - a. Deposit concrete in water only when specified in the Drawings or with approval from the City.
 - b. Make forms or cofferdams tight enough to prevent any water current passing through.
 - c. Do not pump water during or within 36 hours of concrete placement.
 - d. Place the concrete with a tremie, pump, or other approved method.
 - 1) Do not allow the concrete to fall freely through the water and do not disturb the concrete after it has been placed.
 - e. Keep the concrete surface level during placement.
 - f. Submerge the lower end of the tremie or pump hose in the concrete at all times.
 - g. Use continuous placing operations until the work is complete.
 5. Mass Placements
 - a. Develop and obtain approval for a heat control plan for monolithic placements specified in the Drawings as mass concrete.
 - b. Place in accordance with the following temperature limits during the heat dissipation period for mass monolithic placements:
 - 1) The temperature differential between the central core of the placement and the exposed concrete surface does not exceed 35 degrees Fahrenheit
 - 2) The temperature at the central core of the placement does not exceed 160 degrees Fahrenheit
 - 3) Revise the heat control plan as necessary to maintain the temperature limitations.
 - 4) Repair any resulting cracking if the temperature differential between the central core of the placement and the nearest concrete surface exceeds 35 degrees Fahrenheit, at no cost to the City.
 - c. Furnish and install enough temperature recording devices, maturity meters, or other approved equivalent devices to monitor the heat dissipation.

- 1 d. Maintain temperature control methods for 4 days unless otherwise directed or
- 2 approved based on the heat control plan.
- 3 e. Install devices using the following parameters:
- 4 1) Measuring Surface Temperature
- 5 a) Install no more than 3 inches from the surface.
- 6 2) Measuring Core Temperature
- 7 a) Install mid-way between the point of maximum predicted heat to the
- 8 nearest surface.
- 9 f. Do not use maturity meters to predict strength.
- 10 g. If the core temperature exceeds 160 degrees Fahrenheit, the mass concrete will
- 11 be subject to removal and replacement at no cost to the City.
- 12 1) Do not move forward with subsequent construction until the City has
- 13 evaluated the mass concrete.
- 14 6. In Foundation and Substructure
- 15 a. Perform any pumping or bailing from a suitable sump located outside the
- 16 forms.
- 17 b. Construct or adjust all temporary wales or braces inside cofferdams as the work
- 18 proceeds to prevent unauthorized construction joints.
- 19 c. Footings
- 20 1) Do not place concrete in footings until the depth and formwork has been
- 21 inspected.
- 22 2) Place concrete footings upon seal concrete after the cofferdams are free
- 23 from water and the seal concrete is cleaned.
- 24 d. Columns
- 25 1) Place concrete in columns monolithically between construction joints
- 26 unless otherwise specified in the Drawings or by the City.
- 27 2) Place the column concrete to the lower level of the cap or tie beam and
- 28 delay placing the cap or tie beam on top of the column until the column
- 29 concrete has reached a compressive strength of 3,000 psi.
- 30 7. In Box Culverts
- 31 a. For locations where the culvert is more than 4 feet in clear height, delay placing
- 32 the top slab until the wall concrete has reached a compressive strength of 3,000
- 33 psi.
- 34 b. Finishing
- 35 1) Footing slab
- 36 a) Provide a smooth, uniform finish.
- 37 2) Direct traffic top slabs
- 38 a) Finish in accordance with TxDOT Standard Specification Item 422.
- 39 3) Other top slabs
- 40 a) Float finish
- 41 H. Extending Existing Substructures
- 42 1. Removal
- 43 a. Remove portions of the existing structure to the lines and dimensions specified
- 44 in the Drawings or as directed by the City.
- 45 b. Repair any minor damage to the existing structure in accordance with Section
- 46 32 01 29.
- 47 c. Do not use explosives to remove portions of the existing structure.

- 1 d. Do not use a demolition ball, other swinging weight, or impact equipment
- 2 unless directed to or approved by the City.
- 3 e. Use equipment that will not damage the remaining concrete.
- 4 2. Splicing Reinforcing Steel
- 5 a. Splice new reinforcing bars to exposed bars in the existing structure using lap
- 6 splices in accordance with Section 03 00 00.
- 7 b. Welded splices are permitted, perform welds in accordance with TxDOT
- 8 Standard Specification Item 448.
- 9 3. Concrete Preparation
- 10 a. Roughen and clean concrete surfaces in contact with new construction before
- 11 placing forms.
- 12 b. Prepare joint surfaces in accordance with this Section.
- 13 I. Consolidation
- 14 1. Consolidate concrete and flush mortar to the form surfaces with immersion type
- 15 vibrators. Do not use vibrators that operate by attachment to forms or
- 16 reinforcement, unless otherwise approved.
- 17 2. Vibrate the concrete immediately after deposit. Space points of vibration to ensure
- 18 complete consolidation and thorough working of the concrete around the
- 19 reinforcement, embedded fixtures, and into the corners and angles of the forms.
- 20 3. Insert the vibrators vertically where possible.
- 21 4. Vibrate the entire depth of each lift and penetrate the previous lift 2 to 3 inches
- 22 where applicable.
- 23 5. Do not use the vibrator to move the concrete to other locations in the forms.
- 24 6. Do not drag the vibrator through the concrete.
- 25 7. Thoroughly consolidate concrete along construction joints by operating the vibrator
- 26 along and close to the joint surface. Do not vibrate against the joint surface.
- 27 8. Continue vibration until the concrete surrounding reinforcements and fixtures is
- 28 completely consolidated.
- 29 9. Hand-space or rod the concrete if necessary to ensure flushing of mortar to the
- 30 surface of all forms.
- 31 J. Dowels and Anchor Bolts
- 32 1. Install dowels and anchor bolts by casting them in-place or by grouting with grout,
- 33 epoxy, or epoxy mortar, unless otherwise specified.
- 34 2. Form or drill holes for grouting.
- 35 3. Follow the manufacturer's recommended installation procedures for pre-packaged
- 36 grout or epoxy anchor systems.
- 37 4. Test anchors if specified in the Drawings or required within applicable Sections.
- 38 5. Drill holes for anchor bolts to accommodate the bolt embedment specified in the
- 39 Drawings.
- 40 6. Make holes for dowels at least 12 inches deep unless otherwise specified in the
- 41 Drawings.
- 42 7. Hole Diameter Size
- 43 a. A minimum of twice the dowel or bolt diameter

- 1 b. When using cementitious grout or epoxy mortar, do not exceed the dowel or
2 bolt diameter plus 1.5 inches.
- 3 c. When using neat epoxy, make the hole diameter 1/16 to 1/4 inch greater than
4 the dowel or bolt diameter, unless otherwise specified by the epoxy
5 manufacturer.
- 6 8. Thoroughly clean holes of all loose material, oil, grease, or other bond-breaking
7 substance, and blow them clean with filtered compressed air.
- 8 9. Use a wire brush followed by oil-free compressed air to remove all loose material
9 from the holes, repeating as necessary until no more material is removed.
- 10 10. Ensure holes are in a surface-dry condition when epoxy type materials are used and
11 a surface-moist condition when cementitious grout is used.
- 12 11. Develop and demonstrate for approval a procedure for cleaning and preparing the
13 holes for installation of the dowels and anchor bolts.
- 14 12. Completely fill the void between the hole and dowel or bolt with grouting material.
- 15 13. Follow all product recommendations for pre-packaged systems.
- 16 K. Finishing of Surfaces
- 17 1. Standard Surfaces
- 18 a. Provide a consistent and uniform surface for all visible concrete surfaces.
- 19 b. Apply an ordinary smooth surface finish to all concrete surfaces unless a flat,
20 textured, broom, or trowel surface is specified in this Section, the Drawings, or
21 as directed by the City.
- 22 c. Repair defects and surface irregularities in accordance with this Section.
23 Remove and replace any visible surfaces with defects or irregularities that are
24 unable to be repaired.
- 25 d. Apply an ordinary smooth surface finish as the final finish to the following
26 exposed concrete surfaces, unless otherwise specified in the Drawings or by the
27 City:
 - 28 1) Inside and top of inlets
 - 29 2) Inside and top of manholes
 - 30 3) Inside of sewer and appurtenances
 - 31 4) Inside of culvert barrels
- 32 e. Form marks and chamfer edges do not need to be smoothed for the inside of
33 culvert barrels.
- 34 2. Horizontal Surfaces
- 35 a. Do not use mortar topping for surfaces, unless otherwise directed by the City.
- 36 b. Strike off to grade and finish all unformed upper surfaces and float the surface.
- 37 c. Slope the following to drain water from the surface
 - 38 1) Tops of caps and piers between bearing areas from the center slightly
39 toward the edge
 - 40 2) The tops of abutment and transition bent caps from the backwall to the edge
- 41 d. Construct bearing areas for steel units in accordance with TxDOT Standard
42 Specification Item 441.
- 43 e. Finish
 - 44 1) Standard
 - 45 a) Smooth trowel finish
 - 46 2) Bearing area under the expansion ends of concrete slabs and slab and girder
47 spans

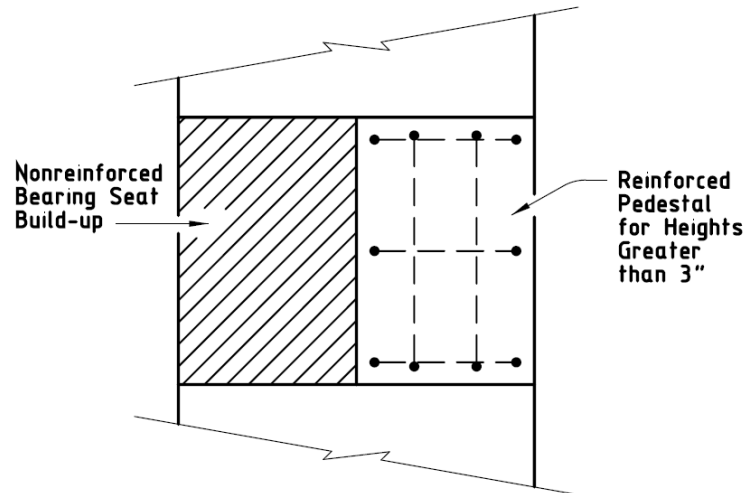
- 1 a) Steel-trowel finish to the grades specified
- 2 3) Bearing areas under elastomeric bearing pads or nonreinforced bearing seat
- 3 buildups
- 4 a) Textured, wood float finish
- 5 4) Do not allow the bearing area to vary from a level plane by more than 1/16
- 6 inch in all directions.
- 7 f. Cast bearing seat buildups or pedestals for concrete units integrally with the cap
- 8 or a construction joint.
- 9 g. Provide a latex-based mortar, an epoxy mortar, or an approved proprietary
- 10 bearing mortar for bearing seat buildups cast with a construction joint.
- 11 h. Construct pedestals of Class C concrete, reinforced as specified in the Drawings
- 12 or, for pedestals less than 12 inches in height, as indicated in Figure 1 and 2



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Figure 1
Section Through Bearing Seat Buildups

Figure 2
Section Through Bearing Seat Buildups



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L. Curing

1. General

- a. Perform curing in accordance with approved methods.
- b. Curing Day
 - 1) Standard
 - a) The temperature, taken in the shade, is above 50 degrees Fahrenheit for at least 19 hours.
 - 2) Cold Day
 - a) The temperature of all surfaces of the concrete is maintained above 40 degrees Fahrenheit for the entire 24 hours.
- c. The curing period begins when all concrete has attained its initial set in accordance with Tex-440-A, unless otherwise indicated in the Drawings.
- d. Curing Locations
 - 1) For vertical surfaces, use form or membrane curing unless otherwise specified in the Drawings or by the City.
 - 2) For horizontal surfaces of HPC or mass concrete, use only water curing.
 - 3) For horizontal or unformed surfaces of all other concrete, use water or membrane curing.
 - 4) For the top surface of any concrete structure that additional concrete will be placed and bonded onto at a later date, use water curing. Examples include, but are not limited to stub walls, caps with backwalls, and risers.
 - 5) Cure all other concrete as specified in other applicable Sections.
- e. Curing Timeframes:
 - 1) Standard
 - a) Cure all concrete for 4 consecutive days

- 1 2) Vertical Surfaces
2 a) Form cure for 48 hours after placement followed by 4 days of form
3 curing.
4 b) Form cure for 12 hours after placement followed by membrane cure in
5 accordance with manufacturer recommendations, as specified by the
6 Drawings, or as directed by the City.
7 c) HPC concrete
8 (1) Form cure for 48 hours after placement followed by membrane
9 cure in accordance with manufacturer recommendations, as
10 specified by the Drawings, or as directed by the City .
11 3) Mass Concrete
12 a) If forms are removed prior to 4 days of curing, form cure as required by
13 the heat control plan and then membrane cure in accordance with
14 manufacturer recommendations, as specified by the Drawings, or as
15 directed by the City.
16 f. If using membrane curing, apply within 2 hours of form removal.
17 2. Form Curing
18 a. When forms are left in contact with the concrete, other curing methods are not
19 required except for exposed surfaces and for cold weather protection.
20 b. Use other approved curing methods if forms are removed prior to the 4 day
21 curing period.
22 3. Water Curing
23 a. Keep all exposed surfaces of the concrete continuously wet for the required
24 curing timeframe.
25 b. Use water in accordance with Section 03 00 00. Do not use water that stains or
26 leaves a residue.
27 4. Blankets
28 a. Keep the concrete continuously wet by maintaining wet cotton or burlap mats
29 in direct contact with the concrete for the required curing time.
30 b. Cover the cotton or burlap mats with a layer of polyethylene sheeting.
31 c. Weigh the mats adequately to provide continuous contact with all concrete.
32 d. Cover surfaces that cannot be cured by direct contact with mats by forming an
33 enclosure well anchored to the forms or ground so outside air cannot enter the
34 enclosure.
35 1) Provide sufficient moisture inside the enclosure to keep all surfaces of the
36 concrete wet.
37 5. Membrane Curing
38 a. Do not vary the type of curing compound throughout the project.
39 b. Apply membrane curing at a rate of approximately 180 square feet per gallon
40 unless otherwise specified in accordance with manufacturer recommendations,
41 as specified by the Drawings, or as directed by the City.
42 c. Do not spray curing compound on projecting reinforcing steel or concrete that
43 will later form a construction joint.
44 d. Do not apply membrane curing to dry surfaces. Follow the manufacturer's
45 recommendations for what level of surface moisture to apply curing compound.
46 e. Leave the film unbroken for the minimum curing period specified by the
47 manufacturer.
48 f. Correct damaged membrane immediately by reapplication of membrane.

1 M. Removal of Falsework and Forms

- 2 1. Follow curing requirements when removing forms.
- 3 2. For mass placements, keep forms in place for 4 days following concrete placement
- 4 unless otherwise specified by the heat control plan, in the Drawings, or by the City.
- 5 3. Do not remove weight-supporting forms and falsework spanning more than 1 foot
- 6 for all bridge components and culvert slabs until the concrete has attained a
- 7 compressive strength of 3,000 psi.
- 8 4. Remove inside forms (walls and top slabs) for box culverts and sewers after
- 9 concrete has attained 75 percent of the design compressive strength.
- 10 5. If a form is not providing support, the form may be removed provided the removal
- 11 does not disturb other forms that are providing support.
- 12 6. Metal Appliances:
- 13 a. Remove all metal appliances used inside forms to a depth of at least one-half
- 14 inch from the concrete surface.
- 15 b. Remove appliances without chipping or spalling the concrete.
- 16 c. If the concrete is damaged, the City will decide if the concrete can be repaired,
- 17 or if it will need to be replaced.
- 18 d. Replace any concrete that has been damaged due to the removal of metal
- 19 appliances at no cost to the City.
- 20 7. Do not leave any forms or falsework in place unless otherwise specified in the
- 21 Drawings or as directed by the City.

22 **3.5 REPAIR**

23 A. Repair Surface Defects and Irregularities

- 24 1. Chip away all loose or broken material to sound concrete where porous, spalled, or
- 25 honeycombed areas are visible after form removal.
- 26 2. Repair spalls in accordance with Section 32 01 29.
- 27 3. Clean and fill holes or spalls caused by the removal of form and falsework with
- 28 latex grout, cement grout, or epoxy grout. Fill only the holes. Do not blend the
- 29 patch with the surrounding concrete.
- 30 4. Remove all fins, rust stains, runs, drips, or mortar from surfaces that will be
- 31 exposed. Smooth all form marks and chamfer edges by grinding or dry-rubbing.
- 32 5. Ensure all repairs are dense, well-bonded, and properly cured. Finish exposed large
- 33 repairs to blend with the surrounding concrete where a higher class of finish is not
- 34 specified.

35 **3.6 RE-INSTALLATION [NOT USED]**

36 **3.7 SITE QUALITY CONTROL**

37 A. Concrete Mix Design and Verification

- 38 1. Perform testing in accordance with Section 03 00 00.

39 B. Concrete Production and Placement Acceptance

- 40 1. Perform production and placement testing in accordance with Section 03 00 00.

41 C. Non-Conforming Work

- 1 1. General
- 2 a. The City may at any time reject a material if it fails to meet the requirements
- 3 specified in this Section.
- 4 b. The City may require the Contractor at any time to remove and replace installed
- 5 concrete if any material is found to be non-conforming, at no additional cost to
- 6 the City.
- 7 c. Any rejection of materials or source locations will be at no cost to the City.
- 8 2. Aggregates
- 9 a. If the aggregates fail to meet the requirements specified in Section 32 05 16, the
- 10 City may reject the aggregates.
- 11 3. Concrete Mix Design and Production Materials
- 12 a. If the mix design fails to meet the requirements specified in this Section and
- 13 Section 03 00 00, the City may reject the mix design.
- 14 b. Any concrete installed using a non-conforming mix design will be subject to
- 15 removal and replacement at no cost to the City.
- 16 c. The City may perform verification testing on all materials to verify the
- 17 conformance of the mixture.

18 **3.8 SYSTEM STARTUP [NOT USED]**

19 **3.9 ADJUSTING [NOT USED]**

20 **3.10 CLEANING [NOT USED]**

21 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

22 **3.12 PROTECTION [NOT USED]**

23 **3.13 MAINTENANCE [NOT USED]**

24 **3.14 ATTACHMENTS [NOT USED]**

25 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 03 34 13
CONTROLLED LOW STRENGTH MATERIAL (CLSM)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Controlled low strength material (CLSM) for use as flowable backfill.
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 03 00 00 – Concrete and Concrete Reinforcing.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. This item is considered subsidiary to utility pipe installed.
 - 2. Payment
 - a. The work performed and materials furnished in accordance with this item are subsidiary to the unit price bid per linear foot of utility pipe installed.

1.3 REFERENCES

- A. Acronyms
 - 1. CLSM – Controlled Low Strength Material.
- B. Reference Standards
 - 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
 - 2. American Society of Testing and Materials (ASTM):
 - a. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - b. C33 - Standard Specification for Concrete Aggregates.
 - c. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - d. C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - e. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - f. C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

- 1 g. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural
- 2 Pozzolan for Use in Concrete.

3 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

4 **1.5 SUBMITTALS**

- 5 A. Submittals shall be in accordance with Section 01 33 00.
- 6 B. All submittals shall be approved by the City prior to delivery.

7 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 8 A. Sieve analysis
 - 9 1. Analyses of fine and coarse aggregates proposed to be used.
 - 10 a. Resubmit at any time there is a significant change in grading of materials.
 - 11 2. Mix
 - 12 a. Full details, including mix design calculations for proposed mix.
- 13 B. Trial batch test data
 - 14 1. Data for each test cylinder.
 - 15 2. Data identifying mix and slump for each test cylinder.

16 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

17 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

18 **1.9 QUALITY ASSURANCE [NOT USED]**

19 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

20 **1.11 SITE CONDITIONS [NOT USED]**

21 **1.12 WARRANTY [NOT USED]**

22 **PART 2 - PRODUCTS**

23 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

24 **2.2 MATERIALS**

- 25 A. Materials
 - 26 1. Portland Cement:
 - 27 a. Type II low alkali Portland cement in accordance with Section 03 00 00.
 - 28 2. Fly Ash in accordance with ASTM C618.
 - 29 3. Water in accordance with Section 03 00 00.
 - 30 4. Admixtures:
 - 31 a. Air entrainer in accordance with ASTM C260.
 - 32 5. Fine Aggregate:
 - 33 a. Concrete sand (not required to be in accordance with ASTM C33).
 - 34 b. No more than 12 percent of fine aggregate shall pass a No. 200 sieve.
 - 35 c. No plastic fines shall be present.

- 1 6. Coarse Aggregate:
 2 a. Pea gravel no larger than 3/8-inch.
- 3 B. Mixes
- 4 1. Performance requirements
- 5 a. Total calculated air content
- 6 1) Not less than 8.0 percent or greater than 12.0 percent.
- 7 b. Minimum unconfined compressive strength
- 8 1) Not less than 50 psi measured at 28 days.
- 9 c. Maximum unconfined compressive strength
- 10 1) Not greater than 150 psi measured at 28 days.
- 11 2) Limit the long-term strength (90 days) to 200 psi such that material could
- 12 be re-excavated with conventional excavation equipment in the future if
- 13 necessary.
- 14 d. Slump
- 15 1) Greater than 9 inches and sufficient to allow the material to flow freely
- 16 during placement.
- 17 e. Wet density
- 18 1) No greater than 132 pounds per cubic foot.
- 19 f. Color
- 20 1) No coloration required unless noted.
- 21 2) Submit dye or other coloration means for approval.
- 22 2. Suggested mix design:

Material	Weight	Specific Gravity	Absolute Volume Cubic Foot
Cement	30 pounds	3.15	0.15
Fly Ash	300 pounds	2.30	2.09
Water	283 pounds	1.00	4.54
Coarse Aggregate	1,465 pounds	2.68	8.76
Fine Aggregate	1,465 pounds	2.68	8.76
Admixture	4-6 ounces	-	2.70
TOTAL	3,543 pounds	-	27.00

23

24 **2.3 ACCESSORIES [NOT USED]**

25 **2.4 SOURCE QUALITY CONTROL**

- 26 A. Trial Batch
- 27 1. After mix design has been accepted by City, have trial batch of the accepted mix
- 28 design prepared by testing laboratory acceptable to City.
- 29 2. Prepare trial batches using specified cementitious materials and aggregates
- 30 proposed to be used for the Work.
- 31 3. Prepare trial batch with sufficient quantity to determine slump, workability,
- 32 consistency, and to provide sufficient test cylinders.

1

1 B. Test Cylinders

- 2 1. Prepare test cylinders in accordance with ASTM C31 with the following
3 exceptions:
4 a. Fill the concrete test cylinders to overflowing and tap sides lightly to settle the
5 mix.
6 b. Do not rod the concrete mix.
7 c. Strike off the excess material.
8 2. Place test cylinders in a moist curing room. Exercise caution in moving and
9 transporting the cylinders since they are fragile and will withstand only minimal
10 bumping, banging, or jolting without damage.
11 3. Do not remove the test cylinder from mold until the cylinder is to be capped and
12 tested.
13 4. The test cylinders may be capped with standard sulfur compound or neoprene pads:
14 a. Perform the capping carefully to prevent premature fractures.
15 b. Use neoprene pads a minimum of 1/2 inch thick, and 1/2 inch larger in diameter
16 than the test cylinders.
17 c. Do not perform initial compression test until the cylinders reach a minimum
18 age of 3 days.

19 C. Compression test 8 test cylinders: Test 4 test cylinders at 3 days and 4 at 28 days in
20 accordance with ASTM C39 with the following exceptions:

- 21 1. The compression strength of the 4 test cylinders tested at 28 days shall be equal to
22 or greater than the minimum required compression strength, but not exceed
23 maximum compression strength.

24 D. If the trial batch tests do not meet the requirements for strength or density, revise and
25 resubmit the mix design, and prepare additional trial batch and tests. Repeat until an
26 acceptable trial batch is produced in accordance with the requirements of this Section.

- 27 1. All the trial batches and acceptability of materials shall be paid by Contractor.
28 2. After acceptance, do not change the mix design without submitting a new mix
29 design, trial batches, and test information.

30 E. Determine slump in accordance with ASTM C143 with the following exceptions:

- 31 1. Do not rod the concrete material.
32 2. Place material in slump cone in 1 semi-continuous filling operation, slightly
33 overfill, tap lightly, strike off, and then measure and record slump.

34 **PART 3 - EXECUTION**

35 **3.1 INSTALLERS [NOT USED]**

36 **3.2 EXAMINATION [NOT USED]**

37 **3.3 PREPARATION [NOT USED]**

38

1 **3.4 INSTALLATION**

2 A. Placement

- 3 1. Place CLSM by any method which preserves the quality of the material in terms of
4 compressive strength and density:
- 5 a. Limit lift heights of CLSM placed against structures and other facilities that
6 could be damaged due to the pressure from the CLSM to 4 feet or the lift height
7 indicated on the Drawings, whichever is less.
 - 8 1) Do not place another lift of CLSM until the last lift of CLSM has set and
9 gained sufficient strength to prevent lateral load due to the weight of the
10 next lift of CLSM.
 - 11 b. The basic requirement for placement equipment and placement methods is the
12 maintenance of its fluid properties.
 - 13 c. Transport and place material so it flows easily around, beneath, or through
14 walls, pipes, conduits, or other structures.
 - 15 d. Maintain slump developed for trial batch during construction at all times within
16 1-inch +/-.
 - 17 e. Use a slump, consistency, workability, flow characteristics, and pumpability
18 (where required) such that when placed, the material is self-compacting, self
19 densifying, and has sufficient plasticity so compaction or mechanical vibration
20 is not required.
 - 21 f. When using as embedment for pipe take appropriate measures to ensure line
22 and grade of pipe.

23 **3.5 REPAIR [NOT USED]**

24 **3.6 RE-INSTALLATION [NOT USED]**

25 **3.7 SITE QUALITY CONTROL**

26 A. Quality Control Testing

- 27 1. Perform testing to determine whether the CLSM, as being produced during the
28 process of construction, is in accordance with the requirements of this Section.
- 29 a. Make and deliver test cylinders to testing laboratory at the Contractor's
30 expense.
- 31 2. Test cylinders
- 32 a. Prepare test cylinders in accordance with ASTM C31 with the following
33 exceptions:
 - 34 1) Fill the concrete test cylinders to overflowing and tap sides lightly to settle
35 the mix.
 - 36 2) Do not rod the concrete mix.
 - 37 3) Strike off the excess material.
 - 38 b. Place the cylinders in a safe location away from the construction activities.
39 Keep the cylinders moist by covering with wet burlap, or equivalent. Do not
40 sprinkle water directly on the cylinders.
 - 41 c. After 2 days, place the cylinders in a protective container, such as a Styrofoam
42 or similar lining that will limit the jarring and bumping of the cylinders, for
43 transport to the laboratory for testing.

- d. Place test cylinders in a moist curing room. Exercise caution in moving and transporting the cylinders since they are fragile and will withstand only minimal bumping, banging, or jolting without damage.
- e. Do not remove the test cylinder from mold until the cylinder is to be capped and tested.
- f. The test cylinders may be capped with standard sulfur compound or neoprene pads:
 - 1) Perform the capping carefully to prevent premature fractures.
 - 2) Use neoprene pads a minimum of 1/2 inch thick and 1/2 inch larger in diameter than the test cylinders.
 - 3) Do not perform initial compression test until the cylinders reach a minimum age of 3 days.
- 3. The number of cylinder specimens taken each day shall be determined by the City.
 - a. Test 1 cylinder at 3 days and 2 at 28 days in accordance with ASTM C39 except as modified herein.
 - b. The compression strength of the cylinders tested at 28 days shall be equal to or greater than the minimum required compression strength, but not exceed maximum compression strength.
- 4. Test the air content of the CLSM. Test will be made immediately after discharge from the mixer in accordance with ASTM C231.
- 5. Test the slump of CLSM using a slump cone in accordance with ASTM C143 with the following exceptions:
 - a. Do not rod the concrete material.
 - b. Place material in slump cone in 1 semi-continuous filling operation, slightly overfill, tap lightly, strike off, and then measure and record slump.
- 6. If compressive strength of test cylinders does not meet requirements, make corrections to the mix design to be in accordance with the requirements of this Section.

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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1

1 **SECTION 03 80 00**
2 **MODIFICATIONS TO EXISTING CONCRETE STRUCTURES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Modifications to existing concrete structures, including manholes, junction boxes,
7 vaults, retaining walls, wingwalls, headwalls, and culverts.
- 8 B. Deviations from this City of Denton Standard Specification:
- 9 1. None.
- 10 C. Related Specification Sections include but are not limited to:
- 11 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
12 Contract.
- 13 2. Division 1 - General Requirements.
- 14 3. Section 03 00 00 – Concrete and Concrete Reinforcing.
- 15 4. Section 03 30 00 – Cast-in-Place Concrete.
- 16 5. Section 03 34 13 - Controlled Low Strength Material (CLSM).
- 17 6. Section 32 32 00 – Retaining Walls.
- 18 7. Section 33 05 05 - Utility Trench Excavation, Embedment, and Backfill.

19 **1.2 PRICE AND PAYMENT PROCEDURES**

- 20 A. Measurement and Payment
- 21 1. Measurement
- 22 a. Modifications to Existing Concrete Structures materials, equipment, tools,
23 testing, and incidentals are subsidiary to the structure or item being installed.
- 24 2. Payment
- 25 a. The work performed and materials furnished in accordance with this item are
26 subsidiary to the unit prices bid for various items which require the use of
27 Modifications to Existing Concrete Structures.

28 **1.3 REFERENCES**

- 29 A. Reference Standards
- 30 1. Reference standards cited in this Section refer to the current reference standard
31 published at the time of the latest revision date logged at the end of this Section
32 unless a date is specifically cited.
- 33 2. Texas Department of Transportation (TxDOT) Departmental Material
34 Specifications (DMS):
- 35 a. DMS-6100, Epoxies and Adhesives.
- 36 3. TxDOT Concrete Repair Manual.

1 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

2 **1.5 SUBMITTALS**

3 A. Submittals shall be in accordance with Section 01 33 00.

4 B. All submittals shall be approved by the City prior to delivery.

5 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

6 A. Product Data

7 1. Provide electronic product data from each manufacturer supplying curing
8 compounds, evaporation retardant, joint fillers, or chemical additives to be used on
9 the project.

10 2. Product data sheets for all products other than epoxy including:

11 a. Manufacturer name

12 b. Date

13 c. Material description

14 d. Point of delivery

15 e. Data and test results as required in this Section

16 f. Material Safety Data Sheets, if applicable, required for Epoxy and Curing
17 Compounds

18 g. Manufacturer Recommended Storing Data, if applicable

19 h. Application Recommendations, if applicable

20 i. Manufacturer's Recommended Storage and Handling instructions

21 3. Epoxy Product Data Sheet Additional Requirements:

22 a. Resin or hardener components

23 b. Brand name

24 c. Name of manufacturer

25 d. Lot or batch number

26 e. Temperature range for storage

27 f. Date of manufacture

28 g. Expiration date

29 h. Quantity contained

30 B. Information Submittals

31 1. Equipment Information

32 a. Submittal for all major equipment including:

33 1) Equipment name and description

34 2) Size

35 3) Intended use

36 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

37 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

38 **1.9 QUALITY ASSURANCE [NOT USED]**

39 **1.10 DELIVERY, STORAGE, AND HANDLING**

40 A. Storage and Handling Requirements

- 1 1. Secure and maintain a location to store the material in accordance with Section 01
2 66 00.

3 **1.11 FIELD CONDITIONS [NOT USED]**

4 **1.12 WARRANTY [NOT USED]**

5 **PART 2 - PRODUCTS**

6 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

7 **2.2 MATERIALS**

8 A. Cast-in-Place Concrete

- 9 1. In accordance with Sections 03 00 00 and 03 30 00.

10 B. Controlled Low Strength Material

- 11 1. In accordance with Section 03 34 13.

12 C. Steel Reinforcement

- 13 1. In accordance with Section 03 00 00.

14 D. Epoxy Bonding Agent

- 15 1. Provide a two component, solvent-free, asbestos-free, moisture-insensitive epoxy
16 resin material used to bond plastic concrete to hardened concrete in accordance with
17 DMS-6100, Type V.

18 E. Backfill material

- 19 1. Trenches
20 a. In accordance with Section 33 05 05.
21 2. Retaining walls
22 a. In accordance with Section 32 32 00.

23 F. Repair Mortars

- 24 1. Provide an asbestos free, moisture insensitive, polymer-modified, Portland cement-
25 based cementitious trowel grade mortar for repairs on horizontal or vertical
26 surfaces.

27 G. Pipe Penetration Sealants

- 28 1. Provide one component polyurethane, bentonite-free, extrudable swelling waterstop
29 that is chemically resistant, not soluble in water, and capable of withstanding
30 wet/dry cycling.

31 **2.3 ACCESSORIES [NOT USED]**

32 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

33 **PART 3 - EXECUTION**

34 **3.1 INSTALLERS [NOT USED]**

35

1 **3.2 EXAMINATION**

2 A. Verification of Conditions

- 3 1. Examine existing structure to be modified for damage or defects that may affect
4 modification.
5 a. Report issue to City for review before beginning modification.

6 **3.3 PREPARATION**

7 A. Connection Surface Preparation

- 8 1. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting
9 materials from the surface by dry mechanical means such as sanding or grinding.
10 a. Irregular voids or surface stones do not need to be removed if they are sound,
11 free of laitance, and firmly embedded into parent concrete, subject to the City's
12 final inspection.

13 B. Reinforcing Steel Preparation

- 14 1. Clean reinforcing steel shown to be incorporated in new concrete of existing
15 demolished concrete by wire brush or other similar means to remove all loose
16 material and products of corrosion before proceeding with the repair.
17 2. If reinforcing steel is exposed, clean by wire brush or other similar means to
18 remove all contaminants.
19 3. If half of the diameter or more of the reinforcing steel is exposed, chip out a
20 minimum of 1 inch behind the steel.
21 4. Cut, bend, or lap to new reinforcing as specified in the Drawings and provide with
22 1-inch minimum cover all around.

23 **3.4 INSTALLATION**

24 A. General

- 25 1. When drilling holes for dowels or bolts at new or existing concrete, stop drilling if
26 rebar is encountered and relocate the hole to avoid rebar as approved by the City
27 and Engineer.
28 2. Do not cut rebar without prior approval by the City and Engineer.

29 B. Concrete Removal

- 30 1. Remove concrete designated to be removed to specific limits as shown on the
31 Drawings by chipping, jack-hammering, or saw-cutting as appropriate in areas
32 where concrete is to be taken out.
33 a. Do not jackhammer sanitary sewer manhole penetrations.
34 2. Remove concrete in such a manner that surrounding concrete or existing reinforcing
35 to be left in place and existing in place equipment is not damaged.
36 3. Where existing reinforcing is exposed due to saw cutting/core drilling and no new
37 material is to be placed on the sawcut surface, apply a coating or surface treatment
38 of epoxy to the entire cut surface to a thickness of 1/4 inch.
39 4. In all cases where the joint between new concrete or grout and existing concrete
40 will be exposed in the finished work, except as otherwise shown or specified,
41 provide a 1-inch deep saw cut on each exposed surface of the existing concrete at
42 the edge of concrete removal.

1 C. Modification

- 2 1. When doweling in new concrete to existing structure, drill a hole 1/4 inch larger
3 than the diameter of the dowel.
4 a. Thoroughly clean the hole of all loose particles and dust and blow clean with
5 filtered compressed air prior to installing epoxy.
6 2. Roughen the existing concrete surface by dry mechanical means such as sanding or
7 grinding prior to placing grout, epoxy, or new concrete.
8 3. Place concrete as specified in the Drawings and in accordance with Section 03 30
9 00.

10 D. Installation Specifics for Coring into an Existing Manhole

- 11 1. The new pipe connection shall be made using a coring method that utilizes a
12 mechanical saw or drill. The use of pipe hammers or jackhammers is not allowed.
13 2. The manhole wall shall be cored or cut to the elevation indicated on the plans. The cut
14 or cored area shall be of sufficient size to allow the insertion of the new pipe and the
15 pipe-to-manhole connector. If required, the bench area shall also be cut or cored to the
16 width of the new conduit to ensure a continuous grade from the new conduit invert
17 into the manhole invert. Care should be taken to minimize the hole size so that the
18 amount of grouting is kept to a minimum.
19 3. The Contractor shall keep debris from entering the wastewater flow stream in the
20 existing manhole. This shall be done by either using a flow-through plug on the
21 existing manhole pipe connections or by bypass pumping around the manhole.
22 4. A pipe-to-manhole connector shall be attached to the sanitary sewer pipe where the
23 sanitary sewer pipe and the manhole meet.
24 5. The new sanitary sewer shall not protrude more than one inch into the manhole.
25 6. The core hole and bench cut (if required) shall be thoroughly cleaned before the
26 application of grout around the new pipe connection.
27 7. Grout shall be applied to the full thickness of the manhole wall all around the new pipe
28 connection to produce a watertight seal. The pipe-to-manhole connector shall be
29 completely encapsulated within the grouted area. If a bench cut was required, the cut
30 area shall be smoothed with grout.

31 **3.5 REPAIR**

- 32 A. Repair damaged concrete specified to be left in place in accordance with the TxDOT
33 Concrete Repair Manual.

- 1 **3.6 RE-INSTALLATION [NOT USED]**
- 2 **3.7 SITE QUALITY CONTROL [NOT USED]**
- 3 **3.8 SYSTEM STARTUP [NOT USED]**
- 4 **3.9 ADJUSTING [NOT USED]**
- 5 **3.10 CLEANING [NOT USED]**
- 6 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 7 **3.12 PROTECTION [NOT USED]**
- 8 **3.13 MAINTENANCE [NOT USED]**
- 9 **3.14 ATTACHMENTS [NOT USED]**

10 **END OF SECTION**

11

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

12

1 **SECTION 31 10 00**
2 **SITE CLEARING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

6 1. Site Preparation

- 7 a. Preparing the right-of-way and designated easements for construction
8 operations by the removal and disposal of obstructions within the project limits.
9 b. Removing trees and shrubs.
10 c. Pruning trees and shrubs.
11 d. Tree protection fence
12 e. Trunk protection

13 B. Deviations from this City of Denton Standard Specification:

- 14 1. None.

15 C. Related Specification Sections include but are not limited to:

- 16 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
17 Contract.
18 2. Division 1 - General Requirements.
19 3. Section 02 41 13 – Selective Site Demolition.
20 4. Section 02 41 15 – Paving Removal.
21 5. Section 31 23 16 – Unclassified Excavation.
22 6. Section 34 71 13 – Traffic Control

23 **1.2 PRICE AND PAYMENT PROCEDURES**

24 A. Measurement and Payment

25 1. Site Preparation

26 a. Measurement

- 27 1) Measured per lump sum of Site Preparation within the project limits, when
28 specifically required by the Contract Documents. Otherwise this item is
29 considered subsidiary to the various items bid.

30 b. Payment

- 31 1) The work performed and materials furnished in accordance with this item
32 and measured as provided under “Measurement” will be paid for at the unit
33 price bid for lump sum for “Site Preparation.”

34 c. The price bid shall include:

- 35 1) Full compensation for Site Preparation as specified by the Drawings
36 2) Tools, equipment, and labor and incidentals needed to execute work
37 3) Sawing
38 4) Grading and backfilling of holes
39 5) Excavation

- 1 6) Topsoil and sod limits of tree removal disturbance unless quantified
- 2 separately under another bid item
- 3 7) Tree and shrub protection for trees and shrubs to remain
- 4 8) Replace any tree designated to remain that is damaged during tree removal
- 5 9) Tree wound treatment material
- 6 10) Tree and shrub pruning
- 7 11) Disposal of debris, tree clippings, limbs, leaves, and pine needles removed
- 8 as part of pruning
- 9 12) Trunk Protection
- 10 a) Closed cell foam pad
- 11 b) Wood planks
- 12 c) Steel straps
- 13 13) Tree protection fence
- 14 a) Woven wire fence
- 15 b) T-Bar posts
- 16 c) One strand barbed wire fence
- 17 d) Tundra weight orange flagging
- 18 14) Remove, haul-off, and dispose of:
- 19 a) Trees, shrubbery, grass and all other vegetation not designated to
- 20 remain
- 21 b) Stumps, roots, brush, and logs
- 22 c) Abandoned utility pipes or conduits
- 23 d) Fence and fence posts if Fence Removal bid item is not used
- 24 e) Gravel, stone, or boulders, not including removal of gravel or stone
- 25 driveways, roads, or other driving surfaces.
- 26 f) Scrap metal
- 27 g) All rubbish or debris
- 28 h) All obstructions and objectionable material not specifically included in
- 29 another bid item

30 1.3 REFERENCES

- 31 A. Abbreviations and Acronyms
- 32 1. SWPPP – Storm Water Pollution Prevention Plan
- 33 2. MUTCD – Manual on Uniform Traffic Control Devices
- 34 3. pH – Potential of Hydrogen
- 35 4. ESA – Environmentally Sensitive Areas
- 36 B. Reference Standards
- 37 1. Reference standards cited in this Section refer to the current reference standard
- 38 published at the time of the latest revision date logged at the end of this Section
- 39 unless a date is specifically cited.
- 40 2. Tree Care Industry Association (TCIA) / American National Standards Institute
- 41 (ANSI):
- 42 a. A300, Tree, Shrub, and Other Woody Plant Management – Standard Practices
- 43 (Pruning).
- 44 3. National Arborist Association Pruning Standards
- 45 4. Texas Manual on Uniform Traffic Control Devices (TMUTCD).

1 5. City of Denton Development Code
2

1 **1.4 ADMINISTRATIVE REQUIREMENTS**

2 A. Disposal Letter

- 3 1. Provide the City with a Disposal Letter in accordance with Division 01.

4 B. Permits

- 5 1. For commercial and residential construction, a Clear and Grade Permit is required
6 to be obtained from City.
7 a. No excavation or embankment activities will be allowed without an executed
8 construction contract and an assigned City inspector.
9 b. Remove and replace any embanked soils if excavation and/or embankment
10 activities are performed prior to an executed construction contract and an
11 assigned City inspector at no cost to the City.
- 12 2. Tree Removal Permit in accordance with the City of Denton Development Code is
13 required.
- 14 3. Tree Inventory Plan prepared in accordance with the City of Denton Development
15 Code or as specified in the Drawings.
16 a. Provide Tree Inventory Plan sufficient for the purposes of obtaining a Tree
17 Removal Permit.
18 1) If insufficient, provide a Tree Inventory Plan that has been prepared by an
19 arborist or a registered landscape architect.
20 b. Provide the City with the correct documents for obtaining the Tree Removal
21 Permit.
- 22 4. SWPPP – Provide a SWPPP in accordance with Section 01 57 13.
- 23 5. ESA Compliance Review – Provide tree protective fencing in accordance with 01
24 57 13.

25 C. Sequencing

- 26 1. Sidewalk Construction
27 a. Where existing sidewalks are to be closed during Paving Removal activities:
28 1) Utilize pedestrian/sidewalk detour route specified in the Drawings
29 a) If no detour route is provided, submit a pedestrian/sidewalk detour
30 route that has been signed and sealed by a registered professional
31 engineer to the City for review.
32 b. The pedestrian/sidewalk detour route will be subsidiary to pertinent Traffic
33 Control items included with the project.
34 c. Install all sidewalk detours and closures in accordance with the TMUTCD,
35 State, and local guidelines.
36 d. Provide any traffic control devices in accordance with Section 34 71 13.

37 D. Pre-Site Clearing Meeting

- 38 1. Hold a site clearing meeting prior to performing any tasks included under Site
39 Clearing with City and appropriate representatives.
- 40 2. Clearly mark all:
41 a. Trees and shrubs to remain
42 b. Trees and shrubs to remove
43 c. Trees and shrubs to be pruned pre and post construction as specified in the
44 Drawings.

3. Have the SWPPP in place and inspected by Watershed Protection prior to Site Clearing activities.
4. Review Tree Inventory Plan as prepared for Tree Removal Permit or in the Drawings.
5. Confirm approval of the Tree Removal Permit.
6. Confirm trees and shrubs to be removed during pre-site clearing meeting
7. Confirm limits for Site Preparation during pre-site clearing meeting.

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Product Data:
 1. Tree wound treatment material product data
- B. Informational Submittal
 1. Certificates
 - a. Certified Arborist
 - 1) A company with a certified arborist is required when performing Tree and Shrub Pruning. Provide the certificate of the employee(s) from the company performing the pruning.
 2. Equipment Information
 - a. Submittal for all major equipment to include:
 - 1) Equipment name
 - 2) Size
 - 3) Intended use

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

- A. Certifications
 1. Tree and Shrub Pruning
 - a. A company with a certified arborist is required.
 - b. Provide the certificate of the employee(s) from the company performing the proposed pruning.
 2. Tree Inventory Plan or Tree Removal Permit
 - a. A certified arborist or a registered landscape architect is required.
 - b. Provide the certificate or license information of the employee(s) from the company preparing the plan and/or permit.

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD CONDITIONS

- A. An ISA Certified Arborist is required to be on site during all pruning activities.

1 B. Avoid pruning between February and July.

- 2 1. When pruning activities need to occur between February and July, use an approved
3 wound treatment material.

4 **1.12 WARRANTY [NOT USED]**

5 **PART 2 - PRODUCTS**

6 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

7 **2.2 PRODUCTS**

8 A. Tree Wound Treatment

9 B. Root Barrier

- 10 1. Century Products, or
11 2. Approved equal.

12 **2.3 ACCESSORIES [NOT USED]**

13 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

14 **PART 3 - EXECUTION [NOT USED]**

15 **3.1 INSTALLERS [NOT USED]**

16 **3.2 EXAMINATION [NOT USED]**

17 **3.3 PREPARATION [NOT USED]**

18 **3.4 EXECUTION**

19 A. General

20 1. Removal

21 a. Notify the City in writing when items required to be removed are:

- 22 1) Buried and not easily detected from the surface
23 2) Not specified in the Drawings.

24 2. Accept ownership and dispose of all materials removed within project limits.

25 3. Plug remaining ends of abandoned underground utilities over 3 inches in diameter
26 with concrete to form a tight closure.

27 4. Backfill, compact, and restore areas where items have been removed unless
28 otherwise specified in the Drawings.

29 5. Do not remove any trees unless directed by City or as specified in the Drawings.

30 6. Dispose of all trees within 24 hours of removal.

31 7. Dispose of all material in accordance with Federal, State, and local laws and
32 regulations.

33 B. Hazardous Material

- 34 1. This item does not include the removal and disposal of hazardous material.

- 1 2. Notify the City immediately if any hazardous or questionable materials not shown
- 2 in the Drawings are encountered.
- 3 3. Test, remove, and dispose of hazardous material in accordance with Division 01.

4 C. Tree and Shrub Protection

5 1. General

- 6 a. Perform all excavation and earthwork within the drip line of trees by hand.
- 7 b. Do not park or service equipment, store materials, or disturb the root area under
- 8 the branches of trees designated to remain.
- 9 c. Protect trees designated to remain during construction activity from:
 - 10 1) Compaction of root area by material storage
 - 11 2) Compaction by driving or parking within the drip-line
 - 12 3) Trunk damage by moving equipment, material storage, nailing, or bolting
 - 13 4) Girding by tying constrictive material to trees
 - 14 5) Poisoning by pouring solvents, gas, paint, etc. on or around trees and roots
 - 15 6) Cutting of roots 1.5 inch in diameter or more.
 - 16 7) Changes of soil pH factor by disposal of lime based material such as
 - 17 concrete within the drip line.
 - 18 8) Deformation or permanent damage to the trunk or limbs
- 19 d. Treatment of Damaged Limbs
 - 20 1) Saw clean all damaged areas and damaged limbs over 1 inch in diameter
 - 21 and treat with an approved wound treatment material.
 - 22 2) Treat with an approved wound treatment within 20 minutes of damaging
 - 23 the tree.

24 2. Tree Protection Fence

- 25 a. Install tree protection fence at the drip line around trees designated to be
- 26 protected in Drawings.
- 27 b. If field conditions do not allow fencing to be installed at the drip line, obtain
- 28 City approval to install tree protection fencing at a minimum of 8 feet from the
- 29 trunk.
- 30 c. Provide “Keep Out. Tree Preservation” signs for protected trees.
- 31 d. Use the following to construct the Tree Protection Fence unless otherwise
- 32 specified in Drawings
 - 33 1) Woven wire fence installed with T-Bar posts
 - 34 2) Space T-Bar posts at 10 feet on center
 - 35 3) Place one strand barbed wire along the top of poses.
 - 36 4) Tie tundra weight orange flagging that is 2 feet in length at 3 feet on center
 - 37 along the woven wire.
- 38 e. Do not install mulch within 12 inches of tree trunk.
- 39 f. Maintain existing grade within the tree protection fence unless otherwise
- 40 specified in Drawings.

41 3. Trunk Protection

- 42 a. Install Trunk Protection as specified in Drawings.
- 43 b. Use the following to construct the Trunk Protection unless otherwise specified
- 44 in Drawings
 - 45 1) Closed cell foam pad around trunk
 - 46 a) Extend the foam pad 6 inches above and 6 inches below the wood
 - 47 planks.

1 2) 4-foot-long planks that are 4 inches wide and 2 inches thick. Staple planks
2 together using steel straps on top of the foam pad and around the trunk.

3 c. Mulch:

4 1) Provide a 2-foot-wide mulch barrier around the tree trunk.

5 d. Provide “Caution. Tree Protection Area” orange tape around protected tree
6 trunks.

7 D. Tree and Shrub Removal

8 1. Remove tree stumps:

9 a. To 12 inches or more below the finished grade when tree is outside of the limits
10 of additional construction activities

11 b. To natural ground when area will be covered by 3 feet or more of embankment

12 c. Completely remove all stumps and roots when the area will be used as borrow
13 or embankment within the project limits.

14 2. Backfill holes with acceptable material and compact flush with surrounding area.

15 3. Install top soil and sod within limits of tree and shrub removal unless topsoil and
16 sod will be installed as part of the project.

17 E. Tree and Shrub Pruning

18 1. Equipment:

19 a. Use a Vermeer V-1550 RC root pruner or equal to perform all root pruning
20 operations.

21 2. Use tree wound treatment when pruning trees or shrubs during the months of
22 February to July.

23 3. Perform all tree, shrub, and root pruning under the supervision of a certified
24 arborist.

25 4. Prune lower limbs to prevent breakage and to permit access by construction
26 machinery during grading, field/site preparation, and clearing and grubbing
27 operations.

28 5. Prune limbs in accordance with ANSI A300 and National Arborist Association
29 Pruning Standards.

30 6. Prune shade trees in accordance with Class IV National Arborist Association
31 Pruning Standards

32 7. Make cuts as close as possible to the trunk or parent limb without cutting into the
33 limb collar or leaving a protruding stub.

34 8. Remove suckers to the height of the lowest main branch.

35 9. Disinfect tools with 70 percent methyl alcohol, benzalkonium chloride, cholérine
36 solution, or other approved disinfectant prior to:

37 a. Pruning oak trees

38 b. Cutting any tree of different type than previous tree pruned

39 10. Tree pruning on 2-inch diameter or larger trees:

40 a. Undercut one-third through the limb 8 to 12 inches from the main stem

41 b. Remove limb 4 to 6 inches outside the first cut.

42 c. Remove stub with an even flush cut so that the limb collar protrudes
43 approximately 0.5 inch

44 d. Do not allow limb to fall free if it could damage any other limbs or items

45 e. Treat exposed cuts with wound treatment within 20 minutes of the cut

1 **3.5 REPAIR**

- 2 A. Repair the following at no cost to the City if any damaged due to Site Clearing
3 activities:
- 4 1. Adjacent concrete or asphalt pavement
 - 5 2. Adjacent sidewalk
 - 6 3. Adjacent curb or curb and gutter
 - 7 4. Subgrade or base material
 - 8 5. Utility piping, structures, and appurtenances
 - 9 6. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe.
 - 10 7. Landscape beds or planters
 - 11 8. Decorative hardscape or landscape features
 - 12 9. Retaining walls
 - 13 10. Trees, shrubs, sodding, and topsoil
 - 14 11. Erosion control devices and ESA fences

15 B. Tree Replacement

- 16 1. Replace any existing tree permanently damaged by construction activities at no cost
17 to the City. Replace tree with an equal or larger caliper tree.

18 **3.6 RE-INSTALLATION [NOT USED]**

19 **3.7 FIELD QUALITY CONTROL [NOT USED]**

20 **3.8 SYSTEM STARTUP [NOT USED]**

21 **3.9 ADJUSTING [NOT USED]**

22 **3.10 CLEANING [NOT USED]**

23 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

24 **3.12 PROTECTION [NOT USED]**

25 **3.13 MAINTENANCE [NOT USED]**

26 **3.14 ATTACHMENTS [NOT USED]**

27 **END OF SECTION**

28

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 31 23 16
UNCLASSIFIED EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation for general site grading, street grading, and channel excavation.
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 02 41 13 – Selective Site Demolition.
 - 4. Section 02 41 15 – Paving Removal.
 - 5. Section 31 00 00 – Site Clearing.
 - 6. Section 31 24 00 – Embankments.
 - 7. Section 31 25 14 – Erosion and Sedimentation Controls.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Unclassified Excavation
 - a. Measurement
 - 1) Measured per cubic yard in its final position using the average end area method of Excavation performed. Limits of measurement shown in the Drawings.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per cubic yard for “Unclassified Excavation.”
 - c. The price bid shall include:
 - 1) Shrinkage and/or swelling factors. Contractor is responsible for determining factors and will not be compensated separately.
 - 2) Excavation of all materials within excavation limits
 - 3) Finishing parkways and medians
 - 4) Excavation
 - 5) Safety
 - 6) Dewatering
 - 7) Temporary drainage
 - 8) Drying
 - 9) Dust control
 - 10) Reworking or replacing over excavated material in rock cuts

- 1 11) Placement
- 2 12) Compaction
- 3 13) Loading, hauling, and unloading
- 4 14) Disposal of unsuitable and excess materials not used elsewhere on the job
- 5 site
- 6 15) Finishing slopes, ditches, and channels
- 7 16) Maintenance blading or scarifying the ground surface
- 8 17) Equipment
- 9 18) Tools, equipment, and labor and incidentals needed to execute work

10 **1.3 REFERENCES**

11 A. Abbreviations and Acronyms

- 12 1. ROW: Right-of-Way
- 13 2. SWPPP: Storm Water Pollution Prevention Plan

14 B. Classification:

- 15 1. All authorized excavation is considered unclassified and involves removal of all
- 16 materials necessary to complete excavation of the site. Any reference to rock,
- 17 limestone, or other material on the Drawings and/or this specification is solely for
- 18 the City and the Contractor's information and is not to be taken as an indication or
- 19 guarantee of classification of excavation. Payment will not be separated based on
- 20 classification of excavation unless expressly noted in the Drawings.

21 C. Reference Standards

- 22 1. Reference standards cited in this Section refer to the current reference standard
- 23 published at the time of the latest revision date logged at the end of this Section
- 24 unless a date is specifically cited.
- 25 a. Occupational Safety and Health Administration (OSHA):
- 26 1) Technical Manual Section 5.
- 27 2) Laws and Regulations Standard 1926, Safety and Health Regulations for
- 28 Construction.
- 29 b. City of Denton Development Code

30 **1.4 ADMINISTRATIVE REQUIREMENTS**

31 A. Permits

- 32 1. For commercial and residential construction, a Clear and Grade Permit is required.
- 33 a. No excavation or embankment activities will be allowed without an executed
- 34 construction contract and an assigned City inspector.
- 35 b. If the City determines or suspects excavation and/or embankment activities
- 36 have occurred prior to an executed contract and a City inspector assigned, all
- 37 construction activities could be suspended for at least 30 days pending the
- 38 results of the Pre-Earthwork meeting.
- 39 c. Any damages caused by early clearing and grading activities will be repaired at
- 40 no cost to the City.

41 B. Sequencing

- 42 1. Sidewalk Construction
- 43 a. Where existing sidewalks are to be closed during Paving Removal activities:
- 44 1) Utilize pedestrian/sidewalk detour route specified in the Drawings

- a) If no detour route is provided, submit a pedestrian/sidewalk detour route to City for review.
- b. The pedestrian/sidewalk detour route will be subsidiary to pertinent Traffic Control items included with the project.
- c. Install all sidewalk detours and closures in accordance with the TMUTCD, State, and local guidelines.
- d. Provide any traffic control devices in accordance with Section 34 71 13.

C. Pre-Earthwork Meeting

1. Hold a Pre-Earthwork meeting at the same time as the Pre-Site Clearing Meeting. Invite the City and appropriate representatives.
2. Clearly mark all the following items prior to the meeting:
 - a. All requirements for pre-site clearing meeting in accordance with 31 00 00.
 - b. Excavation limits
 - c. Cut/fill stakes
3. Submit means and methods for any rock cutting for review prior to the Pre-Earthwork Meeting.
4. Have the SWPPP in place and inspected by Watershed Protection in accordance with Section 01 57 13 prior to excavation activities.
5. Determine any site-specific constraints or concerns prior to meeting for review.

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Informational Submittal

1. Equipment Information
 - a. Submittal for all major equipment to include:
 - 1) Equipment name
 - 2) Size
 - 3) Intended use
2. Explosives, Blasting, and Rock Ripping
 - a. Submit storage locations and guidelines for using explosives.
 - b. For rock ripping and blasting, submit means and methods prior to Pre-Earthwork meeting for review.
 - c. Provide a list of personnel and employer who will be handling and using explosives. Provide reference information including previous projects and certifications proving explosive qualifications.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

A. Excavation Safety

1. Perform all excavations in a safe manner.

2. Comply with the requirements of OSHA 29 CFR part 1926 and state requirements when performing excavation, sheeting, and bracing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Secure and maintain a location to store the material prior to any excavation activities beginning in accordance with Section 01 66 00.
2. Store excavated material to be used in other areas within the right-of-way (ROW) or easement limits unless specifically disallowed in the Contract Documents.
 - a. If the Contract Documents do not allow the storage of excavated materials within ROW or easements, secure and maintain an adequate storage location off-site.
3. Store material and equipment in approved areas that are at least 30 feet from edge of road limits. Install erosion control fencing around staging areas.
4. For urban areas with limited staging areas, designate offsite location for storing and staging of materials and equipment. If this is not feasible, obtain approval from the City to stage and store materials within project site.
5. All offsite staging areas to be in accordance with SWPPP and Watershed Protection requirements. Offsite staging areas are considered part of the project site and will need to be included with the SWPPP and Watershed Protection review.
6. If excavated material is stored off-site:
 - a. Provide an authorized letter from property owner approving the storage of excavated materials.
 - b. Contractor is responsible for negotiating and coordinating with the property owner.
 - c. The City is not responsible for establishing an off-site location.
 - d. The City is not liable for any damage resulting in off-site storage of excavated materials.
7. Remove any excavated material not used in other areas within 48 hours of excavation activities.
8. Do not block drainage ways, inlets, or driveways with excavation activities or materials.
9. Provide erosion control in accordance with Section 31 25 14.
10. Store materials only in areas barricaded as provided in the traffic control plans or as approved by the City if excavation is performed during active traffic.
11. Do not store material within the drip line of any tree or in landscaped areas.
12. Install tree protection in accordance with Section 31 10 00.

1.11 FIELD CONDITIONS

A. Existing Conditions

1. Any data provided regarding subsurface conditions of excavated material is not intended as a representation or warranty of accuracy or continuity of proposed excavated material.
2. The City is not responsible for interpretations or conclusions made by the Contractor regarding the existing material to be excavated.

1 **1.12 WARRANTY [NOT USED]**

2 **PART 2 - PRODUCTS [NOT USED]**

3 **2.1 CITY-FURNISHED [NOT USED]**

4 **2.2 MATERIALS [NOT USED]**

5 **2.3 ACCESSORIES [NOT USED]**

6 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

7 **PART 3 - EXECUTION**

8 **3.1 INSTALLERS [NOT USED]**

9 **3.2 EXAMINATION [NOT USED]**

10 **3.3 PREPARATION**

11 A. Surface Preparation

- 12 1. If needed, provide temporary drainage to maintain positive drainage throughout
13 excavation activities. Any temporary drainage construction will be considered
14 subsidiary to excavation.
- 15 2. Dewatering and temporary storm drain activities will be considered part of the
16 SWPPP and Watershed Protection review and are required to be in accordance with
17 all requirements listed therein.

18 B. Demolition / Removal

- 19 1. Remove any existing pavement in accordance with Section 02 41 15 and 02 41 13.

20 **3.4 EXCAVATION**

21 A. General

- 22 1. Accept ownership of unsuitable or excess material and dispose of material off-site
23 in accordance with Federal, State, and local regulations. City is not responsible for
24 any disposed material or disposal activities.
- 25 2. Perform excavations while material to be excavated is dry aside from water applied
26 for dust control.
- 27 3. Contractor is responsible for the condition of the subgrade until the pavement is in
28 place.
- 29 4. Over-excavate and replace any portion of subgrade that becomes damaged or
30 unstable due to weather or construction activities prior to stabilizing the subgrade,
31 installing base material, or placing the pavement. This will be at no cost to the City.
- 32 5. Separate, remove, and dispose of unacceptable fill material as defined in Section 31
33 24 00 in accordance with Federal, State, and local regulations.
- 34 6. Maintain positive drainage in the excavated area to avoid damage to any existing
35 structures, proposed structures, and the roadway.

- 1
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7. Shape slopes to avoid loosening material below or outside the proposed grade.
 8. Remove and dispose of slides as directed.

1 B. Earth Cut

- 2 1. Excavate to finish grade or subgrade within acceptable subgrade tolerances.
3 2. Use approved embankment material compacted in accordance with 31 24 00 to
4 replace over-excavated material at no cost to City. Anticipated reasons for over
5 excavation can include, but are not limited to:
6 a. Excavation below an acceptable subgrade tolerance
7 b. Soils damaged due to weather or construction activities
8 3. Shape and compact subgrade in accordance with Section 31 24 00.
9 4. Subgrade Tolerances
10 a. Excavate to within 0.1 foot in all directions.
11 b. In areas of over excavation, provide fill material approved by the City at no cost
12 to City.

13 C. Rock Cut

- 14 1. Do not use dynamite or rock ripping within 500 feet of residences or commercial
15 development.
16 2. Blasting
17 a. Obtain City approval prior to any blasting.
18 b. Send notification at least 15 days in advance to all property owners within
19 1,000 feet of the blasting site.
20 c. Follow all OSHA regulations for explosives and blasting agents, including but
21 not limited to requirements in the OSHA Technical Manual Section 5, and
22 OSHA Laws and Regulations Standard 1926, Safety and Health Regulations for
23 Constructions.
24 d. Use only authorized workers with training, knowledge, or experience in the
25 field of transporting, storing, handling, and use of explosives.
26 1) Authorized workers also need to have working knowledge of State and
27 local laws and regulations pertaining to explosives.
28 e. If there are concerns that seismic vibrations may cause damage to adjacent
29 structures, provide:
30 1) A structural engineer to determine safe limits to prevent any damage.
31 2) All equipment, monitors, tools, and engineering design necessary at no cost
32 to the City.
33 f. Use blasting mats or other approved containment equipment to ensure that no
34 rocks or debris will be thrown into the air.
35 g. Comply with all City of Denton noise ordinances when blasting.
36 3. Excavate to finish grade or subgrade within acceptable subgrade tolerances.
37 4. For small pockets or thin layers, remove rock to at least 12-inches below subgrade.
38 5. Use approved embankment material compacted in accordance with 31 24 00 to
39 replace over excavated material at no cost to City.

40 D. Water for Construction

- 41 1. Provide water as needed for site preparation, compaction, dust control, and other
42 incidental activities in accordance with local requirements in accordance with
43 Section 01 35 13.
44

1 E. Dewatering

- 2 1. Dewatering is subsidiary to excavation and includes the installation and operation
3 of all pumping, bailing, well-pointing, sumps, and draining necessary to keep the
4 excavation free from groundwater, seepage water, water from storm drains,
5 wastewater collection systems, ditches, creeks, ponds, and other sources.
- 6 2. Keep channels, trenches, pits, and other low point excavations drained as much as
7 practical during construction at no cost to the City.
- 8 3. Construction will not be permitted in standing water.
- 9 4. Conform all discharge from dewatering activities to Federal, State, and local
10 requirements in a manner approved by the City.
- 11 5. Control outlet velocities from dewatering discharges to prevent erosion.

12 F. Excavated Material

- 13 1. Maintain safe and convenient access to private and public properties adjacent to
14 excavation activities unless specified in the Drawings. Obtain approval from the
15 City for maintenance of access methods.
- 16 2. Acceptable fill material may be used for embankment in accordance with 31 24 00.
- 17 3. Stockpile acceptable excavated materials on-site in accordance with Sections 31 10
18 00 and 31 24 00. Proper erosion control and BMPs to be utilized in accordance with
19 the Drawings, local guidelines, and approved by the City.

20 G. Methods of Excavation

- 21 1. Submit means and methods for review by the City prior for any method of
22 excavation that is not using traditional excavation methods.
- 23 2. Comply with all Federal, State, and local regulations when developing and
24 submitting for approval any alternative method.
- 25 3. If an alternative method is requested and approved after contract execution, perform
26 excavation at no additional cost to the City beyond the stated excavation unit price
27 in the bid form.

28 **3.5 REPAIR**

29 A. Repair the following at no cost to the City if any damage is caused due to excavation
30 activities:

- 31 1. Adjacent concrete or asphalt pavement to remain
- 32 2. Adjacent sidewalk to remain
- 33 3. Adjacent curb or curb and gutter to remain
- 34 4. Adjacent subgrade or base material to remain
- 35 5. Utility piping, structures, and appurtenances
- 36 6. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe.
- 37 7. Landscape beds or planters
- 38 8. Decorative hardscape or landscape features
- 39 9. Retaining walls

40 **3.6 RE-INSTALLATION [NOT USED]**

41 **3.7 SITE QUALITY CONTROL [NOT USED]**

- 1 **3.8 SYSTEM STARTUP [NOT USED]**
- 2 **3.9 ADJUSTING [NOT USED]**
- 3 **3.10 CLEANING [NOT USED]**
- 4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 5 **3.12 PROTECTION [NOT USED]**
- 6 **3.13 MAINTENANCE [NOT USED]**
- 7 **3.14 ATTACHMENTS [NOT USED]**

8 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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1 **SECTION 31 24 00**
2 **EMBANKMENT**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Furnishing, placing, and compacting approved soils for construction.

7 B. Deviations from this City of Denton Standard Specification:

- 8 1. None.

9 C. Related Specification Sections include but are not limited to:

- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
11 Contract.
12 2. Division 1 - General Requirements.
13 3. Section 31 10 00 – Site Clearing.
14 4. Section 31 25 14 – Erosion and Sedimentation Controls.

15 **1.2 PRICE AND PAYMENT PROCEDURES**

16 A. Measurement and Payment

17 1. Embankment

18 a. Measurement

- 19 1) Measured per cubic yard in its final position using the average end area
20 method of Embankment performed. Limits of measurement shown in the
21 Drawings.

22 b. Payment

- 23 1) The work performed in accordance with this item and measured as
24 provided under “Measurement” will be paid for at the unit price bid per
25 cubic yard for “Embankment.”

26 c. The price bid shall include:

- 27 1) Transporting or hauling material
28 2) Placing, compacting, and finishing Embankment
29 3) Construction Water
30 4) Dust Control
31 5) Proof Rolling
32 6) Disposal of excess materials
33 7) Reworking or replacement of undercut material

34 2. Select Fill Embankment

35 a. Measurement

- 36 1) Measured cubic yard in its final position using the average end area method
37 of Select Fill Embankment performed. Limits of measurement shown in the
38 Drawings.

39

- b. Payment
 - 1) The work performed in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per cubic yard for “Select Fill Embankment”.
- c. The price bid shall include:
 - 1) Transporting or hauling material
 - 2) Placing, compacting, and finishing Embankment
 - 3) Construction Water
 - 4) Dust Control
 - 5) Clean-up
 - 6) Proof Rolling
 - 7) Disposal of excess materials
 - 8) Reworking or replacement of undercut material

1.3 REFERENCES

A. Reference Standards

1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
2. ASTM Standards:
 - a. D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - b. D4318, Test Procedure for Determining Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - c. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - d. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Permits

1. For commercial and residential construction, a Clear and Grade Permit is required.
 - a. No excavation or embankment activities will be allowed without an executed construction contract and an assigned City inspector.
 - b. Any excavation or embankment activities performed prior to an executed construction contract and an assigned City inspector is subject to additional testing, compaction, and site requirements at no cost to the City.

B. Sequencing

1. Install all erosion control measures in accordance with Section 31 25 14 prior to commencing any earthwork activities.
2. Complete all site clearing in accordance with Section 31 10 00 prior to commencing any earthwork activities.

C. Pre-Earthwork Meeting

1. A Pre-Earthwork Meeting is not required for Capital Improvement projects.
2. Hold a Pre-Earthwork meeting at the same time as the Pre-Site Clearing Meeting. Invite the City and appropriate representatives.

3. Clearly mark all the following items prior to the meeting:
 - a. All requirements for pre-site clearing meeting in accordance with 31 10 00.
 - b. Excavation limits
 - c. Cut/fill stakes
4. Have the SWPPP in place and inspected by Watershed Protection in accordance with Section 01 57 13 prior to Excavation activities.
5. Determine any site-specific constraints or concerns prior to meeting for review.

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to commencement of any lime treating activities.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Information Submittal
 1. Equipment Information
 - a. Submittal for all major equipment to include:
 - 1) Equipment name
 - 2) Size
 - 3) Intended use

1.7 CLOSEOUT SUBMITTALS

- A. Test and Evaluation Reports
 1. All test reports generated during testing.

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 1. Secure and maintain a location to store the material in accordance with Section 01 66 00.
 2. Within Existing Rights-of-Way (ROW)
 - a. Store soil within existing ROW, easements, or temporary construction easements, unless specifically disallowed in the Contract Documents.
 - b. Do not block drainage ways, inlets, or driveways.
 - c. When the Work is performed in active traffic areas, store materials only in areas barricaded as provided in the traffic control plans.
 - d. In non-paved areas, do not store material on the root zone of any trees or in landscaped areas.
 3. Designated Storage Areas
 - a. If the Contract Documents do not allow the storage within the ROW, easement or temporary construction easement, secure and maintain an adequate storage location.
 - b. Provide an affidavit verifying rights have been secured to store the materials on private property.

c. Do not block drainage ways.

1.11 FIELD CONDITIONS

A. Ambient Conditions

1. Surface temperature must be at least 40°F and the ambient temperature must be 45°F and rising.
2. Do not install embankment during or shortly after rain events which prevent proper work placement of the material and compaction.
 - a. Prior to resuming compaction operations:
 - 1) Let soil dry to optimal density.
 - 2) Remove muddy material off the surface to expose firm and compacted materials.

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. General

1. Furnish material capable of forming a stable embankment.
2. Furnish material free from trees, stumps, roots, vegetation, or other deleterious materials.

B. Acceptable Fill Material

1. In-situ or imported soils classified as CL, CH, SC, or GC in accordance with ASTM D2487.
2. Free from deleterious materials, boulders over 6 inches in size, and organics.
3. Can be placed free from voids.
4. Has 20 percent passing the number 200 sieve.
5. Meets the requirements of Table 1.

Table 1 – Acceptable Fill Material Requirements

Property	Test Method	Specification Limit
Liquid Limit (LL)	Tex-104-E	≤ 50
Plasticity Index (PI)	Tex-106-E	≤ 35
Sulfate Limit	Tex-145-E	≤ 3000 ppm
Bar Linear Shrinkage	Tex-107-E	≥ 2

C. Blended Fill Material

1. In-situ soils classified as SP, SM, GP, or GM in accordance with ASTM D2487.
2. Blended with in-situ or imported Acceptable Fill material in accordance with the requirements of this Section.

3. Free from deleterious materials, boulders over 6 inches in size, and organics.
4. Has 20 percent passing the number 200 sieve.
5. Final blended product meets the requirements of Table 1.

D. Unacceptable Fill Material

1. In-situ soils classified as ML, MH, PT, OL, or OH in accordance with ASTM D2487

E. Select Fill Material

1. Classified as SC or CL in accordance with ASTM D2487
2. Free from deleterious materials, boulders over 6 inches in size, and organics.
3. Can be placed free from voids.
4. Has 20 percent passing the number 200 sieve.
5. Meets the requirements of Table 2.

Table 2 – Select Fill Material Requirements

Property	Test Method	Specification Limit
Liquid Limit (LL)	Tex-104-E	≤ 35
Plasticity Index (PI)	Tex-106-E	≤ 20
Sulfate Limit	Tex-145-E	≤ 2000 ppm
Bar Linear Shrinkage	Tex-107-E	≥ 2

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Borrow material shall be tested prior to delivery to the Site.

1. Provide Proctor Test results, Gradation, and Atterberg Limits for Borrow material from each source.
 - a. All testing listed above shall be performed in accordance with ASTM D698, D6913, and D4318 respectively.

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION

A. Protection of In-Place Conditions

1. Pavement
 - a. Conduct activities in such a way that does not damage existing pavement designated to remain.

- 1 b. Repair or replace any pavement damaged due to the negligence of the
2 contractor outside the limits designated for pavement removal at no additional
3 cost.
- 4 2. Trees
- 5 a. Flag and protect all trees designated to remain in accordance with Section 31 10
6 00.
- 7 b. Conduct embankments in a manner such that there is no damage to the tree
8 canopy.
- 9 c. Prune or trim tree limbs as specified in the Drawings or as directed by City.
- 10 1) Pruning or trimming may only be accomplished with equipment
11 specifically designed for tree pruning or trimming.
- 12 3. Above ground Structures
- 13 a. Protect all above ground structures adjacent to the construction.
- 14 B. Surface Preparation
- 15 1. Backfill stump holes or other small incidental excavations due to site clearing with
16 material of same properties as in-situ material.
- 17 2. Scarify base soil surface on which the embankment will be constructed to a
18 minimum depth of 6 inches.
- 19 3. Bench slopes before placing new material.

20 **3.4 EMBANKMENT**

- 21 A. General
- 22 1. Provide material type as specified in the Drawings.
- 23 2. Begin filling in the lowest section or the toe of the work area.
- 24 3. When fill is placed directly or upon older fill, remove debris and any loose material
25 and proof roll existing surface.
- 26 4. After spreading the loose lifts to required thickness and adjusting its moisture
27 content as necessary, simultaneously recompact scarified material with the placed
28 embankment material.
- 29 5. Compact material in loose lifts no greater than 8 inches.
- 30 6. Roll with enough passes to achieve the minimum required compaction.
- 31 7. Provide water sprinkled as necessary to achieve required moisture levels for
32 specified compaction.
- 33 8. Do not add additional lifts until the entire previous lift is properly compacted.
- 34 B. Surface Water Control
- 35 1. Grade surface horizontally but provide with sufficient longitudinal and transverse
36 slope to allow for runoff of surface water from every point.
- 37 2. Conduct fills so no obstruction to drainage from any other sections of fill is created.
- 38 3. Install temporary dewatering sumps in low areas during filling where excess
39 amounts of runoff collect.
- 40 4. Compact uniformly throughout. Keep surfaces of fill reasonably smooth and free
41 from humps and hollows that would prevent proper uniform compaction.
- 42 C. Earth Embankments

- 1 1. Construct embankments in successive layers, evenly distributing materials in
- 2 lengths suited for sprinkling and rolling.
- 3 2. Move the material dumped in piles or windrows by blading or by similar methods
- 4 and incorporate it into uniform layers.
- 5 3. Construct embankments in layers approximately parallel to the finished grade of the
- 6 street.
- 7 4. Featheredge or mix abutting layers of dissimilar material for at least 100 feet to
- 8 ensure no abrupt changes in the material.
- 9 5. Break down clods or lumps of material and mix embankment until a uniform
- 10 material is attained.
- 11 6. Establish grade and shape to the typical sections specified in the Drawings.
- 12 7. Maintain finished sections of embankment to the grade and compaction
- 13 requirements until the project is accepted.
- 14 D. Rock Embankments
- 15 1. Rock Embankments for roadways are only allowed when specified in the Drawings.
- 16 2. Construct rock embankments in successive layers for the full width of the roadway
- 17 cross-section with a depth of 18 inches or less.
- 18 3. The layer depth for large rock sizes shall not exceed a depth of 18 inches in any
- 19 case.
- 20 4. Fill voids created by the large stone matrix with smaller stones during the
- 21 placement and filling operations.
- 22 5. Ensure the depth of the embankment layer is greater than the maximum dimension
- 23 of any rock.
- 24 6. Do not place rock greater than 18 inches in its maximum dimension.
- 25 7. Do not place rock embankments in any location where future utilities are
- 26 anticipated.
- 27 8. Construct the final layer with graded material so the density and uniformity is in
- 28 accordance with compaction requirements.
- 29 E. Density Control
- 30 1. Determine maximum dry density and moisture content using ASTM D698 and
- 31 submit moisture-density curves to City for review.
- 32 2. Compact each lift to meet the following requirements:
- 33 a. For soils with a PI less than 35, compact to 98% of maximum dry density, plus
- 34 or minus 2%.
- 35 b. For soils with a PI greater than 35, compact to at least 98% of maximum dry
- 36 density.
- 37 F. Maintenance of Moisture and Reworking
- 38 1. Maintain the density and moisture content once all requirements are met.
- 39 2. For soils with a PI greater than 15, maintain the moisture content no lower than 4
- 40 percentage points below optimum.
- 41 3. Rework the material to obtain specified compaction when the material loses the
- 42 required stability, density, moisture, or finish.

- 1 4. Alter the compaction methods and procedures on subsequent work to obtain
2 specified density as directed by City.

3 **3.5 REPAIR**

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- 1 A. Repair the following at no cost to the City if any damage is caused due to Embankment
2 activities:
- 3 1. Adjacent concrete or asphalt pavement to remain
 - 4 2. Adjacent sidewalk to remain
 - 5 3. Adjacent curb or curb and gutter to remain
 - 6 4. Adjacent subgrade or base material to remain
 - 7 5. Utility pipes
 - 8 6. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe.
 - 9 7. Landscape beds or planters
 - 10 8. Decorative hardscape or landscape features
 - 11 9. Retaining walls

12 **3.6 RE-INSTALLATION [NOT USED]**

13 **3.7 FIELD QUALITY CONTROL**

14 A. Field Tests and Inspections

- 15 1. Proctors
 - 16 a. Perform Proctor Tests in accordance with ASTM D698.
 - 17 b. Notify the City if the characteristic of the soil changes.
 - 18 c. Perform new Proctors for varying soils:
 - 19 1) When indicated in the geotechnical investigation in the Appendix
 - 20 2) If notified by the Engineer
 - 21 3) At the convenience of the City
 - 22 d. For Embankments where different soil types are present and are blended, the
 - 23 Proctors shall be based on the mixture of those soils.
- 24 2. Proof Rolling
 - 25 a. City must be on-site during proof rolling operations.
 - 26 b. Make at least two passes with the proof roller, offsetting each trip by at most
 - 27 one tire width.
 - 28 c. Correct areas of rutting or pumping and unstable or non-uniform areas in
 - 29 accordance with this Section.
- 30 3. Density Testing of Embankments
 - 31 a. Density Testing shall be in accordance with ASTM D6938.
 - 32 b. City must be on site during density testing.
 - 33 c. For Embankments under future pavement:
 - 34 1) Perform density testing twice per working day when compaction operations
 - 35 are being conducted.
 - 36 2) Measure density every 100' along corridor.
 - 37 3) City to determine density testing locations.
 - 38 d. For Embankments not under future pavement or structures:
 - 39 1) The City will perform density testing once per working day when
 - 40 compaction operations are being conducted.
 - 41 2) Measure density every 250' along embankment.
 - 42 3) City to determine density testing locations.
 - 43 e. Test reports shall include:
 - 44 1) Location of test by station number

- 1 2) Time and date of test
- 2 3) Depth of testing
- 3 4) Field moisture
- 4 5) Dry density
- 5 6) Proctor identifier
- 6 7) Percent Proctor Density

7 B. Non-Conforming Work

- 8 1. All non-conforming work shall be removed and replaced at no additional cost to the
- 9 City.

10 **3.8 SYSTEM STARTUP [NOT USED]**

11 **3.9 ADJUSTING [NOT USED]**

12 **3.10 CLEANING [NOT USED]**

13 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

14 **3.12 PROTECTION [NOT USED]**

15 **3.13 MAINTENANCE [NOT USED]**

16 **3.14 ATTACHMENTS [NOT USED]**

17 **END OF SECTION**

18

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

19

SECTION 31 25 14
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Installation and maintenance of temporary control measures necessary to prevent and control soil erosion, sedimentation, and water pollution.

B. Deviations from this City of Denton Standard Specification:

1. None.

C. Related Specification Sections include but are not limited to:

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 - General Requirements.
3. Section 32 05 26 – Aggregates for Exterior Improvements.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Silt Fence

a. Measurement

- 1) Measured per linear foot of Silt Fence installed.

b. Payment

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Silt Fence” installed.

c. The price bid shall include:

- 1) Furnishing and installing Silt Fence as specified by the Drawings
- 2) Posts
- 3) Filter fabric
- 4) Net reinforcement
- 5) Fasteners
- 6) Stone overflows
- 7) Safety caps
- 8) Cleaning
- 9) Disposal of silt
- 10) Repair of damaged Silt Fence

2. Check Dam

a. Measurement

- 1) Measured per linear foot of Check Dam installed.

b. Payment

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Check Dam” installed.

- 1 c. The price bid shall include:
 - 2 1) Furnishing and installing Check Dam as specified by the Drawings
 - 3 2) Aggregate, wire reinforcement, and filter fabric
 - 4 3) Excavation
 - 5 4) Loading, unloading, hauling, and storing
 - 6 5) Cleaning
 - 7 6) Disposal of silt
 - 8 7) Repair of damaged Check Dam
- 9 3. Organic Filter Tube
 - 10 a. Measurement
 - 11 1) Measured per linear foot of Organic Filter Tube installed.
 - 12 b. Payment
 - 13 1) The work performed and materials furnished in accordance with this item
 - 14 and measured as provided under “Measurement” will be paid for at the unit
 - 15 price bid per linear foot for “Organic Filter Tube” installed.
 - 16 c. The price bid shall include:
 - 17 1) Furnishing and installing Organic Filter Tube as specified by the Drawings
 - 18 2) Containment mesh
 - 19 3) Core material
 - 20 4) Posts
 - 21 5) Rock bags
 - 22 6) Cleaning
 - 23 7) Disposal of silt
 - 24 8) Repair of damaged Organic Filter Tube
- 25 4. Inlet Protection
 - 26 a. Measurement
 - 27 1) Measured per each of Inlet Protection installed.
 - 28 b. Payment
 - 29 1) The work performed and materials furnished in accordance with this item
 - 30 and measured as provided under “Measurement” will be paid for at the unit
 - 31 price bid per each for “Inlet Protection” installed.
 - 32 c. The price bid shall include:
 - 33 1) Furnishing and installing Inlet Protection as specified by the Drawings
 - 34 2) All items pertaining to hog wire, organic filter tubes or rock bags for
 - 35 erosion control as needed
 - 36 3) Loading, unloading, hauling, and storing
 - 37 4) Cleaning
 - 38 5) Disposal of silt
 - 39 6) Repair of damaged Inlet Protection items
- 40 5. Erosion Control Blanket
 - 41 a. Measurement
 - 42 1) Measured per square yard of Erosion Control Blanket installed.
 - 43 b. Payment
 - 44 1) The work performed and materials furnished in accordance with this item
 - 45 and measured as provided under “Measurement” will be paid for at the unit
 - 46 price bid per square yard for “Erosion Control Blanket” installed.
 - 47 c. The price bid shall include:

- 1) Furnishing and installing Erosion Control Blanket as specified by the Drawings
 - 2) Blanket and staples
 - 3) Loading, unloading, hauling, and storing
 - 4) Cleaning
 - 5) Disposal of silt
 - 6) Repair of damaged Erosion Control Blanket
6. Stabilized Construction Exit
- a. Measurement
 - 1) This item is considered subsidiary to the various items bid.
 - b. Payment
 - 1) The work performed and the materials furnished in accordance with this item are subsidiary to the various items bid and no other compensation will be allowed.
7. Mulching
- a. Measurement
 - 1) Measured square yard of Mulching installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid per square yard for "Mulching" installed.
 - c. The price bid shall include:
 - 1) Furnishing and installing Mulching as specified by the Drawings
 - 2) Loading, unloading, hauling, and storing
8. Pipe Inlet Sediment Trap
- a. Measurement
 - 1) Measured per each Pipe Inlet Sediment Trap installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid per each for "Pipe Inlet Sediment Trap" installed.
 - c. The price bid shall include:
 - 1) Furnishing and installing Pipe Inlet Sediment Trap as specified by the Drawings
 - 2) Filter stone
 - 3) Loading, unloading, hauling, and storing
 - 4) Cleaning
 - 5) Disposal of silt
 - 6) Repair of damaged Pipe Inlet Sediment Traps
9. Stone Outlet Sediment Trap
- a. Measurement
 - 1) Measured per each Stone Outlet Sediment Trap installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid per each for "Stone Outlet Sediment Trap" installed.
 - c. The price bid shall include:

- 1) Furnishing and installing Stone Outlet Sediment Trap as specified by the Drawings
 - 2) Filter stone
 - 3) Loading, unloading, hauling, and storing
 - 4) Cleaning
 - 5) Disposal of silt
 - 6) Repair of damaged Stone Outlet Sediment Traps
10. Turf Reinforcement Mat
- a. Measurement
 - 1) Measured square yard of Turf Reinforcement Mat installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard for “Turf Reinforcement Mat” installed.
 - c. The price bid shall include:
 - 1) Furnishing and installing Turf Reinforcement Mat as specified by the Drawings
 - 2) Loading, unloading, hauling, and storing
 - 3) Cleaning
 - 4) Disposal of silt
 - 5) Repair of damaged Pipe Inlet Sediment Traps items
11. Dewatering Controls
- a. Measurement
 - 1) This item is considered subsidiary to the various items bid.
 - b. Payment
 - 1) The work performed and the materials furnished in accordance with this item are subsidiary to the various items bid and no other compensation will be allowed.
12. Storm Water Pollution Prevention Device Installation
- a. Measurement
 - 1) Measurement for this item shall be by lump sum.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item shall be paid for at the lump sum price bid for all “Storm Water Pollution Prevention Device Installation”.
 - c. The price bid shall include:
 - 1) Furnishing and installing all items under Storm Water Pollution Prevention Device Installation as specified by the Drawings
 - 2) Excavation
 - 3) Loading, unloading, hauling, and storing
 - 4) Cleaning
 - 5) Disposal of silt
 - 6) Repair of damaged Storm Water Pollution Prevention Devices
13. Remove Storm Water Pollution Prevention Devices
- a. Measurement
 - 1) Measurement for this item shall be by lump sum.
 - b. Payment

- 1) The work performed and materials furnished in accordance with this item shall be paid for at the lump sum price bid for all “Remove Storm Water Pollution Prevention Devices.”
- c. The price bid shall include:
 - 1) Removing all items previously installed as part of the Storm Water Pollution Prevention Plan as specified by the Drawings
 - 2) Loading, unloading, and hauling
 - 3) Cleaning
 - 4) Disposal of silt

1.3 REFERENCES

A. Abbreviations and Acronyms

1. Environmentally Sensitive Area: ESA

B. Reference Standards

1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
2. City of Denton, Stormwater Design Criteria Manual
3. North Central Texas Council of Governments (NCTCOG) Integrated Stormwater Management (iSWM) Technical Manual.
4. Texas Department of Transportation, Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (TxDOT):
 - a. Item 169, Soil Retention Blankets.
5. Texas Department of Transportation (TxDOT), Departmental Material Specifications (DMS):
 - a. DMS-6200, Filter Fabric.
 - b. DMS-6230, Temporary Sediment Control Fence Fabric.
 - c. DMS-6370, Erosion Control Blankets.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Sequencing

1. Ensure erosion control measures are fully installed prior to any earth disturbing activities begin.
2. Contact Watershed Protection division for initial inspection prior to any earth disturbing activities.
 - a. Joetta Dailey Joetta.dailey@cityofdenton.com (940) 349-7153 or Zachary Peterson zachary.peterson@cityofdenton.com (940) 349-7123, for an initial inspection.
 - 1) Upon installation of ESA protection, if applicable, coordinate with Christi Upton Christi.upton@cityofdenton.com (940) 349-7141 in addition to those listed above.
3. On phased projects, final stabilization shall be completed and Erosion and Sediment Control devices removed from each phase as construction is completed.

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.

B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Storm Water Pollution Prevention Plan (SWPPP) submittals in accordance with Section 01 57 13.

B. Product Data

1. Provide product data from each manufacturer supplying Erosion and Sediment Control devices and accessories.
2. Product data sheets for all products to include:
 - a. Manufacturer name
 - b. Date
 - c. Material description
 - d. Point of delivery
 - e. Data and test results as specified in this Section
 - f. Manufacturer Recommended Storing Data, if applicable
 - g. Application Recommendations, if applicable

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Secure and maintain a location to store the material in accordance with Section 01 66 00.
2. Store all storm water pollution prevention materials in accordance with manufacturer's recommendations.

1.11 SITE CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-SUPPLIED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Silt Fence

1. Fabric
 - a. Provide fabric in accordance with the following criteria:

Property	Test Method	Specification Limit
Tensile Strength	ASTM D4632	90-lbs
Puncture Rating	ASTM D4833	60-lbs
Mullen Burst Rating	ASTM D3796	280-psi

Apparent Opening Size	ASTM D4751	Sieve No. 30 to No. 100
Ultraviolet Resistance	ASTM D4355	70 percent min

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- 2. Posts
 - a. Provide steel T-section or L-section posts, 1.3 pounds per linear foot, and 4 feet in length minimum.
 - b. Provide plastic caps on all steel posts in areas exposed to pedestrian traffic.
 - c. Wood posts may be approved by City if project duration is expected to be less than 90 days.
- 3. Net Reinforcement
 - a. Provide net reinforcement of at least 12 gauge galvanized welded wire mesh, with a maximum opening size of 2x2 inches.
- 4. Stone Overflows
 - a. Provide 1 1/2 inch washed stone aggregate in accordance with Section 32 05 26.

B. Check Dam

- 1. Aggregate
 - a. Provide 3 to 6 inch aggregate in accordance with Section 32 05 26 for check dam heights of 24 inches or less.
 - b. Provide 4 to 8 inch aggregate in accordance with Section 32 05 26 for check dam greater than 24 inches in height.
- 2. Wire
 - a. If required, provide mesh consisting of minimum 20 gauge galvanized wire.
- 3. Fabric
 - a. For check dams greater than 18 inches in height, provide filter fabric in accordance with the following criteria:

Property	Test Method	Specification Limit
Tensile Strength	ASTM D4632	250-lbs
Puncture Rating	ASTM D4833	135-lbs
Mullen Burst Rating	ASTM D3796	420-psi
Apparent Opening Size	ASTM D4751	Sieve No. 20 max
Ultraviolet Resistance	ASTM D4355	20 percent min

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C. Organic Filter Tube

- 1. Containment Mesh
 - a. Provide biodegradable, photodegradable, or recyclable containment mesh with a minimum rated life of one year under normal site conditions, such as burlap, twine, UV photodegradable plastic, or polyester.
 - 1) Obtain approval from the City for use of any other material.
 - b. Provide recyclable containment mesh for temporary organic filter tube installation.
 - c. Provide biodegradable or photodegradable containment mesh when organic filter tube will remain in place as part of vegetative system.
- 2. Core Material

- 1 a. Provide biodegradable or recyclable core material such as compost, mulch, or
- 2 coir.
- 3 1) Obtain approval from the City for use of any other material.
- 4 3. Posts
- 5 a. Provide steel T-section or L-section posts, 1.3 pounds per linear foot or 2
- 6 inches by 2 inches wooden posts.
- 7 b. Provide posts at least 6 inches longer than the outside diameter of the Organic
- 8 Filter Tube.

9 D. Inlet Protection

- 10 1. Provide Inlet Protection comprised of Organic Filter Tubes or rock bags for erosion
- 11 control in accordance with this Section.

12 E. Erosion Control Blanket

- 13 1. Blanket
- 14 a. In accordance with DMS 6370.
- 15 2. Staples
- 16 a. In accordance with the Erosion Control Blanket manufacturer
- 17 recommendations.

18 F. Stabilized Construction Exit

- 19 1. Aggregate
- 20 a. Provide 3 to 6 inch aggregate in accordance with Section 32 05 26.

21 G. Mulching

- 22 1. Provide type of organic mulching as specified in the Drawings.

23 H. Pipe Inlet Sediment Trap

- 24 1. Riprap
- 25 a. Provide 6 to 12 inch Dry Stone Riprap in accordance with Section 31 37 00.
- 26 2. Filter Stone
- 27 a. Provide 1 1/2 inch washed stone aggregate in accordance with Section 32 05
- 28 26.
- 29 3. Wire
- 30 a. Provide mesh consisting of minimum 20 gauge galvanized wire with 1/2 inch
- 31 by 1/2 inch openings.
- 32 4. Fabric
- 33 a. Provide Filter Fabric meeting the following criteria:
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Property	Test Method	Specification Limit
Tensile Strength	ASTM D4632	250-lbs
Puncture Rating	ASTM D4833	135-lbs
Mullen Burst Rating	ASTM D3796	420-psi
Apparent Opening Size	ASTM D4751	Sieve No. 20 max
Ultraviolet Resistance	ASTM D4355	20 percent min

- 35
- 36 5. Concrete Block
- 37 a. Provide standard 8-inch x 8-inch x 16-inch concrete masonry units in
- 38 accordance with ASTM C139.

I. Stone Outlet Sediment Trap

1. Riprap
 - a. Provide 6 to 12 inch Dry Stone Riprap in accordance with Section 31 37 00.
2. Filter Stone
 - a. Provide 1 1/2 inch washed stone aggregate in accordance with Section 32 05 26.
3. Fabric
 - a. Provide Filter Fabric in accordance with the following criteria:

Property	Test Method	Specification Limit
Tensile Strength	ASTM D4632	250-lbs
Puncture Rating	ASTM D4833	135-lbs
Mullen Burst Rating	ASTM D3796	420-psi
Apparent Opening Size	ASTM D4751	Sieve No. 20 max
Ultraviolet Resistance	ASTM D4355	20 percent min

J. Turf Reinforcement Mat

1. Provide Turf Reinforcement Mats in accordance with TxDOT Item 169 Approved Products List, *Erosion Control Approved Products* and in accordance with the following criteria:

Property	Test Method	Specification Limit
Minimum Thickness	ASTM D6525	0.25 in
Ultraviolet Resistance	ASTM D4355	80 percent
Tensile Strength	ASTM D6818	175 lbs/ft

K. Dewatering Controls

1. Sediment Filter Bag
 - a. Provide sediment filter bags made of non-woven, needle-punched, geotextile that meets the following criteria:

Property	Test Method	Specification Limit
Tensile Strength	ASTM D4632	250-lbs
Puncture Rating	ASTM D4833	135-lbs
Mullen Burst Rating	ASTM D3796	420-psi
Ultraviolet Resistance	ASTM D4355	20 percent min
Water Flow Rate	ASTM D4491	85 to 110 gpm/ft ²

2. Temporary Sediment Tank
 - a. Provide compartmented container with a storage volume equal to 1 cubic foot for each gallon per minute of pump discharge capacity.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION**

5 A. General

- 6 1. Remove trees, brush, stumps, and other objectionable material that will interfere
7 with the construction of the erosion control measure.

8 B. Erosion Control Blanket

- 9 1. Remove rocks, dirt clods, stumps, and other objectionable material that will prevent
10 the mat from lying in direct contact with the soil.

11 C. Mulching

- 12 1. Fertilize and treat soil prior to mulching installation when used with final
13 vegetation.
14 a. Fertilization and soil treatment are not required when using mulching with
15 hydroseeding or when seed is spread during winter months.

16 D. Turf Reinforcement Mat

- 17 1. Remove rocks, dirt clods, stumps, and other objectionable material that will prevent
18 the mat from lying in direct contact with the soil.

19 **3.4 INSTALLATION**

20 A. Silt Fence

- 21 1. Provide silt fence near the downstream perimeter of a disturbed area to intercept
22 sediment from sheet flow.
23 2. Install posts 18 inches deep, maximum 6 feet on center.
24 3. Dig 6-inch x 6-inch trench on uphill side of fence and embed fabric and wire mesh.
25 Backfill the trench.
26 4. Attach net reinforcement to posts with clips for steel posts or staples for wood posts
27 in at least four equally spaced locations per post.
28 5. Fasten fabric to top of net reinforcement at a maximum spacing of 15 inches.
29 6. Locate splices in fabric at a post and provide a 3-foot overlap ensuring no leakage
30 or bypass.
31 7. Install stone overflow structures at low points or spaced at approximately 300 feet if
32 there is no apparent low point.
33 8. Turn last 10 feet of Silt Fence slightly uphill to prevent bypass.
34 9. Repair or replace any posts, net reinforcement, or fabric that are bent, torn, or
35 otherwise unable to function as intended in accordance with this Section.

36 B. Check Dam

- 37 1. Place the aggregate to the lines, height, and slopes specified in the Drawings.
38 2. Place Check Dams perpendicular to the direction of flow.

39 C. Organic Filter Tube

- 1 1. Install Organic Filter Tubes near the downstream perimeter of a disturbed area to
2 intercept sediment from sheet flow.
- 3 2. When placed on soil, excavate a 1-inch to 2-inch deep bedding trench along the
4 length of the Organic Filter Tubes.
- 5 3. Secure Organic Filter Tubes using posts to prevent displacement as a result of
6 normal rain events, damage to the logs, and flow from penetrating under the logs.
7 a. Rock bags may be used in place of posts on paved surfaces.
- 8 4. Overlap ends of Organic Filter Tubes by at least 18 inches and secure ends together
9 preventing gaps from forming.
- 10 5. Turn last 10 feet of Organic Filter Tubes slightly uphill to prevent bypass.

11 D. Inlet Protection

- 12 1. Install prefabricated inlet protection systems in accordance with manufacturer's
13 instructions.
- 14 2. Install Organic Filter Tubes, rock bags, and filter fabric as specified in the
15 Drawings and in accordance with this Section.
- 16 3. Install inlet protection systems to provide 2-inch overflow capability to allow storm
17 water overflow during extreme storm events or when filter media on protection
18 device clogs.

19 E. Erosion Control Blanket

- 20 1. Use an Erosion Control Blanket anywhere seeding is to be used and the slope is
21 steeper than a 6:1 slope.
- 22 2. Use Turf Reinforcement Mat when stabilizing slopes of 2:1 or steeper.
- 23 3. Provide blanket on sod locations only when specified in the Drawings.
- 24 4. Dig 6 inch trench along the entire perimeter of the installation area.
- 25 5. Lay Erosion Control Blanket into trench and backfill with compacted soil.
- 26 6. Fasten Erosion Control Blanket in accordance with manufacturer's instructions.
- 27 7. Ensure staples are installed parallel to the direction of flow.
- 28 8. Overlap ends of Erosion Control Blanket by a minimum of 3 feet, and longitudinal
29 edges by 6 inches.
- 30 9. Staple Erosion Control Blanket at all critical channel points and all overlaps.
- 31 10. ECBs shall be installed vertically down slope (across contours) on cut/fill slopes
32 and embankments and along contours (parallel to flow) in swales and drainage
33 ditches.
- 34 11. Unless the ECB is seeded to establish vegetation, perimeter applications shall be
35 limited to thirty feet wide drainage areas (I.e. linear construction projects) for an 8
36 feet width of ECB.

37 F. Stabilized Construction Exit

- 38 1. Install stabilized construction exit as specified in the Drawings.
- 39 2. Install stabilized construction exits at any point where traffic will be leaving a
40 construction site to or from a street, alley, sidewalk, or parking area.
- 41 3. Slope stabilized construction exit away from offsite paved surfaces or incorporate a
42 drainage swale to prevent runoff from leaving the construction site.

- 1 4. Do not place stabilized construction exits at the lowest point on the construction site
2 or on top of utility lines.
- 3 5. Minimum width of 15 feet for one-way and 20 feet for two-way.
- 4 G. Mulching
- 5 1. Spread organic mulch by hand or mechanical means providing complete, uniform
6 coverage of the specified area.
- 7 2. Install mulching to a thickness between 1 to 2 inches.
- 8 3. Anchor mulching by application of fiber mulch binder, synthetic mulch binder,
9 using a tractor-drawn crimper to punch into the soil, or by placing netting above the
10 mulch and stapled into the ground when placed on slopes of 3:1 or steeper.
- 11 4. Do not use mulching on slopes of 1.5:1 or steeper.
- 12 H. Pipe Inlet Sediment Trap
- 13 1. Install pipe inlet sediment trap as specified in the Drawings.
- 14 2. Provide a stormwater and sediment storage area upslope of the pipe inlet sediment
15 trap to a minimum volume equal to the runoff calculated from the temporary
16 control design storm.
- 17 3. Provide side slopes surrounding the storage area at 2:1 or flatter.
- 18 4. Install the pipe inlet sediment trap to a maximum height of half the inlet pipe
19 diameter.
- 20 5. Install pipe inlet sediment trap to provide 2-inch overflow capability to allow storm
21 water overflow during extreme storm events or when filter media on protection
22 device clogs.
- 23 I. Stone Outlet Sediment Trap
- 24 1. Install stone outlet sediment trap as specified in the Drawings.
- 25 2. Provide a stormwater and sediment storage area upslope of the pipe inlet sediment
26 trap to a minimum volume equal to the runoff calculated from the temporary
27 control design storm.
- 28 3. Install the pipe inlet sediment trap to a maximum height of half the inlet pipe
29 diameter.
- 30 4. Grade side slopes surrounding the storage area at 2:1 or flatter.
- 31 5. Install pipe inlet sediment trap to provide 2-inch overflow capability to allow storm
32 water overflow during extreme storm events or when filter media on protection
33 device clogs.
- 34 J. Turf Reinforcement Mat
- 35 1. Install turf reinforcement mats as specified in the Drawings and manufacturer's
36 recommendations.
- 37 2. Install turf reinforcement mats immediately after completing grading of the slope or
38 channel, and at most within 14 days after completing the grading.
- 39 3. Install turf reinforcement mats vertically down slope on steep cut/fill slopes,
40 embankments, and steep channel slopes above the water surface level.
- 41 4. Install turf reinforcement mats horizontally (parallel to flow) for channel slopes
42 below the water surface level.

- 1 5. Dig 6 inch trench along the entire perimeter of the installation area.
- 2 6. Lay turf reinforcement mat into trench and backfill with compacted soil.
- 3 7. Fasten turf reinforcement mat in accordance with manufacturer's instructions.
- 4 8. Ensure staples are installed parallel to the direction of flow.
- 5 9. Overlap ends of turf reinforcement mat by a minimum of 3 feet, and longitudinal
- 6 edges by 6 inches.
- 7 10. Staple turf reinforcement mat at all critical channel points and all overlaps.

8 **3.5 REPAIR**

- 9 1. Repair any controls determined to no longer be functioning as intended in
- 10 accordance with this Section.
- 11 2. Repair devices as soon as exposed ground has dried sufficiently to prevent further
- 12 damage from equipment operations needed for repairs.

13 **3.6 RE-INSTALLATION [NOT USED]**

14 **3.7 FIELD QUALITY CONTROL**

15 A. Field Inspections

- 16 1. Inspect all storm water pollution prevention controls at least once every 7 calendar
- 17 days with City Watershed Protection Division.
- 18 2. Inspect dewatering pumps and sediment controls hourly while pumps are in
- 19 operation.

20 **3.8 SYSTEM STARTUP [NOT USED]**

21 **3.9 ADJUSTING [NOT USED]**

22 **3.10 CLEANING [NOT USED]**

23 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

24 **3.12 PROTECTION [NOT USED]**

25 **3.13 MAINTENANCE**

26 A. General

- 27 1. If a storm water pollution prevention control ceases to function as intended, repair
- 28 and replace the device or any portions necessary. Repeated failure indicates a
- 29 device is insufficient and additional or different Erosion and Sediment Control
- 30 devices must be selected.
- 31 2. Remove sediment, debris, and litter from all devices as necessary to maintain
- 32 intended operation.
- 33 3. Continue maintenance of all erosion and sediment control devices until vegetative
- 34 cover reaches 70 percent density, as determined by the City.

35 B. Check Dam

- 36 1. Remove silt when it reaches a depth equal to one-third the height of the dam or one
- 37 foot, whichever is less.

38 C. Dewatering Controls

- 1 1. Repair areas eroded due to dewatering pumping and install erosion control devices
2 to prevent further erosion.
3 2. Clean sediment tanks when they become half full of sediment.

4 **3.14 ATTACHMENTS [NOT USED]**

5

6

7

END OF SECTION

8

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

9

1 **SECTION 31 34 19**
2 **GEOSYNTHETIC SOIL REINFORCEMENT**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

6 1. Geosynthetic Soil Reinforcements.

7 B. Deviations from this City of Denton Standard Specification:

8 1. None.

9 C. Related Specification Sections include but are not limited to:

10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
11 Contract.

12 2. Division 1 - General Requirements.

13 **1.2 PRICE AND PAYMENT PROCEDURES**

14 A. Measurement and Payment

15 1. Geosynthetic Soil Reinforcement

16 a. Measurement

17 1) Measured per the square yard of Geosynthetic Soil Reinforcement installed.

18 b. Payment

19 1) The work performed and materials furnished in accordance with this item
20 and measured as provided under "Measurement" will be paid for at the unit
21 price bid per square yard for "Geosynthetic Soil Reinforcement" installed.

22 c. The price bid shall include:

23 1) Furnishing and installing Geosynthetic Soil Reinforcement

24 2) Loading

25 3) Unloading

26 4) Hauling

27 5) Disposal of excess materials

28 6) Clean-up

29 **1.3 REFERENCES**

30 A. Reference Standards

31 1. Reference standards cited in this Section refer to the current reference standard
32 published at the time of the latest revision date logged at the end of this Section
33 unless a date is specifically cited.

34 2. American Society for Testing and Materials (ASTM):

35 a. D4632, Grab Breaking Load and Elongation of Geotextiles

36 b. D276, Identification of Fibers in Textiles

37 c. D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to
38 Light, Moisture and Heat in a Xenon Arc-Type Apparatus

39 3. TXDOT Test Procedures:

1 a. Tex-616-J, Construction Fabrics

2 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

3 **1.5 SUBMITTALS**

4 A. Submittals shall be in accordance with Section 01 33 00.

5 B. All submittals shall be approved by the City prior to delivery.

6 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

7 A. Product Data

8 1. Name

9 2. Manufacturer

10 3. Chemical composition

11 4. Material Properties

12 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

13 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

14 **1.9 QUALITY ASSURANCE [NOT USED]**

15 **1.10 DELIVERY, STORAGE, AND HANDLING**

16 A. Storage and Handling Requirements

17 1. Secure and maintain a location to store the material in accordance with Section 01
18 66 00.

19 **1.11 FIELD CONDITIONS**

20 A. Ambient Conditions

21 1. Install Geosynthetic Soil Reinforcement under appropriate ambient and soil
22 conditions in accordance with manufacturer's recommendations.

23 **1.12 WARRANTY [NOT USED]**

24 **PART 2 - PRODUCTS**

25 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

26 **2.2 MATERIALS**

27 A. Manufacturers

28 1. Manufacturer List

29 a. Geosynthetic Soil Reinforcement

30 1) TriAx Geogrid by Tensar, or

31 2) Approved equal

32 2. Substitution requests for manufacturers or models not indicated above shall be
33 processed in accordance with Section 01 25 00.

34 B. Material Requirements

35

1 1. Provide Geosynthetic Soil Reinforcement meeting the following requirements:
2

Characteristic	Test Method	Average Roll Minimum Value
Grab Strength	ASTM D4632	80-lbs @ 12-in per minute
Elongation at Break	ASTM D4632	50% @ 12-in per minute
Asphalt Retention	Tex-616-J	0.5-oz per square foot
Melting Point	ASTM D276	300° F
Resistance to UV Light	ASTM D4355	70%

3
4 **2.3 ACCESSORIES [NOT USED]**

5 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

6 **PART 3 - EXECUTION**

7 **3.1 INSTALLERS [NOT USED]**

8 **3.2 EXAMINATION [NOT USED]**

9 **3.3 PREPARATION [NOT USED]**

10 **3.4 INSTALLATION**

11 A. Install Geosynthetic Soil Reinforcement in accordance with manufacturer's guidelines.

12 **3.5 REPAIR [NOT USED]**

13 **3.6 RE-INSTALLATION [NOT USED]**

14 **3.7 FIELD QUALITY CONTROL [NOT USED]**

15 **3.8 SYSTEM STARTUP [NOT USED]**

16 **3.9 ADJUSTING [NOT USED]**

17 **3.10 CLEANING [NOT USED]**

18 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

19 **3.12 PROTECTION [NOT USED]**

20 **3.13 MAINTENANCE [NOT USED]**
21

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 32 01 17**
2 **FLEXIBLE PAVING REPAIR**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Flexible Paving Repair including:
7 a. Flexible Paving Repair
8 b. Pothole Repair (Flexible Paving)
9 c. Cleaning and Sealing Cracks
10 d. Flexible Paving Repair for Utility Trench
11 e. Temporary Flexible Paving Repair for Utility Trench

12 B. Deviations from this City of Denton Standard Specification:

- 13 1. None.

14 C. Related Specification Sections include but are not limited to:

- 15 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
16 Contract.
17 2. Division 1 - General Requirements.
18 3. Section 03 00 00 – Concrete and Concrete Reinforcement.
19 4. Section 32 05 16 – Aggregates for Exterior Improvements.
20 5. Section 32 11 23 – Flexible Base Courses.
21 6. Section 32 12 16 – Asphalt Paving.
22 7. Section 32 13 13 – Concrete Paving.
23 8. Section 32 12 73 – Asphalt Pavement Crack Sealants.

24 **1.2 PRICE AND PAYMENT PROCEDURES**

25 A. Measurement and Payment

- 26 1. Flexible Paving Repair
27 a. Measurement
28 1) Measured per square yard of Flexible Paving Repair installed.
29 b. Payment
30 1) The work performed and materials furnished in accordance with this item
31 and measured as provided under “Measurement” will be paid for at the unit
32 price bid per square yard for “Flexible Paving Repair” installed for:
33 a) Various street classifications.
34 c. The price bid shall include:
35 1) Furnishing and installing Flexible Paving Repair as specified by the
36 Drawings
37 2) Removal of existing asphalt pavement and base material.
38 3) Loading
39 4) Unloading
40 5) Storing

- 1 6) Hauling
- 2 7) Handling of materials
- 3 8) Traffic control for all testing
- 4 9) Trial batches (as needed)
- 5 10) All costs associated with obtaining and submitting the required action and
- 6 informational submittals
- 7 11) Asphalt, aggregate, and additives
- 8 12) Materials and work needed for any corrective action
- 9 13) Tack coat, PCE, Fog Seal, Crack sealant
- 10 14) Removal and/or sweeping excess material
- 11 2. Pothole Repair (Flexible Paving)
- 12 a. Measurement
- 13 1) Measured per square yard of Pothole Repair (Flexible Paving) installed.
- 14 b. Payment
- 15 1) The work performed and materials furnished in accordance with this item
- 16 and measured as provided under “Measurement” will be paid for at the unit
- 17 price bid per square yard for “Pothole Repair (Flexible Paving)” installed.
- 18 c. The price bid shall include:
- 19 1) Furnishing and installing Pothole Repair (Flexible Paving) as specified by
- 20 the Drawings
- 21 2) Loading
- 22 3) Unloading
- 23 4) Storing
- 24 5) Hauling
- 25 6) Handling of materials
- 26 7) Traffic control for all testing
- 27 8) Trial batches (as needed)
- 28 9) All costs associated with obtaining and submitting the required action and
- 29 informational submittals
- 30 10) Asphalt, aggregate, and additives
- 31 11) Materials and work needed for any corrective action
- 32 12) Tack coat, PCE, Fog Seal, Crack sealant
- 33 13) Removal and/or sweeping excess material
- 34 3. Cleaning and Sealing Cracks
- 35 a. Measurement
- 36 1) Measured by the pound of “Cleaning and Sealing Joints and Cracks”
- 37 installed.
- 38 b. Payment
- 39 1) The work performed and materials furnished in accordance with this item
- 40 and measured as provided under “Measurement” will be paid for at the unit
- 41 price bid per pound for “Cleaning and Sealing Joints and Cracks (Flexible
- 42 Paving)” installed.
- 43 c. The price bid shall include:
- 44 1) Furnishing and installing Cleaning and Sealing Cracks as specified by the
- 45 Drawings
- 46 2) Loading
- 47 3) Unloading
- 48 4) Storing

- 1 5) Hauling
- 2 6) Handling of materials
- 3 7) Traffic control for all testing
- 4 8) Trial batches (as needed)
- 5 9) All costs associated with obtaining and submitting the required action and
- 6 informational submittals
- 7 10) Asphalt, aggregate, and additives
- 8 11) Materials and work needed for any corrective action
- 9 12) Tack coat, PCE, Fog Seal, Crack sealant
- 10 13) Removal and/or sweeping excess material
- 11 4. Flexible Paving Repair for Utility Trench
- 12 a. Measurement
- 13 1) Measured per square yard of Flexible Paving Repair for Utility installed.
- 14 b. Payment
- 15 1) The work performed and materials furnished in accordance with this item
- 16 and measured as provided under “Measurement” will be paid for at the unit
- 17 price bid per square yard for “Flexible Paving Repair for Utility Trench”
- 18 installed for:
- 19 a) Various street classifications.
- 20 c. The price bid shall include:
- 21 1) Furnishing and installing Flexible Paving Repair for Utility Trench as
- 22 specified by the Drawings
- 23 2) Removal of temporary material
- 24 3) Loading
- 25 4) Unloading
- 26 5) Storing
- 27 6) Hauling
- 28 7) Handling of materials
- 29 8) Traffic control for all testing
- 30 9) Trial batches (as needed)
- 31 10) All costs associated with obtaining and submitting the required action and
- 32 informational submittals
- 33 11) Asphalt, aggregate, and additives
- 34 12) Materials and work needed for any corrective action
- 35 13) Tack coat, PCE, Fog Seal, Crack sealant
- 36 14) Removal and/or sweeping excess material
- 37 5. Temporary Flexible Paving Repair for Utility Trench
- 38 a. Measurement
- 39 1) Measured per square yard of Temporary Flexible Paving Repair for Utility
- 40 Trench installed.
- 41 b. Payment
- 42 1) The work performed and materials furnished in accordance with this item
- 43 and measured as provided under “Measurement” will be paid for at the unit
- 44 price bid per square yard for “Temporary Flexible Paving Repair for Utility
- 45 Trench” installed for:
- 46 a) Various street classifications.
- 47 c. The price bid shall include:

- 1) Furnishing and installing Temporary Flexible Paving Repair for Utility Trench as specified by the Drawings
- 2) Loading
- 3) Unloading
- 4) Storing
- 5) Hauling
- 6) Handling of materials
- 7) Traffic control for all testing
- 8) Trial batches (as needed)
- 9) All costs associated with obtaining and submitting the required action and informational submittals
- 10) Asphalt, aggregate, and additives
- 11) Materials and work needed for any corrective action
- 12) Tack coat, PCE, Fog Seal, Crack sealant
- 13) Removal and/or sweeping excess material

1.3 REFERENCES

- A. Abbreviations and Acronyms
 1. TxDOT – Texas Department of Transportation
- B. Definitions
 1. Concrete Base Material – Class D Concrete in accordance with Section 03 00 00.
 - a. Referred to as 2-sack concrete backfill on the City Standard Details.
- C. Reference Standards
 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
 2. American Society for Testing and Materials (ASTM):
 - a. ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
 3. TxDOT Standards:
 - a. Tex-414-A – Air Content of Freshly Mixed Concrete by the Volumetric Method
 - b. Tex-415-A – Slump of Hydraulic Cement Concrete
 - c. Tex-416-A – Air Content of Freshly-Mixed Concrete by the Pressure Method
 - d. Tex-422-A – Measuring Temperature of Freshly Mixed Portland Cement Concrete

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Shop Drawings
 1. Product Data

- 1
 - 2
 - 3
 - 4
- a. Submit product data for all products used for Pot Hole Repair and Cleaning and Sealing Joints and Cracks. Provide product data in accordance with Section 32 12 73 and this Section.

- 1 2. Asphalt Mix Design
- 2 a. Provide an asphalt mix design for TY C, TY D, and TY B asphalt in
- 3 accordance with Section 32 12 16.
- 4 3. Concrete Mix Design
- 5 a. Provide a mix design for Class D concrete in accordance with Section 03 00 00.
- 6 4. Rolling Pattern
- 7 a. Provide the proposed rolling pattern in accordance with Section 32 12 16.

8 B. Information Submittals

- 9 1. Equipment Information
- 10 a. Submittal for all major equipment to include:
- 11 1) Equipment name and description
- 12 2) Size
- 13 3) Intended use

14 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

15 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

16 **1.9 QUALITY ASSURANCE [NOT USED]**

17 **1.10 DELIVERY, STORAGE, AND HANDLING**

18 A. Storage and Handling Requirements

- 19 1. Secure and maintain a location to store the material in accordance with Section 01
- 20 66 00.
- 21 B. Follow all delivery, storage, and handling requirements for asphalt and concrete in
- 22 Sections 32 12 16, 32 13 13, and 03 00 00.
- 23 C. Follow all manufacturer recommendations for delivery, storage, and handling
- 24 requirements specified in the product data.

25 **1.11 FIELD CONDITIONS**

- 26 A. Follow all field condition requirements for asphalt and concrete in Sections 32 05 16,
- 27 32 11 23, 32 12 16, 32 13 13, and 03 00 00.

28 **1.12 WARRANTY [NOT USED]**

29 **PART 2 - PRODUCTS**

30 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

31 **2.2 MATERIALS**

- 32 A. Refer to City Standard Details and Section 33 05 05 for requirements for excavation,
- 33 embedment, and backfill.
- 34 B. Asphalt Paving:
- 35 1. Refer to Section 32 12 16 for material requirements.
- 36 2. Use TY C or TY D for the 2-inch surface course. Refer to street classification in
- 37 this Section and the City Standard Detail.

- 1 3. Use TY B for the intermediate and/or base courses.
- 2 C. Concrete Base Material for Trench Repair
- 3 1. Concrete Class: Class D in accordance with Section 03 00 00.
- 4 2. Production Materials:
- 5 a. Cement
- 6 1) Type II in accordance with Section 03 00 00.
- 7 b. Fly Ash
- 8 1) Class F Fly Ash F in accordance with Section 03 00 00.
- 9 c. Water
- 10 1) In accordance with Section 03 00 00.
- 11 d. Chemical Admixtures
- 12 1) Air entraining admixture in accordance with Section 03 00 00.
- 13 e. Aggregate:
- 14 1) Provide aggregate in accordance with Section 03 00 00 and 32 05 16.
- 15 2) Fine Aggregate:
- 16 a) Provide fine aggregate with maximum of 12 percent of fine aggregate
- 17 passing the number 200 sieve.
- 18 3) Coarse Aggregate:
- 19 a) Use pea gravel that is no larger than 3/8 inch.
- 20 D. Cleaning and Sealing Joints and Cracks
- 21 1. Provide sealants in accordance with Section 32 12 73.
- 22 E. Subgrade or Subbase Course
- 23 1. Provide a Flexible Base, TY A, GR 1-2 in accordance with Section 32 11 23 for all
- 24 base course installation and repair unless otherwise specified in the Drawings or
- 25 directed by the City.

26 **2.3 ACCESSORIES [NOT USED]**

27 **2.4 SOURCE QUALITY CONTROL**

- 28 A. Tests and Inspections
- 29 1. Concrete Base Material for Trench Repair
- 30 a. Provide Class D concrete conforming to all the testing requirements specified
- 31 in Section 03 00 00.
- 32 B. Perform all tests and inspections required for asphalt, concrete, and flexible base in
- 33 accordance with Sections 32 13 13, 32 12 16, 03 00 00, and 32 11 23.
- 34 C. Non-Conforming Work
- 35 1. If the materials do not meet the requirements of Sections 32 13 13, 32 12 16, 03 00
- 36 00, and 32 11 23, or the product data sheet, the material will be considered non-
- 37 conforming and will be rejected or removed and replaced at Contractor's expense.

38 **PART 3 - EXECUTION**

39 **3.1 INSTALLERS [NOT USED]**

40 **3.2 EXAMINATION [NOT USED]**

1 **3.3 PREPARATION**

2 A. Surface Preparation for Pothole Repair

- 3 1. Square the edges of the pothole by saw-cutting 1' from the edge of the pothole to
4 the depth of the pothole around the entire pothole.
5 2. Remove any loose and foreign material.
6 3. Clean and dry the repair area thoroughly.

7 B. Surface Preparation for Asphalt Pavement Repair

- 8 1. Full-depth sawcut and remove asphalt pavement and base material within the limits
9 shown on the Drawings in accordance with Section 02 41 15.

10 **3.4 PAVEMENT REPAIR**

11 A. Disposal, Salvaging, and Recycling Removed Pavement

- 12 1. In accordance with the requirements in Section 02 41 15.

13 B. Concrete Base for Trench Repair

- 14 1. Install concrete base material in accordance with the requirements for Class D
15 concrete in Section 03 00 00.
16 2. Install to the depth and width specified in the Drawings and the City Standard
17 Details.

18 C. Asphalt Pavement Repair

19 1. General

- 20 a. Refer to City Standard Details for flexible pavement sections and subgrade
21 depth based on street classifications. Standard street classifications are: All
22 Residential, Residential Collector, Commercial Collector, and Arterial.

23 2. Pavement Section for Standard Pavement Repair:

24 a. Subgrade:

- 25 1) After the asphalt and base material is removed, replace the subgrade to the
26 depth specified on the City Standard Detail based on the street
27 classification.
28 2) Install subgrade material Flexible Base TY A, GR 1-2 in accordance with
29 Section 32 11 23.
30 3) Install the full-depth of asphalt courses and subgrade specified on the City
31 Standard Detail. Use flexible base for the subgrade at the depth specified.
32 4) Installation of base and full-depth asphalt material is considered subsidiary
33 to Asphalt Pavement Repair.

34 b. Pavement Section

- 35 1) Compare the existing flexible pavement section with the City Standard
36 Details for Asphalt Paving based on the street classification specified on the
37 Drawings.
38 a) If the existing flexible pavement section matches the Detail or is
39 thicker, match the existing pavement section.
40 b) If the existing flexible pavement section is thinner than the Detail,
41 install asphalt pavement to the thickness specified on the City Standard
42 Detail.

- 1 2) Full-depth installation of all courses of asphalt pavement is considered
- 2 subsidiary to Asphalt Pavement Repair.
- 3 3. Pavement Section for Utility Trench:
- 4 a. If a street classification is specified in Drawings:
- 5 1) Follow the same process for selecting a pavement section as for standard
- 6 pavement repair.
- 7 2) Full-depth installation of all courses of asphalt pavement is considered
- 8 subsidiary to Asphalt Pavement Repair for Utility Service Trench.
- 9 b. If no street classification is specified in Drawings:
- 10 1) Pavement Section:
- 11 a) Surface Course: 3 inches TY C
- 12 (1) Unless approved by City in writing, surface course shall not be less
- 13 than 2 inches.
- 14 b) Base Asphalt Course: 9 inches TY B
- 15 c) Subgrade Depth: 12 inches of flexible base or Class D Concrete
- 16 D. Pothole Repair
- 17 1. After the surface is prepared, apply a tack coat to the exposed asphalt surface.
- 18 2. Hot-Mix Asphalt
- 19 a. Use TY D asphalt for hot-mix asphalt.
- 20 3. Cold-Mix Asphalt
- 21 a. Provide a high-performance polymer-modified cold asphalt. Submit a product
- 22 data submittal for material approval.
- 23 4. After material is placed, finish to grade and compact to conform to the existing
- 24 roadway surface. Compact with a hand tamp, mechanical tamps, or rollers as
- 25 directed or approved. Compact until full consolidation is achieved.
- 26 5. Clean roadway surface after repair operations and remove and dispose of any
- 27 excess material.
- 28 6. Maximum pot hole size:
- 29 a. The maximum allowable size of a pothole is roughly 3 feet by 3 feet or larger
- 30 and 3 inches deep.
- 31 b. If the pothole measures larger than 3 feet by 3 feet, or if the depth of the
- 32 pothole is 3 inches or greater, perform a full depth removal of asphalt and base
- 33 material. Refer to Section 02 41 15 for paving removal limits.
- 34 c. Any base repair will be considered subsidiary to the square yards of asphalt for
- 35 pot hole repair.
- 36 d. Use a flexible base course in accordance with Section 32 11 23 for repair of any
- 37 base material.
- 38 e. If a full depth repair is needed, coordinate with the City prior to performing
- 39 repair activities on that pot hole. The City may choose to allow a temporary
- 40 patch of the pothole. Obtain written permission from the City if a temporary
- 41 patch is allowed and follow all requirements provided by the City.
- 42 E. Cleaning and Sealing Joints and Cracks
- 43 1. Prepare the site and install sealants in accordance with Section 32 12 73.
- 44 F. Temporary Paving Repair for Utility Trenches
- 45 1. Refer to City Standard Details for additional information.

- 1 2. Refer to Section 02 41 15 for paving removal.
- 2 3. Pavement thickness
- 3 a. Match existing pavement thickness.
- 4 b. If street classification is specified in Drawings:
- 5 1) Provide pavement section as shown on City Standard Details for full depth
- 6 of asphalt. The depth should include the surface and both base depths.
- 7 2) Example: Arterial Street – 3 inches of TY C on 9 inches of TY B.
- 8 c. If no street classification is specified in Drawings:
- 9 1) Minimum thickness: 2 inches TY C or TY D
- 10 2) If existing asphalt is rutting:
- 11 a) Surface Course: 3 inches TY C or TY D
- 12 b) Base Course: 6 inches TY B

13 **3.5 REPAIR [NOT USED]**

14 **3.6 RE-INSTALLATION [NOT USED]**

15 **3.7 SITE QUALITY CONTROL**

- 16 A. Crack Sealant, Polymer-Modified Cold Mix Asphalt, and other Products
- 17 1. Perform placement testing in accordance with this Section.
- 18 B. Asphalt Paving
- 19 1. Perform all testing requirements for asphalt pavement in accordance with Section
- 20 32 12 16.
- 21 C. Concrete Base Material for Trench Repair
- 22 1. Testing Frequency:
- 23 a. Test Class D concrete each day for a concrete mixture of up to 25 cubic yards.
- 24 For each additional 50 cubic yards, perform an additional test.
- 25 2. Testing of Fresh Concrete:
- 26 a. Perform in accordance with Sections 03 00 00 and 32 13 13.
- 27 3. Concrete Strength Test
- 28 a. Refer to Section 03 00 00 and 32 13 13 for required strength for Class D
- 29 concrete.
- 30 b. Provide trained technicians during concrete paving to cast and test cylinders in
- 31 accordance with ASTM C31 and ASTM C39.
- 32 c. Test cylinders after 7 days to verify the concrete base material is in accordance
- 33 with the strength requirements for Class D concrete.
- 34 d. If the concrete does not meet the concrete strength, the Contractor may ask the
- 35 City for a waiver.
- 36 1) If the City does not approve, remove and replace all non-conforming Class
- 37 D concrete at no cost to the City.
- 38 2) If the City does approve, obtain approval in writing.

39 **3.8 SYSTEM STARTUP [NOT USED]**

40 **3.9 ADJUSTING [NOT USED]**

41 **3.10 CLEANING [NOT USED]**

1 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

2 **3.12 PROTECTION [NOT USED]**

3 **3.13 MAINTENANCE [NOT USED]**

4 **3.14 ATTACHMENTS [NOT USED]**

5 **END OF SECTION**

6

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

7

1 **SECTION 32 01 29**
2 **CONCRETE REPAIR**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Concrete Repair Including:
7 a. Concrete Paving Repair
8 b. Concrete Paving Repair for Utility Trench
9 c. Concrete Pavement Spalling Repair
10 d. Concrete Structure Repair, Concrete Crack Repair
11 e. Cleaning and Sealing Joints and Cracks

12 B. Deviations from this City of Denton Standard Specification:

- 13 1. None.

14 C. Related Specification Sections include but are not limited to:

- 15 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
16 Contract.
17 2. Division 1 - General Requirements.
18 3. Section 03 00 00 – Concrete and Concrete Reinforcement.
19 4. Section 32 05 16 – Aggregates for Exterior Improvements.
20 5. Section 32 11 23 – Flexible Base Courses.
21 6. Section 32 13 13 – Concrete Paving.
22 7. Section 32 13 73 – Concrete Paving Joint Sealants.

23 **1.2 PRICE AND PAYMENT PROCEDURES**

24 A. Measurement and Payment

- 25 1. Concrete Paving Repair
26 a. Measurement
27 1) Measured per square yard of Concrete Paving Repair installed.
28 b. Payment
29 1) The work performed and materials furnished in accordance with this item
30 and measured as provided under “Measurement” will be paid for at the unit
31 price bid per square yard for “Concrete Paving Repair” installed for:
32 a) Various Street Classifications.
33 c. The price bid shall include:
34 1) Furnishing and installing Concrete Paving Repair as specified by the
35 Drawings
36 2) Subgrade removal and replacement as specified on the Drawings
37 3) Sawing and removal of existing pavement
38 4) Removal of base material as needed
39 5) Water
40 6) Loading

- 1 7) Unloading
- 2 8) Storing
- 3 9) Hauling
- 4 10) Handling of materials
- 5 11) Traffic control for all testing
- 6 12) Trial batches (as needed)
- 7 13) Materials and work needed for any corrective action
- 8 14) Concrete
- 9 15) Aggregate
- 10 16) Supplementary cementing materials
- 11 17) Concrete additives
- 12 18) Mixing
- 13 19) Placement of concrete
- 14 20) Finishing of concrete
- 15 21) Curing and curing compounds
- 16 22) Joint sealant
- 17 23) Reinforcing steel and reinforcement chairs
- 18 24) Disposal of excess material
- 19 25) Clean-up
- 20 2. Concrete Paving Repair for Utility Trench
- 21 a. Measurement
- 22 1) Measured per square yard of Concrete Paving Repair for Utility Trench
- 23 installed.
- 24 b. Payment
- 25 1) The work performed and materials furnished in accordance with this item
- 26 and measured as provided under "Measurement" will be paid for at the unit
- 27 price bid per square yard for "Concrete Paving Repair for Utility Trench"
- 28 installed for:
- 29 a) Various Street Classifications.
- 30 c. The price bid shall include:
- 31 1) Furnishing and installing Concrete Paving Repair for Utility Trench as
- 32 specified by the Drawings
- 33 2) Sawing
- 34 3) Water
- 35 4) Loading
- 36 5) Unloading
- 37 6) Storing
- 38 7) Hauling
- 39 8) Handling of materials
- 40 9) Traffic control for all testing
- 41 10) Trial batches (as needed)
- 42 11) Materials and work needed for any corrective action
- 43 12) Concrete
- 44 13) Aggregate
- 45 14) Supplementary cementing materials
- 46 15) Concrete additives
- 47 16) Mixing
- 48 17) Placement of concrete
- 49 18) Finishing of concrete

- 1 19) Curing and curing compounds
- 2 20) Joint sealant
- 3 21) Reinforcing steel and reinforcement chairs
- 4 22) Disposal of excess material
- 5 23) Clean-up
- 6 3. Concrete Structure Repair
- 7 a. Measurement
- 8 1) Measured per square foot of Concrete Structure Repair installed.
- 9 b. Payment
- 10 1) The work performed and materials furnished in accordance with this item
- 11 and measured as provided under “Measurement” will be paid for at the unit
- 12 price bid per square foot for “Concrete Structure Repair” installed.
- 13 c. The price bid shall include:
- 14 1) Furnishing and installing Concrete Structure Repair as specified by the
- 15 Drawings
- 16 2) Sawing and removal of existing pavement
- 17 3) Removal of base material as needed
- 18 4) Water
- 19 5) Loading
- 20 6) Unloading
- 21 7) Storing
- 22 8) Hauling
- 23 9) Handling of materials
- 24 10) Traffic control for all testing
- 25 11) Trial batches (as needed)
- 26 12) Materials and work needed for any corrective action
- 27 13) Concrete
- 28 14) Aggregate
- 29 15) Supplementary cementing materials
- 30 16) Concrete additives
- 31 17) Mixing
- 32 18) Placement of concrete
- 33 19) Finishing of concrete
- 34 20) Curing and curing compounds
- 35 21) Joint sealant
- 36 22) Reinforcing steel and reinforcement chairs
- 37 23) Disposal of excess material
- 38 24) Clean-up
- 39 4. Concrete Pavement Spalling Repair
- 40 a. Measurement
- 41 1) Measured per square foot of Concrete Pavement Spalling Repair installed.
- 42 b. Payment
- 43 1) The work performed and materials furnished in accordance with this item
- 44 and measured as provided under “Measurement” will be paid for at the unit
- 45 price bid per square foot for Concrete Pavement Spalling Repair installed.
- 46 c. The price bid shall include:
- 47 1) Furnishing and installing Concrete Pavement Spalling Repair as specified
- 48 by the Drawings

- 1 2) Sawing and removal of existing pavement
- 2 3) Removal of base material as needed
- 3 4) Water
- 4 5) Loading
- 5 6) Unloading
- 6 7) Storing
- 7 8) Hauling
- 8 9) Handling of materials
- 9 10) Traffic control for all testing
- 10 11) Trial batches (as needed)
- 11 12) Materials and work needed for any corrective action
- 12 13) Concrete
- 13 14) Aggregate
- 14 15) Supplementary cementing materials
- 15 16) Concrete additives
- 16 17) Mixing
- 17 18) Placement of concrete
- 18 19) Finishing of concrete
- 19 20) Curing and curing compounds
- 20 21) Joint sealant
- 21 22) Reinforcing steel and reinforcement chairs
- 22 23) Disposal of excess material
- 23 24) Clean-up
- 24 5. Concrete Crack Repair
- 25 a. Measurement
- 26 1) Measured per linear foot of Concrete Crack Repair installed.
- 27 b. Payment
- 28 1) The work performed and materials furnished in accordance with this item
- 29 and measured as provided under "Measurement" will be paid for at the unit
- 30 price bid per linear foot for Concrete Crack Repair installed.
- 31 c. The price bid shall include:
- 32 1) Furnishing and installing Concrete Crack Repair as specified by the
- 33 Drawings
- 34 2) Sawing
- 35 3) Concrete
- 36 4) Aggregate
- 37 5) Supplementary cementing materials
- 38 6) Concrete additives
- 39 7) Mixing
- 40 8) Placement of concrete
- 41 9) Finishing of concrete
- 42 10) Curing and curing compounds
- 43 11) Joint sealant
- 44 12) Loading
- 45 13) Unloading
- 46 14) Storing
- 47 15) Hauling
- 48 16) Handling of materials

- 17) All costs associated with obtaining and submitting the required action and informational submittals.
- 18) Removal and/or sweeping excess material
- 19) Tools
- 20) Equipment
- 6. Cleaning and Sealing Joints
 - a. Measurement
 - 1) Measured per linear foot of Cleaning and Sealing Joints installed.
 - 2) This item is considered subsidiary to other pertinent items when used, which can include, but is not limited to, Concrete Paving and Concrete Paving Repair.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for Cleaning and Sealing Joints installed.
 - c. The price bid shall include:
 - 1) Furnishing and installing Cleaning and Sealing Joints as specified by the Drawings
 - 2) Cleaning and joint sealant materials
 - 3) Loading
 - 4) Unloading
 - 5) Storing
 - 6) Hauling
 - 7) Handling of materials
 - 8) Traffic control for all testing
 - 9) Trial batches (as needed)
 - 10) Materials and work needed for any corrective action
 - 11) Joint sealant
 - 12) Clean-up

1.3 REFERENCES

- A. Abbreviations and Acronyms
 - 1. TxDOT – Texas Department of Transportation
- B. Definitions
- C. Reference Standards
 - 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
 - 2. American Society for Testing and Materials (ASTM) Standards:
 - a. ASTM C928 – Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
 - 3. TxDOT Concrete Repair Manual.
 - 4. TxDOT Standards:
 - a. Tex-418-A – Compressive Strength of Cylindrical Concrete Specimens.
 - b. Tex-448-A – Flexural Strength of Concrete Using Simple Beam Third-Point Loading.

- 1 c. DMS-4655, Concrete Repair Materials.
- 2 d. DMS-6100 – Epoxies and Adhesives.

3 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

4 **1.5 SUBMITTALS**

- 5 A. Submittals shall be in accordance with Section 01 33 00.
- 6 B. All submittals shall be approved by the City prior to delivery.

7 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

8 A. Shop Drawings

- 9 1. Product Data
 - 10 a. Submit product data for all products used for Cleaning and Sealing Joints.
 - 11 Provide product data in accordance with Section 32 13 73 and this Section.
- 12 2. Concrete Mix Design
 - 13 a. Provide a mix design for each class or type of concrete used in accordance with
 - 14 Section 03 00 00 and DMS-4655.
- 15 3. Structural Repair
 - 16 a. Submit all materials and application methods for approval at least 3 weeks prior
 - 17 to performing any structural repair work.
- 18 4. Crack Repair
 - 19 a. Submit all materials and application methods for approval prior to performing
 - 20 any crack repair work.

21 B. Information Submittals

- 22 1. Equipment Information
 - 23 a. Submittal for all major equipment to include:
 - 24 1) Equipment name and description
 - 25 2) Size
 - 26 3) Intended use

27 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

28 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

29 **1.9 QUALITY ASSURANCE [NOT USED]**

30 **1.10 DELIVERY, STORAGE, AND HANDLING**

31 A. Storage and Handling Requirements

- 32 1. Secure and maintain a location to store the material in accordance with Section 01
- 33 66 00.
- 34 B. Follow all delivery, storage, and handling requirements for concrete in Section 32 05
- 35 16, 32 11 23, 32 13 13, 32 13 73, and 03 00 00.
- 36 C. Follow all manufacturer recommendations for delivery, storage, and handling
- 37 requirements specified in the product data.

38 **1.11 FIELD CONDITIONS**

- 1 A. Follow all field condition requirements in Section 32 05 16, 32 11 23, 32 13 13, 32 13
- 2 73, and 03 00 00.
- 3 B. Follow all manufacturer recommendations for field conditions specified in the product
- 4 data.
- 5 C. Concrete Pavement Spalling Repair
- 6 1. Place concrete if the air temperature is 40 degrees Fahrenheit and rising.
- 7

1 **1.12 WARRANTY [NOT USED]**

2 **PART 2 - PRODUCTS**

3 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

4 **2.2 MATERIALS**

- 5 A. Refer to City Standard Details and Section 33 05 05 for requirements for excavation,
6 embedment, and backfill.
- 7 B. Concrete Paving Repair:
- 8 1. Refer to Section 03 00 00 and 32 13 13 for material requirements.
- 9 2. Concrete Class:
- 10 a. Standard Concrete Pavement: Concrete Class P2 or HES
- 11 1) Provide HES concrete designed to attain a minimum compressive strength
12 in accordance with Section 03 00 00. Use HES when concrete needs to be
13 open to traffic within 72 hours.
- 14 2) Provide Class P2 concrete when possible.
- 15 3) Use standard concrete pavement unless otherwise approved by the City or
16 specified in the Drawings.
- 17 b. Alternate Concrete Material: Type A or B concrete listed on TxDOT's DMS-
18 4655 Concrete Repair Materials.
- 19 1) The Contractor may request to use Type A or B concrete. The Contractor
20 must obtain approval in writing unless otherwise specified in the Drawings.
- 21 3. Reinforcing Steel, Dowel Bars, and Tie Bars
- 22 a. Provide reinforcing steel, dowel bars, and tie bars in accordance with Section
23 03 00 00 and 32 13 13.
- 24 C. Concrete Structure Repair
- 25 1. Concrete Repair Materials:
- 26 a. Provide repair materials suitable for the appropriate horizontal, vertical, or
27 overhead application in accordance with the requirements in DMS-4655.
- 28 b. Trowel-Applied:
- 29 1) Use Type C in vertical and overhead applications that are less than 3 inches
30 unless otherwise shown on the Drawings.
- 31 c. Horizontal or Form-and-Pour Applications:
- 32 1) Use neat Type A or Type D materials for applications that are less than 3
33 inches thick.
- 34 2) Use extended Type A or Type D for repairs exceeding 3 inches in depth.
- 35 d. Use Type D instead of Type A if rapid strength gain is not necessary.
- 36 e. Use Type B only if specified in the Drawings or approved by the City.
- 37 f. The City may reject any product based on structural compatibility.
- 38 2. Pneumatically Applied Materials:
- 39 a. Provide concrete conforming to TxDOT Item 431 – Pneumatically Placed
40 Concrete.
- 41 b. Only use pneumatically applied materials when specified in Drawings or
42 approved by the City.

- 1 c. Prepare trial batches of any proposed repair material and application method as
2 specified by Item 431, this Section, the Drawings, and/or directed by the City.
- 3 3. Epoxy Mortars
- 4 a. Use Type 8 neat epoxy or epoxy mortar per DMS-6100 – Epoxies and
5 Adhesives for repairs less than 1 inch thick unless otherwise noted on the plans.
- 6 4. Concrete:
- 7 a. Concrete Class: Class C for substructures, Class S for decks, or concrete
8 designed to the strength specified in the Drawings unless the following
9 conditions apply:
 - 10 1) An option for vertical/overhead repairs greater than 6 inches thick,
 - 11 2) For full or partial depth slab repairs,
 - 12 3) For replacement of entire members or elements, or
 - 13 4) As an option for horizontal repairs greater than 4 inches thick.
 - 14 5) If the previous conditions apply, stop work until the City provides written
15 direction on how to proceed.
- 16 b. Do not use corrosion-inhibiting admixtures unless specified in the Drawings or
17 approved by the City.
- 18 5. Steel
- 19 a. Provide reinforcing in accordance with the Drawings and Section 03 00 00.
- 20 D. Concrete Pavement Spalling Repair:
- 21 1. Refer to Section 03 00 00 and 32 13 13 for material requirements.
- 22 2. Concrete Type:
- 23 a. Provide Type B concrete in accordance with DMS-4655 unless otherwise
24 specified in the Drawings.
- 25 b. Use a packed blend of cement, sand, and gravel (maximum size 3/8 inch) which
26 requires the addition of water and has a maximum shrinkage of 0.15 percent in
27 accordance with ASTM C928.
- 28 3. Do not use chlorides, magnesium, or gypsum to accelerate setting time.
- 29 4. Demonstrate the mixture meets a minimum compressive strength of 5,100 psi in 7
30 days and 6,300 psi in 28 days before spall repair operations. Test in accordance
31 with Tex-418-A and Tex-448-A. Provide test results as part of concrete submittal.
- 32 5. Do not use polymeric patching material unless otherwise specified in the Drawings
33 or approved by the City.
- 34 E. Concrete Crack Repair
- 35 1. Use epoxy injection, gravity filling, routing and sealing, or surface sealing.
- 36 2. Provide materials in accordance with TxDOT's Concrete Repair Manual. Select a
37 pre-approved material meeting the requirements of the applicable DMS when
38 available.
- 39 3. Provide materials and application methods for approval prior to crack repair.
- 40 F. Cleaning and Sealing Joints
- 41 1. Provide joint and crack sealants in accordance with Section 32 13 73.

42 **2.3 ACCESSORIES [NOT USED]**

43 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

1 **PART 3 - EXECUTION**
2

1 **3.1 EQUIPMENT**

2 A. Provide equipment necessary to complete the specified concrete repair in accordance
3 with Section 32 05 16, 32 11 23, 32 13 13, 32 13 73, and 03 00 00.

4 **3.2 EXAMINATION [NOT USED]**

5 **3.3 PREPARATION**

6 A. Concrete Paving Repair (Non-Structural)

7 1. Remove the existing concrete pavement in accordance with Section 02 41 15.

8 B. Cleaning and Sealing Joints

9 1. Prepare the site in accordance with Section 32 13 73.

10 **3.4 CONCRETE REPAIR**

11 A. Concrete Paving Repair

12 1. General

13 a. Half-depth repairs will not be allowed. Perform only full-depth concrete
14 pavement repairs.

15 b. Refer to City Standard Details for concrete pavement sections and subgrade
16 depth based on street classifications. Standard street classifications are: All
17 Residential, Residential Collector, Commercial Collector, and Arterial.

18 2. Pavement Section for Standard Pavement Repair:

19 a. Subgrade Repairs:

20 1) Once the pavement has been removed, repair any damaged subgrade using
21 Flexible Base, TY A, GR 1-2 in accordance with Section 32 11 23 or as
22 specified in the Drawings.

23 2) Remove and replace subgrade under paving repair section with Flexible
24 Base TY A, GR 1-2 if specified in the Drawings. This will be considered
25 subsidiary to the Concrete Paving Repair item.

26 3) After removing the pavement, if the existing subgrade is found to be
27 deficient by the City, stop work and obtain approval from the City
28 indicating how to proceed.

29 b. Pavement Section

30 1) Compare the existing concrete pavement section with the City Standard
31 Details for Concrete Paving based on the street classification specified on
32 the Drawings.

33 2) If the existing concrete pavement section matches or is thicker than the
34 Standard Detail, match the existing pavement section.

35 3) If the existing concrete pavement section is thinner than the detail, install
36 concrete pavement to the thickness specified on the City Standard Detail.

37 4) Full-depth installation of concrete pavement is considered subsidiary to
38 Concrete Paving Repair.

39 3. Pavement Section for Utility Service Trench

40 a. If a street classification is specified in the Drawings:

41 1) Follow the same process for selecting a pavement section for standard
42 pavement repair.

- 1 2) Full-depth installation of concrete pavement is considered subsidiary to
- 2 Concrete Paving Repair for Utility Service Trench.
- 3 b. If no street classification is specified in Drawings:
- 4 1) Match thickness specified on the City Standard Detail for Existing
- 5 Pavement Trench.
- 6 4. Concrete Installation:
- 7 a. Reinforcing:
- 8 1) Use tie bars and epoxy in accordance with Section 03 00 00 and 32 13 13.
- 9 2) Place tie bars as shown on the Drawings or in the City Standard Details.
- 10 3) Drill holes in accordance with Section 03 00 00 and 32 13 13 into the
- 11 existing concrete at least 10 inches deep unless otherwise directed. Inject
- 12 the holes with Type 3, Class C epoxy in accordance with Section 03 00 00
- 13 before inserting tie bars.
- 14 4) Place reinforcing steel and dowel bars of the size and spacing shown on the
- 15 Drawings or in the City Standard Details. Lap all longitudinal steel at least
- 16 25 inches. Provide and place steel supports in accordance with Section 03
- 17 00 00 and 32 13 13 as needed.
- 18 b. Concrete Placement and Joints:
- 19 1) Mix, place, cure, and test concrete in accordance with Section 03 00 00 and
- 20 32 13 13.
- 21 2) Install and restore joints in accordance with Section 03 00 00 and 32 13 13.
- 22 B. Concrete Structure Repair
- 23 1. Follow procedures outlined in the TxDOT Concrete Repair Manual unless
- 24 otherwise specified in the Drawings.
- 25 C. Concrete Pavement Spalling Repair
- 26 1. General:
- 27 a. Saw at least 1.5 inches deep around the repair area before concrete removal
- 28 unless otherwise directed. Provide a vertical face around the perimeter of the
- 29 repair area.
- 30 b. Protect and maintain existing reinforcing if encountered, unless it is damaged or
- 31 otherwise directed by the City.
- 32 c. If the City determines that the existing reinforcing is damaged, full-depth
- 33 remove and replace concrete. Perform full-depth paving repair in accordance
- 34 with this Section.
- 35 2. Removal of Concrete:
- 36 a. Remove deteriorated concrete to a depth of at least 1.5 inches or the maximum
- 37 depth of the deteriorated concrete, whichever is greater.
- 38 b. If deteriorated concrete is deeper than 1.5 inches in depth, use chipping
- 39 hammers not heavier than the nominal 15-pound class or hydro-demolition
- 40 equipment.
- 41 3. Concrete Placement:
- 42 a. Clean the surface so it is free of loose particles.
- 43 b. Mix, place, and cure the concrete in accordance with Section 03 00 00 and 32
- 44 13 13.
- 45 c. Screed concrete to the existing roadway surface.
- 46 4. Texture: Match existing pavement.

- 1 D. Concrete Crack Repair
- 2 1. Follow procedures outlined in the TxDOT Concrete Repair Manual unless
- 3 otherwise specified in the Drawings.
- 4 2. Submit application methods for review and approval prior to performing any crack
- 5 repair.
- 6 E. Cleaning and Sealing Joints
- 7 1. Install joint sealants in accordance with Section 32 13 73.
- 8 F. Disposal, Salvaging, and Recycling
- 9 1. Perform in accordance with Section 02 41 15.

10 **3.5 REPAIR [NOT USED]**

11 **3.6 RE-INSTALLATION [NOT USED]**

12 **3.7 SITE QUALITY CONTROL**

13 A. Concrete Testing

- 14 1. Perform testing in accordance with this specification and Sections 03 00 00, 03 30
- 15 00, and 32 13 13.

16 **3.8 SYSTEM STARTUP [NOT USED]**

17 **3.9 ADJUSTING [NOT USED]**

18 **3.10 CLEANING [NOT USED]**

19 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

20 **3.12 PROTECTION [NOT USED]**

21 **3.13 MAINTENANCE [NOT USED]**

22 **3.14 ATTACHMENTS [NOT USED]**

23 **END OF SECTION**

24

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

25

1 **SECTION 32 05 16**
2 **AGGREGATES FOR EXTERIOR IMPROVEMENTS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Coarse and fine aggregate requirements for asphalt and concrete.

7 B. Deviations from this City of Denton Standard Specification:

- 8 1. None.

9 C. Related Specification Sections include but are not limited to:

- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
11 Contract.
12 2. Division 1 - General Requirements.

13 **1.2 PRICE AND PAYMENT PROCEDURES**

- 14 A. Aggregate materials, equipment, tools, and incidentals will not be measured or paid for
15 separately. All items required for the testing and furnishing of aggregates is subsidiary
16 to other pertinent items.

17 **1.3 REFERENCES**

18 A. Abbreviations and Acronyms

- 19 1. AQMP – Texas Department of Transportation’s Aggregate Quality Monitoring
20 Program (Tex-499-A)
21 2. BRSQC – Texas Department of Transportation’s *Bituminous Rated Source Quality*
22 *Catalog*
23 3. CRSQC – Texas Department of Transportation’s *Concrete Rated Source Quality*
24 *Catalog*
25 4. HMA – Hot-Mix Asphalt
26 5. RAP – Reclaimed Asphalt Pavement
27 6. RAS – Recycled Asphalt Shingles
28 7. SAC – Surface Aggregate Classification
29 8. TxDOT – Texas Department of Transportation
30 9. WWARP – Wet Weather Accident Reduction Program

31 B. Reference Standards

- 32 1. Reference standards cited in this Section refer to the current reference standard
33 published at the time of the latest revision date logged at the end of this Section
34 unless a date is specifically cited.
35 2. Texas Department of Transportation (TxDOT) Departmental Material
36 Specifications (DMS)
37 a. DMS-9210, Limestone Rock Asphalt (LRA).

3. TxDOT Test Procedures:
 - a. Tex-100-E, Surveying and Sampling Soils for Highways.
 - b. Tex-107-E, Determining the Bar Linear Shrinkage of Soils.
 - c. Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates.
 - d. Tex-203-F, Sand Equivalent Test.
 - e. Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates (Bituminous Mixtures).
 - f. Tex-221-F, Sampling Aggregate for Bituminous Mixtures, Surface Treatments, and Limestone Rock Asphalt.
 - g. Tex-280-F, Determining Flat and Elongated Particles.
 - h. Tex-402-A, Fineness Modulus of Fine Aggregate.
 - i. Tex-406-A, Material finer than No. 200 Sieve in Mineral Aggregates (Decantation Test for Concrete Aggregates)
 - j. Tex-408-A, Organic Impurities in Fine Aggregate for Concrete.
 - k. Tex-410-A, Abrasion of Coarse Aggregate Using the Los Angeles Machine.
 - l. Tex-411-A, Soundness of Aggregate Using Sodium Sulfate or Magnesium Sulfate.
 - m. Tex-413-A, Determining Deleterious Material in Mineral Aggregate.
 - n. Tex-460-A, Determining Crushed Face Particle Count.
 - o. Tex-499-A, Aggregate Quality Monitoring Program.

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Secure and maintain a location to store the material in accordance with Section 01 66 00.

B. Storage and Stockpiling of Aggregates

1. General
 - a. Selected stockpiling location should be relatively flat. Clean the area of trash, weeds, and grass.
 - b. Stockpile aggregates for each source and type separately.
 - c. Do not add materials to approved stockpiles.
 - d. Prevent segregation of the aggregates and maintain the stockpiles.
2. Coarse Aggregates
 - a. Separate the stockpiles into different gradations.
 - b. The stockpiles should be separated so that the grading requirements of final product are met when the piles are combined.

- 1 c. No more than 20 percent by weight of material that passes a number 8 sieve
- 2 will be allowed in the coarse aggregate stockpile unless specified in the
- 3 Drawings.
- 4 3. Fine Aggregates
- 5 a. Stockpiles may contain coarse aggregate of up to 20-percent by weight.
- 6 b. The coarse aggregate included in the fine aggregate stockpile is required to
- 7 meet the quality tests specified in Table 2.

8 **1.11 FIELD CONDITIONS [NOT USED]**

9 **1.12 WARRANTY [NOT USED]**

10 **PART 2 - PRODUCTS**

11 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

12 **2.2 MATERIALS**

13 A. General

- 14 1. Provide aggregates free from loam, clay balls, or other injurious foreign matter
- 15 occurring either free or as a coating.
- 16 2. Provide aggregates in accordance with the definitions in Tex-100-E.
- 17 3. Perform, document, and provide all test results for aggregate testing.
- 18 4. Provide aggregates from sources that stockpile each type of aggregate separately.
- 19 5. Furnish LRA in accordance with DMS-9210, "Limestone Rock Asphalt (LRA)"
- 20 when used.
- 21 6. Provide aggregates for asphalt production from TxDOT's *Bituminous Rated Source*
- 22 *Quality Catalog* (BRSQC).
- 23 7. Provide aggregates for concrete production from TxDOT's *Concrete Rated Source*
- 24 *Quality Catalog* (CRSQC).
- 25 8. Submit material tests from source locations to verify the aggregates are in
- 26 accordance with this Section.
- 27 9. Conform aggregate sampling to Tex-221-F.

28 **Table 1**
29 **Aggregate Types**

Type	Material
A	Gravel, crushed slag, crushed stone, or LRA
B	Crushed gravel, crushed slag, crushed stone, or LRA
C	Gravel, crushed slag, or crushed stone
D	Crushed gravel, crushed slag, or crushed stone

30 B. Coarse Aggregate

- 31 1. The portion of the total aggregates retained on the number 10 sieve.
- 32 2. Provide coarse aggregate of uniform quality throughout.
- 33 3. Asphalt Requirements

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- a. General
 - 1) Provide aggregates from stockpiles that have no more than 20% material passing the number 8 sieve.
 - 2) Provide aggregates that meet the definitions of crushed gravel or crushed stone in accordance with Tex-100-E.
 - 3) Use only the rated values on the BRSQC for hot-mix. Rated values for surface treatment do not apply to coarse aggregate sources used in hot-mix asphalt.
 - 4) Maximum aggregate size should not be over half of the proposed lift depth to prevent particle on particle contact issues.
 - b. RAP
 - 1) Aggregate from RAP is not required to meet the requirements of Table 2 unless otherwise specified in the Drawings or directed by the City.
 - c. SAC Requirements
 - 1) Furnish aggregate with a minimum SAC of A for all surface course asphalt lifts used on travel lanes. The BRSQC lists the SAC for sources on the AQMP.
 - 2) Do not blend aggregate to meet the SAC unless otherwise approved.
 - 3) If blending is approved by the City:
 - a) Class A and Class B aggregates are defined in TxDOT WWARP.
 - b) Class B aggregate meeting all other requirements in Table 2 may be blended with a Class A aggregate to meet requirements for Class A materials.
 - (1) Ensure that at least 50 percent by weight, or volume if required, of the material retained on the Number 4 sieve comes from the Class A aggregate source.
 - c) Blend by volume if the bulk specific gravities of Class A and B aggregates differ by more than 0.300.
 - d) Coarse aggregate from RAP and RAS will be considered as Class B aggregate for blending purposes.
 - 4. Concrete Requirements
 - a. General
 - 1) Provide coarse aggregate consisting of durable particles of gravel, crushed blast furnace slag in accordance with the requirements of ASTM C989 Grade 100 or 120, recycled crushed hydraulic cement concrete, crushed stone, or combinations which are free from frozen material and from injurious amounts of salt, alkali, vegetable matter, or other objectionable material.
 - 2) Provide coarse aggregate of uniform quality throughout.

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**Table 2
 Coarse Aggregate Requirements**

Property	Test Method	Requirement
Sampling	Tex-221-F	–
SAC	Tex-499-A (AQMP)	Note 1
Deleterious material, percent maximum	Tex-217-F, Part 1	1.5
Decantation, percent maximum	Tex-406-A, Part 2	1.5
Los Angeles Abrasion, percent maximum	Tex-410-A	40
Magnesium sulfate soundness, ^{2,3} 5 cycles, percent maximum (non-air-entrained concrete and asphalt)	Tex-411-A	25
Coarse aggregate angularity, 2 crushed faces, percent minimum	Tex-460-A, Part 1	85
Additional Requirements for Asphalt		
Flat and elongated particles at 5:1, percent maximum	Tex-280-F	10
Additional Requirements for Concrete		
Magnesium sulfate soundness, ^{2,4} 5 cycles, percent maximum (air-entrained concrete)	Tex-411-A	18
Weight of Clay Lumps, percent maximum	Tex-413-A	0.25
Weight of Shale, percent maximum		1.0
Weight of Laminate and Friable Particle, percent maximum		5.0

1. SAC A for All Surface Courses Unless Otherwise Noted on Drawings.
2. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
3. Only when air-entrained concrete is required by the plans.
4. FOR CONCRETE ONLY: If the material finer than the number 200 sieve is determined to be at least 85% calcium carbonate in accordance with Tex-406-A:
 - Increase the decantation limit to 3.0 percent for all classes of concrete.
 - Increase the decantation limit to 5.0 percent for Class A, B, and P concrete.
 - Provide test results with concrete action submittals.

C. Fine Aggregate

1. Consists of crushed stone, crushed gravel, sand, and/or limestone or steel slag screenings
2. Provide fine aggregate, except for field sand, from coarse aggregate sources that meet the requirements of this specification.
3. Asphalt Requirements
 - a. Provide sand, limestone, or steel slag screenings passing the number 40 sieve that conform to the requirements shown in Table 3.
 - b. Provide aggregates free from impurities.
 - c. Use fine aggregate, with the exception of field sand, from coarse aggregate sources that conform to requirements in Table 3.
 - d. Sand
 - 1) No more than 15 percent of the total aggregate may be field sand or other uncrushed fine aggregate.
 - 2) Gradation – The gradation of the sand is the portion of the total aggregate that passes the No. 10 sieve. Provide sand that is well graded and composed of sound, durable sand particles.

4. Concrete Requirements
 - a. Provide fine aggregate consisting of natural sand, manufactured sand, or a combination of the two, that is clean, hard, durable, uncoated, and free from clay lumps.
 - b. Provide fine aggregate free from frozen material and injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

**Table 3
 Fine Aggregate Requirements**

Property	Test Method	Requirement
Requirements for Asphalt		
Linear Shrinkage, Percent, Maximum	Tex-107-E	3
Organic Impurities	Tex-408-A	None allowed
Additional Requirements for Concrete		
Weight of clay lumps, percent maximum	Tex-413-A	0.50
Sand Equivalent, percent maximum	Tex-203-F	80
Fineness Modulus	Tex-402-A	2.3 to 3.1
Organic Impurities*	Tex-408-A	None allowed

* - Only when air-entrained concrete is required by the plans.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Aggregate Quality Requirements

1. Submit material tests from source location to verify the aggregates are in accordance with the applicable requirements in Tables 2 and 3.
 - a. Test and Evaluation Reports
 - a) Provide testing and evaluation reports to the City for each material being used to prepare concrete pavement. Test samples or provide product data verifying source material complies with all requirements in this Section. Materials to be tested include, but are not limited to:
 - (1) Coarse and Fine Aggregate Testing
 - (a) Provide verification that the material source location is listed on TxDOT's CRSQC. If listed, source quality testing may be waived.
 - (b) If the source location is not listed on TxDOT's CRSQC, provide all testing and evaluation reports to verify the source material complies with all requirements in Section 32 05 16.
 - (2) Cement and Supplementary Cementing materials
 - (3) Manufacturer supplied testing and product data
2. Submit new material tests from any new source location.

B. Non-Conforming Work

1. General
 - a. The City may at any time reject a material if it is found to be non-conforming to this Section.
 - b. The City may require the Contractor at any time to remove and replace installed Concrete Pavement if any material used is found to be non-conforming at no cost to the City.

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- 1 2. Aggregates
- 2 a. Test in accordance with specified ASTM and TxDOT Test Methods in this
- 3 Section.
- 4 b. Aggregates that fail to meet the requirements of this Section will be rejected.
- 5 c. Aggregate source locations may be rejected if supplied aggregates do not meet
- 6 the requirements of this Section.
- 7 d. Any rejection of materials or source locations will be at no cost to the City.

8 **PART 3 - EXECUTION [NOT USED]**

9 **3.1 INSTALLERS [NOT USED]**

10 **3.2 EXAMINATION [NOT USED]**

11 **3.3 PREPARATION [NOT USED]**

12 **3.4 INSTALLATION [NOT USED]**

13 **3.5 REPAIR [NOT USED]**

14 **3.6 RE-INSTALLATION [NOT USED]**

15 **3.7 SITE QUALITY CONTROL [NOT USED]**

16 **3.8 SYSTEM STARTUP [NOT USED]**

17 **3.9 ADJUSTING [NOT USED]**

18 **3.10 CLEANING [NOT USED]**

19 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

20 **3.12 PROTECTION [NOT USED]**

21 **3.13 MAINTENANCE [NOT USED]**

22 **3.14 ATTACHMENTS [NOT USED]**

23 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

25

1 **SECTION 32 11 23**
2 **FLEXIBLE BASE COURSES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A.Section Includes:

- 6 1. Foundation course for surface course or other base course composed of flexible
7 base constructed in one or more courses in accordance with the typical section
8 specified in the Drawings.

9 B.Deviations from this City of Denton Standard Specification:

- 10 1. None.

11 C.Related Specification Sections include but are not limited to:

- 12 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
13 Contract.
14 2. Division 1 - General Requirements.
15 3. Section 32 05 16 – Aggregates for Exterior Improvements.

16 **1.2 PRICE AND PAYMENT PROCEDURES**

17 A.Measurement and Payment

18 1. Flexible Base

19 a. Measurement

- 20 1) Measured by the square yard of Flexible Base Course installed.

21 b. Payment

- 22 1) The work performed and materials furnished in accordance with this item
23 and measured as provided under “Measurement” will be paid for at the unit
24 price bid per square yard for Flexible Base Course installed for:
25 a) Various depths.
26 b) Various grades.
27 c) Various types.

28 c. The price bid shall include:

- 29 1) Furnishing and installing Flexible Base Course as specified by the
30 Drawings
31 2) Loading
32 3) Unloading
33 4) Hauling
34 5) Storing
35 6) Disposal of excess materials

36 2. Rework

37 a. Payment

- 38 1) Material used and work performed for reworking will not be paid for
39 directly but will be subsidiary to original item bid.

1 **1.3 REFERENCES**

2 A.Definitions

- 3 1. RAP – Recycled Asphalt Pavement.

4 B.Reference Standards

- 5 1. Reference standards cited in this Section refer to the current reference standard
6 published at the time of the latest revision date logged at the end of this Section
7 unless a date is specifically cited.
- 8 2. ASTM International (ASTM):
- 9 a. D698, Standard Test Methods for Laboratory Compaction Characteristics of
10 Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
- 11 b. D6938, Standard Test Method for In-Place Density and Water Content of Soil
12 and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- 13 3. Texas Department of Transportation (TxDOT) Test Procedures:
- 14 a. Tex-104-E, Determining Liquid Limits of Soils
- 15 b. Tex-106-E, Calculating the Plasticity Index of Soils
- 16 c. Tex-107-E, Determining the Bar Linear Shrinkage of Soils
- 17 d. Tex-110-E, Particle Size Analysis of Soils
- 18 e. Tex-116-E, Ball Mill Method for Determining the Disintegration of Flexible
19 Base Material
- 20 f. Tex-117-E, Triaxial Compression for Disturbed Soils and Base Materials
- 21 g. Tex-140-E, Measuring Thickness of Pavement Layer
- 22 h. Tex-411-A, Soundness of Aggregate Using Sodium Sulfate or Magnesium
23 Sulfate
- 24 i. Tex-413-A, Determining Deleterious Material in Mineral Aggregate

25 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

26 **1.5 SUBMITTALS**

27 A. Submittals shall be in accordance with Section 01 33 00.

28 B. All submittals shall be approved by the City prior to delivery of materials.

29 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

30 A.Informational Submittals

- 31 1. Proposed source and supplier of flexible base material.
- 32 2. Equipment Information
- 33 a. Submittal for all major equipment to include:
- 34 1) Equipment name and description
- 35 2) Size
- 36 3) Intended use

37 **1.7 CLOSEOUT SUBMITTALS**

38 A.Test and Evaluation Reports

- 39 1. All test reports generated during testing.

1 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

2 **1.9 QUALITY ASSURANCE [NOT USED]**

3 **1.10 DELIVERY, STORAGE, AND HANDLING**

4 A.Delivery and Acceptance Requirements

- 5 1. Deposit material directly on subgrade and spread and shape same day.

6 B.Storage and Handling Requirements

- 7 1. Secure and maintain a location to store the material in accordance with Section 01
8 66 00.
- 9 2. Stockpiling
- 10 a. When required, stockpile base material at a location approved by City.
- 11 b. Create stockpiles in layers no greater than 2 feet thick.
- 12 c. Stockpile must have a total height between 6 feet and 12 feet.
- 13 d. Do not load material from stockpile until City has approved stockpile
14 construction.
- 15 e. Load by making successive vertical cuts through the entire depth of the
16 stockpile.

17 **1.11 FIELD CONDITIONS [NOT USED]**

18 **1.12 WARRANTY [NOT USED]**

19 **PART 2 - PRODUCTS**

20 **2.1 CITY-FURNISHED PRODUCTS**

21 A. Existing Products

- 22 1. Recycled Concrete
- 23 a. Recycled concrete may only be used in Type D Flexible Base when obtained
24 from the City.
- 25 1) Coordinate with City regarding quantity available for use in the Work.
- 26 a) Contractor will not be entitled to additional payment or to submit a
27 Contract Claim if recycled concrete is not available for their use.
- 28 b. City-furnished recycled concrete is not subject to the requirements of Table 1.
- 29 c. The final blended product will be subject to the requirements of Table 1.

30 **2.2 MATERIALS**

31 A.General

- 32 1. Furnish uncontaminated materials of uniform quality in accordance with this
33 Section and as specified in the Drawings.
- 34 2. Notify City of changes to material sources.
- 35 3. The City may sample and test project materials at any time before compaction
36 throughout the duration of the project to assure materials accordance with this
37 Section.
38

1 B. Aggregates

- 2 1. Furnish aggregate of the type and grade specified in the Drawings and in
 3 accordance with the requirements of Table 1.
 4 2. If blending of sources is approved by the City, ensure each source is in accordance
 5 with the requirements of Table 1.
 6 3. Do not use additives, such as but not limited to lime, cement, or fly ash to modify
 7 aggregates to meet the requirements of Table 1 unless approved by the City.
 8 a. Additives may be used during final placing as directed by the geotechnical report.

9
 10 **Table 1**
 11 **Material Requirements**

Property	Test Method	Grade 1	Grade 2
Master gradation sieve size (% retained)	Tex-110-E		
2-1/2 in.		–	0
1-3/4 in.		0	0–10
7/8 in.		10–35	–
3/8 in.		30–50	–
No. 4		45–65	45–75
No. 40		70–85	60–85
Liquid limit, % max. ¹	Tex-104-E	35	40
Plasticity index, max. ¹	Tex-106-E	10	12
Wet ball mill, % max. ²	Tex-116-E	40	45
Wet ball mill, % max. increase passing the No. 40 sieve		20	20
Classification ³	Tex-117-E	1.0	1.1–2.3
Min. compressive strength ³ , psi lateral pressure 0 psi lateral pressure 15 psi		45 175	35 175

- 12 1. Determine plastic index in accordance with Tex 107-E (linear shrinkage) when liquid limit is unattainable as
 13 defined in Tex 104-E.
 14 2. When a soundness value is required by the Drawings, test material in accordance with Tex 411-A.
 15 3. Meet both the classification and the minimum compressive strength, unless otherwise shown on the Drawings.

16 C. Flexible Base Types

- 17 1. Type A
 18 a. Flexible Base Course consisting of limestone aggregate obtained from single,
 19 naturally occurring source in accordance with Section 32 05 16.
 20 b. Do not use gravel or recycled materials in Type A Flexible Base Course.
 21 2. Type B
 22 a. Flexible Base Course consisting of limestone aggregate obtained from two or
 23 more naturally occurring sources in accordance with Section 32 05 16.
 24 b. Do not use gravel or recycled materials in Type B Flexible Base Course.
 25 3. Type D
 26 a. Flexible Base Course consisting of Type A material in addition to up to 30%
 27 recycled material.

1 b. Ensure final blended material is in accordance with the requirements of Table 1.

2 D. Recycled Materials

3 1. General

- 4 a. Obtain City approval prior to using any recycled materials.
5 b. Furnish recycled materials free from reinforcing steel and other objectional
6 material.
7 c. Furnish recycled materials with at most 1.5 percent deleterious material when
8 tested in accordance with TEX-413-A.

9 2. Recycled Asphalt Pavement (RAP)

- 10 a. Up to 30% of Flexible Base Course material may be RAP when approved by
11 the City.
12 b. Crush RAP such that 100% passes the 2 inch sieve.

13 E. Water

- 14 1. Furnish water free of industrial wastes and other objectionable material.

15 **2.3 ACCESSORIES [NOT USED]**

16 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

17 **PART 3 - EXECUTION**

18 **3.1 INSTALLERS [NOT USED]**

19 **3.2 EXAMINATION [NOT USED]**

20 **3.3 PREPARATION**

21 A. Surface Preparation

- 22 1. Shape subgrade or existing base to within 0.2 feet of finished grade according to the
23 typical sections specified in the Drawings or as directed by City.
24 2. Proof roll subgrade material and correct soft spots as directed.
25 3. Remove unsuitable soil or material and replace with acceptable soil.
26 4. When material is imported from a borrow source, manipulate and thoroughly mix
27 new base with existing material to provide uniform mixture before shaping.

28 B. Demolition / Removal

- 29 1. Remove existing pavement in accordance with Section 02 41 15 as specified in the
30 Drawings.

31 **3.4 INSTALLATION**

32 A. General

- 33 1. Construct each layer uniformly, free of loose or segregated areas, and with the
34 required density and moisture content.
35 2. Maximum layer depth of flexible base course in single layer not to exceed 6 inches.
36 3. Minimum layer depth of flexible base course is 2 inches.
37 4. Where subbase or base course exceeds 6 inches in thickness, construct in 2 or more
38 courses of equal thickness not exceeding 4 inches.

- 1 5. Provide a smooth surface in accordance with the typical sections, lines, and grades
2 specified in the Drawings or as directed by City.

3 B. Equipment

- 4 1. Provide machinery, tools, and equipment necessary for proper execution of the
5 work.
6 2. Compaction
7 a. Sheepsfoot roller required for all compaction operations.
8 1) Alternate Equipment
9 a) Contractor may use alternative compaction equipment that produces
10 equivalent results if approved by City prior to use.
11 b) Discontinue use of the alternate equipment and furnish the specified
12 equipment if the desired results are not achieved.
13 2) City may require Contractor to substitute equipment if production rate and
14 quality requirements of the Contract Documents are not met.

15 C. Placement

- 16 1. Spread and shape flexible base into a uniform layer by approved means the same
17 day as delivered unless otherwise approved by City.
18 2. Move all material from the location in which it is deposited no more than once.
19 3. Place material such that it is mixed to minimize segregation.
20 4. Construct layers to the thickness specified in the Drawings while maintaining the
21 shape of the course.
22 5. Control dust by sprinkling.
23 6. Correct or replace segregated areas as directed.
24 7. Place successive base courses and finish courses using the same construction
25 methods required for the first course.
26 8. When required to use multiple lifts, ensure successive base courses and finish
27 courses are placed such that section breaks do not align.

28 D. Compaction

- 29 1. Compact using density control unless otherwise specified in the Contract
30 Documents.
31 2. Bring each layer to the moisture content directed. When necessary, sprinkle the
32 material to the extent necessary to provide not less than the required density as
33 specified in this Section.
34 3. Compact the full depth of the subbase or base to the extent necessary to remain firm
35 and stable under construction equipment.
36 4. Density Control
37 a. Compact until the entire depth of the mixture has achieved a uniform density
38 not less than 98 percent of the maximum density as determined by ASTM
39 D698.
40 b. Final moisture content shall be plus or minus 2 percent of optimum.

41 E. Finishing

- 42 1. After completing compaction, clip, skin, or tight-blade surface with a maintainer or
43 subgrade trimmer to a depth of approximately 1/4 inch.

- 1 2. Remove loosened material and dispose of it at an approved location.
- 2 3. Seal the clipped surface immediately by rolling with an appropriate size pneumatic
- 3 tire roller until a smooth surface is attained.
- 4 4. Add small increments of water as needed during rolling.
- 5 5. Shape and maintain the course and surface in accordance with the typical sections,
- 6 lines, and grades as specified in the Drawings or as directed by the City.
- 7 6. In areas where surfacing is to be placed, correct grade deviations greater than 1/4
- 8 inch in 16 feet measured longitudinally or greater than 1/4 inch over the entire
- 9 width of the cross-section.

10 **3.5 REPAIR [NOT USED]**

11 **3.6 RE-INSTALLATION**

12 A.Reworking a Flexible Base Section

- 13 1. Rework any constructed course which fails to meet the requirements of this Section.
- 14 2. Reworking includes loosening, adding material or removing unacceptable material
- 15 if necessary, mixing as directed, compacting, and finishing.

16 **3.7 FIELD QUALITY CONTROL**

17 A.Field Test and Inspections

- 18 1. Test in accordance with Section 01 45 23.
- 19 2. Density Test
 - 20 a. City must be on site during density testing
 - 21 b. Measure density of flexible base course in accordance with ASTM D6938.
 - 22 c. Measure density every 100' along corridor or as directed by City.
 - 23 d. City to determine density testing locations.
- 24 3. Depth Test
 - 25 a. City must be on site during density testing
 - 26 b. Measure depth of flexible base course in accordance with Tex-140-E in hand
 - 27 excavated holes.
 - 28 c. Measure depth every 300' along corridor or as directed by City.

29 **3.8 SYSTEM STARTUP [NOT USED]**

30 **3.9 ADJUSTING [NOT USED]**

31 **3.10 CLEANING [NOT USED]**

32 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

33 **3.12 PROTECTION [NOT USED]**

34 **3.13 MAINTENANCE**

- 35 A.Maintain the completed flexible base in good condition, satisfactory to the City as to
- 36 grade, crown, and cross section until the overlaying or next course is constructed.
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1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 32 11 29**
2 **LIME TREATED BASE COURSES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Treating subgrade, subbase, and base courses by pulverization and addition of lime.
7 2. Mixing and compacting the mix material to the required density.

8 B. Deviations from City of Denton Standards:

- 9 1. None.

10 C. Related Specification Sections include but are not limited to:

- 11 1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
12 2. Division 1 – General Requirements.
13 3. Section 02 41 15 – Paving Removal.
14 4. Section 31 23 16 – Unclassified Excavation.
15 5. Section 31 24 00 – Embankments.
16 6. Section 32 11 23 – Flexible Base Courses.
17 7. Section 32 12 16 – Asphalt Paving.

18 **1.2 PRICE AND PAYMENT PROCEDURES**

19 A. Measurement and Payment

20 1. Commercial Lime Slurry

21 a. Measurement

- 22 1) Measured by ton (dry weight) as calculated from minimum percent dry
23 solids content of slurry multiplied by weight of Commercial Lime Slurry
24 installed.

25 b. Payment

- 26 1) The materials furnished in accordance with this item and measured as
27 provided under “Measurement” will be paid for at the unit price bid per ton
28 for “Commercial Lime Slurry.”

29 c. The price bid shall include:

- 30 1) Furnishing Commercial Lime Slurry as specified by the Drawings
31 2) Hauling
32 3) Unloading
33 4) Storing
34 5) Handling

35 2. Quicklime

36 a. Measurement

- 37 1) Measured by ton (dry weight) of Quicklime installed.
38

- 1 b. Payment
- 2 1) The materials furnished in accordance with this item and measured as
- 3 provided under “Measurement” will be paid for at the unit price bid per ton
- 4 of “Quicklime” installed.
- 5 c. The price bid shall include:
- 6 1) Furnishing Quicklime as specified by the Drawings.
- 7 2) Hauling
- 8 3) Unloading
- 9 4) Storing
- 10 5) Handling
- 11 3. Lime Treatment
- 12 a. Measurement
- 13 1) Measured by square yard of base course treated.
- 14 b. Payment
- 15 1) The work performed in accordance with this item and measured as
- 16 provided under “Measurement” will be paid for at the unit price bid per
- 17 square yard of “Lime Treatment” for:
- 18 a) Various depths.
- 19 c. The price bid shall include:
- 20 1) Treating base course as specified in the Drawings
- 21 2) Subgrade preparation
- 22 3) Excavation
- 23 4) Loading
- 24 5) Unloading
- 25 6) Hauling
- 26 7) Disposal of excess material
- 27 8) Compaction
- 28 9) Clean-up

29 **1.3 REFERENCES**

30 A. Definitions

- 31 1. Commercial Lime Slurry: liquid mixture of hydrated lime solids and water
- 32 delivered to a project in slurry form.
- 33 2. Quicklime: dry material consisting of calcium oxide furnished in Grade DS –
- 34 “pebble” quicklime suitable for use in the preparation of slurry for wet placing.

35 B. Reference Standards

- 36 1. Reference standards cited in this Section refer to the current reference standard
- 37 published at the time of the latest revision date logged at the end of this Section,
- 38 unless a date is specifically cited.
- 39 2. ASTM International (ASTM):
- 40 a. C977, Standard Specification for Quicklime and Hydrated Lime for Soil
- 41 Stabilization.
- 42 b. D698, Standard Test Methods for Laboratory Compaction Characteristics of
- 43 Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- 44 c. D6938, Standard Test Method for In-Place Density and Water Content of Soil
- 45 and Soil-Aggregate by Nuclear Methods (Shallow Depth).

3. Texas Department of Transportation (TxDOT) Departmental Material Specifications (DMS)
 - a. DMS-6350, Lime and Lime Slurry.
4. TxDOT Test Procedures:
 - a. Tex-101-E, Preparing Soil and Flexible Base Materials for Testing.
 - b. Tex-140-E, Measuring Thickness of Pavement Layer.

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00.

B. All submittals shall be approved by the City prior to commencement of any lime treating activities.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Informational Submittals

1. Proposed source and supplier of lime treatment material.
2. Equipment Information
 - a. Submittal for all major equipment to include:
 - 1) Equipment name and description
 - 2) Size
 - 3) Intended use

1.7 CLOSEOUT SUBMITTALS

A. Test and Evaluation Reports

1. All test reports generated during testing.

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements

1. List the weight of lime measured on certified scales on each truck ticket.
2. Submit delivery tickets, certified by supplier, that include weight with each bulk delivery of lime to the site.
3. When using slurry, spread lime across treatment area when delivered in accordance with this Section.

B. Storage and Handling Requirements

1. Secure and maintain a location to store the material in accordance with Section 01 66 00.
2. Store Quicklime pellets in closed, weatherproof containers.

1.11 FIELD CONDITIONS

A. Ambient Conditions

- 1 1. Surface temperature must be at least 60°F and the ambient temperature must be
2 45°F and rising.

3 B. Suspend Lime Treatment if:

- 4 1. Ambient Condition requirements are not met
5 2. City determines weather conditions are unsuitable

6 **1.12 WARRANTY [NOT USED]**

7 **PART 2 - PRODUCTS**

8 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

9 **2.2 MATERIALS**

10 A. General

- 11 1. Furnish uncontaminated materials of uniform quality in accordance with the
12 Drawings and this Section.
13 2. Notify the City of the proposed material sources and changes to material sources.
14 3. Obtain City approval for material sources.
15 4. The City may sample and test project materials at any time before compaction.
16 5. Furnish lime in accordance with the requirements of ASTM C977.
17 6. Furnish lime in slurry or Quicklime pebble form.

18 B. Slurry Grades

- 19 1. Prior to treating the base select a grade to be used and notify the City.
20 2. Furnish Commercial Lime Slurry in accordance with DMS-6350 and the applicable
21 grade requirements below:
22

	Minimum Dry Solids Contents by Percentage of the Slurry
Grade 2	35
Grade 3	46

23

24 C. Quicklime

- 25 1. Furnish Grade DS Quicklime only in accordance with DMS-6350.

26 D. Flexible Base Courses

- 27 1. Furnish base material in accordance with Section 32 11 23, for the type and grade
28 specified in the Drawings, before the addition of lime.

29 E. Embankment

- 30 1. Furnish Embankments in accordance with Section 31 24 00 before the addition of
31 lime.

32 F. Water

- 33 1. Furnish water free of industrial wastes and other objectionable material.

1 **2.3 ACCESSORIES [NOT USED]**

2 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

3 **PART 3 - EXECUTION**

4 **3.1 INSTALLERS [NOT USED]**

5 **3.2 EXAMINATION [NOT USED]**

6 **3.3 PREPARATION**

7 A. Surface Preparation

- 8 1. Shape the subgrade or existing base to within 0.2 feet of finished grade in
9 accordance with typical sections specified in the Drawings or as directed.
- 10 2. Proof roll the subgrade and correct any rutting.
- 11 3. Remove unsuitable soil or material and replace with acceptable soil.
- 12 4. When material is imported from a borrow source, manipulate and thoroughly mix
13 new base with existing material to provide uniform mixture before shaping.

14 B. Demolition / Removal

- 15 1. Remove existing pavement in accordance with Section 02 41 15 as shown in the
16 Drawings.
- 17 2. Remove existing soil in accordance with Section 31 23 16 as shown in the
18 Drawings.

19 **3.4 INSTALLATION**

20 A. General

- 21 1. Produce a completed course of treated material containing:
 - 22 a. Uniform lime mixture, free from loose or segregated areas
 - 23 b. Uniform density and moisture content
 - 24 c. Well bound for full depth
 - 25 d. A smooth surface suitable for placing subsequent courses
- 26 2. Maximum layer depth of 6 inches of lime treatment in single layer.
- 27 3. Minimum layer depth of 2 inches of lime treatment.
- 28 4. For treated subgrades exceeding 6 inches deep, pulverize, apply lime, mix,
29 compact, and finish in equal layers not exceeding 4 inches deep.

30 B. Equipment

- 31 1. Provide machinery, tools, and equipment necessary for proper execution of the
32 work.
- 33 2. Pulverization Equipment
 - 34 a. Provide pulverization equipment that:
 - 35 1) Cuts and pulverizes material uniformly to the proper depth with cutters
36 plane to a uniform surface over the entire width of the cut.
 - 37 2) Provides a visible indication of the depth of cut at all times
 - 38 3) Uniformly mixes the materials.

- 1
 - 2
 - 3
3. Compaction
 - a. Sheepsfoot roller required for all compaction operations.

- 1 4. Proof Rolling
- 2 a. Use equipment that will apply sufficient load to identify soft spots that rut or
- 3 pump.
- 4 1) Acceptable equipment includes fully loaded single-axle water truck with
- 5 minimum 1,500-gallon capacity.
- 6 5. Slurry Equipment
- 7 a. Provide a distributor truck equipped with an agitator, or
- 8 b. Provide a pump for agitating the slurry.
- 9 6. Substitution requests for equipment not indicated above shall be processed in
- 10 accordance with Section 01 25 00.
- 11 a. City may require Contractor to substitute equipment if production rate and
- 12 quality requirements of the Contract Documents are not met.
- 13 C. Pulverization
- 14 1. Pulverize or scarify existing material after shaping so 100 percent passes a 2 1/2
- 15 inch sieve.
- 16 2. If the material cannot be uniformly processed to the required depth in a single pass,
- 17 excavate and windrow the material to expose a secondary grade to achieve
- 18 processing to depth as specified in the Drawings.
- 19 D. Application of Lime
- 20 1. General
- 21 a. Uniformly apply lime in accordance with the Drawings or as directed by the
- 22 City.
- 23 b. Add lime in accordance with percentage specified in Geotechnical report or as
- 24 directed by the City.
- 25 c. Apply lime slurry only on an area where mixing can be completed during the
- 26 same working day.
- 27 d. Apply Quicklime pebbles only on an area where mixing can be completed
- 28 immediately after placement.
- 29 2. Slurry Placement
- 30 a. Apply Commercial Lime Slurry with a percentage not less applicable for grade
- 31 used.
- 32 b. Make successive passes over a measured surface of roadway until the proper
- 33 moisture and lime content have been achieved.
- 34 3. Quicklime Pebble Placement
- 35 a. Spread Quicklime pebbles using a rotary vane spreader.
- 36 E. Mixing
- 37 1. Begin mixing within 6 hours of application of lime.
- 38 2. Thoroughly mix the material and lime using approved equipment.
- 39 3. Mix until a homogeneous, friable mixture of material and lime is obtained, free
- 40 from all clods and lumps.
- 41 4. Do not mix greater than 1 inch deeper than specified stabilization depth.
- 42 5. Mix materials containing plastic clay or other materials not readily mixed with lime
- 43 as thoroughly as possible at the time of lime application. Bring mixture to the
- 44 proper moisture content and seal with a pneumatic roller.

6. Allow the mixture to cure for 72 hours.
7. When Quicklime pebble is used allow the mixture to cure for 2 to 4 days as directed.
8. Sprinkle the treated materials during the mixing and curing operation to achieve adequate hydration and proper moisture content.
9. After curing, resume mixing until a homogeneous, friable mixture is obtained.
10. After mixing, City may sample the mixture at roadway moisture and test in accordance with Tex-101-E, Part III, to determine compliance with the following gradation requirements:

Sieve Size	Minimum % Passing
1-3/4 in.	100
3/4 in.	85
No. 4	60

F. Compaction

1. General
 - a. Begin compaction immediately after final mixing.
 - b. Aerate and sprinkle as necessary to provide optimum moisture content.
 - c. When multiple lifts are required bring each layer to moisture content as directed by the City.
2. Proof Rolling
 - a. City must be on-site during proof rolling operations.
 - b. Minimum of 2 passes made with the proof roller, offsetting each trip by at most one tire width.
 - c. Correct areas of rutting or pumping greater than 3/4 in and unstable or non-uniform areas in accordance with this Section.
3. Density Control
 - a. Compact until entire depth of mixture has achieved a uniform density of not less than 98 percent of the maximum density in accordance with ASTM D698.
 - b. Final moisture content shall be plus or minus 2 percent of optimum.

G. Finishing

1. Complete after compaction of the final course.
2. Clip, skin, or tight-blade surface of lime-treated material with a maintainer or subgrade trimmer to a depth of approximately 1/4 inch.
3. Remove loosened material and dispose of at an approved location.
4. Roll the clipped surface immediately with pneumatic tire roller until a smooth surface is attained.
5. Maintain density control by adding small amounts of water as needed during rolling.
6. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades shown in the Drawings or as directed.

H. Curing

1. Allow lime treatment to cure in accordance with finished pavement type.

- a. Concrete pavement
 - 1) Sprinkle with water
 - 2) Maintain moisture during curing
 - 3) Do not allow equipment on the finished course during curing except as required for sprinkling.
- b. Asphalt Pavement
 - 1) Apply an asphalt material in accordance with 32 12 16 at a rate of 0.05 to 0.20 gallon per square yard.
 - 2) Do not allow equipment on the finished course during curing.
2. Allow lime treatment to cure for minimum number of days in accordance with requirements for PI of untreated material:

Untreated Material	Curing (Days)
PI ≤ 35	2
PI > 35	5

3. Begin paving operations or add other courses within 14 calendar days of final compaction.
4. Keep treated subgrade moist preventing cracking until pavement or other courses are placed.
5. If the pavement or other courses are not to be placed within 14 days of final compaction apply a seal coat to the treated subgrade surface in accordance with Section 32 12 16.

3.5 REPAIR [NOT USED]

3.6 RE-INSTALLATION

A. Reworking

1. Reworking includes loosening, adding material, or removing unacceptable material, if necessary, mixing as directed, compacting, and finishing.
2. Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted.
 - a. Continue until material is in accordance with the requirements of this Section.
 - b. Rework in accordance with this Section.
3. A minimum of 72 hours of curing time after the initial mixing of the subgrade will be required before remixing is allowed and the placement of base courses or other construction activities are permitted.
4. When a section is reworked more than 72 hours after completion of compaction, add additional lime at 25 percent of the percentage specified.

3.7 FIELD QUALITY CONTROL

A. Field Test and Inspections

1. Perform tests in accordance with Section 01 45 23.
2. Density Test
 - a. City must be on site during density testing

- 1 b. Measure density of lime treated subgrade in accordance with ASTM D6938.
- 2 c. Measure density every 100' along corridor.
- 3 d. City determines density testing locations.
- 4 3. Depth Test
- 5 a. City must be on site during density testing.
- 6 b. Measure depth of lime treated subgrade in accordance with Tex-140-E in hand
- 7 excavated holes.
- 8 c. Measure depth every 250' along corridor.

9 **3.8 SYSTEM STARTUP [NOT USED]**

10 **3.9 ADJUSTING [NOT USED]**

11 **3.10 CLEANING [NOT USED]**

12 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

13 **3.12 PROTECTION [NOT USED]**

14 **3.13 MAINTENANCE**

- 15 A. Maintain the completed soil lime base in good condition and satisfactory to the City as
- 16 to grade, crown, and cross section until the overlaying or next course is constructed.
- 17 B. Keep treated subgrade moist preventing cracking until pavement or other courses are
- 18 placed.

19 **3.14 ATTACHMENTS [NOT USED]**

20 **END OF SECTION**

21

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 32 11 33
CEMENT TREATED BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Treating subgrade, subbase, and base courses by pulverization and addition of cement.
2. Mixing and compacting the mix material to the required density.

B. Deviations from this City of Denton Standard Specification

1. None.

C. Related Specification Sections include but are not necessarily limited to

1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 – General Requirements.
3. Section 02 41 15 – Paving Removal.
4. Section 31 24 00 - Embankment.
5. Section 32 11 23 – Flexible Base Courses.
6. Section 32 12 16 – Asphalt Paving.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Cement

a. Measurement

- 1) Measured by the ton of Cement installed.

b. Payment

- 1) The materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per ton of Cement installed.

c. The price bid shall include:

- 1) Furnishing Cement as specified in the Drawings
 - 1) Hauling
 - 2) Unloading
 - 3) Storing
 - 4) Handling

2. Cement Treatment

a. Measurement

- 1) Measured by the square yard of base course treated.

b. Payment

- 1) The work performed in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard of “Cement Treatment” for:
 - a) Various depths.

- 1 c. The price bid shall include:
- 2 1) Treating base course as specified in the Drawings
- 3 2) Subgrade preparation
- 4 3) Excavation
- 5 4) Loading
- 6 5) Unloading
- 7 6) Hauling
- 8 7) Disposal of excess material
- 9 8) Compaction
- 10 9) Clean-up

11 **1.3 REFERENCES**

12 A. Reference Standards

- 13 1. Reference standards cited in this Section refer to the current reference standard
- 14 published at the time of the latest revision date logged at the end of this Section
- 15 unless a date is specifically cited.
- 16 2. ASTM International (ASTM):
- 17 a. C150, Standard Specification for Portland Cement.
- 18 b. D558, Standard Test Methods for Moisture-Density (Unit Weight) Relations of
- 19 Soil-Cement Mixtures.
- 20 c. D6938, Standard Test Methods for In-Place Density and Water Content of Soil
- 21 and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- 22 3. TxDOT Test Procedures:
- 23 a. Tex-101-E, Preparing Soil and Flexible Base Materials for Testing.
- 24 b. Tex-120-E, Soil-Cement Testing
- 25 c. Tex-140-E, Measuring Thickness of Pavement Layer

26 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

27 **1.5 SUBMITTALS**

- 28 A. Submittals shall be in accordance with Section 01 33 00.
- 29 B. All submittals shall be approved by the City prior to commencement of any cement
- 30 treatment activities.

31 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

32 A. Informational Submittals

- 33 1. Proposed source and supplier of cement treatment material.
- 34 2. Equipment Information
- 35 a. Submittal for all major equipment to include:
- 36 1) Equipment name and description
- 37 2) Size
- 38 3) Intended use
- 39 3. Cement Mix Design
- 40 a. Submit mix design detailing target cement content and optimum moisture
- 41 content in accordance with Tex-120-E.
- 42

1 **1.7 CLOSEOUT SUBMITTALS**

2 A. Test and Evaluation Reports

- 3 1. All test reports generated during testing.

4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

5 **1.9 QUALITY ASSURANCE [NOT USED]**

6 **1.10 DELIVERY, STORAGE, AND HANDLING**

7 A. Delivery and Acceptance Requirements

- 8 1. List the weight of cement measured on certified scales on each truck ticket.
9 2. Submit delivery tickets, certified by supplier, that include weight with each bulk
10 delivery of cement to the site.

11 B. Storage and Handling Requirements

- 12 1. Secure and maintain a location to store the material in accordance with Section 01
13 66 00.
14 2. Store cement in closed, weatherproof containers.

15 **1.11 FIELD CONDITIONS**

16 A. Ambient Conditions

- 17 1. Surface temperature must be at least 60°F and the ambient temperature must be
18 45°F and rising.

19 B. Suspend cement treatment if:

- 20 1. Ambient Condition requirements are not met
21 2. City determines weather conditions are unsuitable

22 **1.12 WARRANTY [NOT USED]**

23 **PART 2 - PRODUCTS**

24 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

25 **2.2 MATERIALS**

26 A. General

- 27 1. Furnish uncontaminated materials of uniform quality in accordance with the
28 Drawings and this Section.
29 2. Notify the City of the proposed material sources and of changes to material sources.
30 3. Obtain City approval for material sources.
31 4. The City may sample and test project materials at any time before compaction.

32 B. Cement

- 33 1. Furnish cement in accordance with ASTM C150 Type I, II or IP.
34

- 1 C. Flexible Base Courses
- 2 1. Furnish base material in accordance with the requirements of Section 32 11 23 for
- 3 the type and grade specified in the Drawings, before the addition of cement.
- 4 D. Embankment
- 5 1. Furnish embankment in accordance with the requirements of Section 31 24 00
- 6 before the addition of cement.
- 7 E. Water
- 8 1. Furnish water free of industrial wastes and other objectionable material.

9 **2.3 ACCESSORIES [NOT USED]**

10 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

11 **PART 3 - EXECUTION**

12 **3.1 INSTALLERS [NOT USED]**

13 **3.2 EXAMINATION [NOT USED]**

14 **3.3 PREPARATION**

- 15 A. Surface Preparation
- 16 1. Shape the subgrade or existing base to within 0.2 feet of finished grade in
- 17 accordance with the typical sections shown in the Drawings or as directed.
- 18 2. Proof roll roadbed in accordance with Paragraph 3.4 unless specified otherwise.
- 19 3. Remove unsuitable soil or material and replace with acceptable soil.
- 20 4. When material is imported from a borrow source manipulate and thoroughly mix
- 21 new base with existing material to provide a uniform mixture before shaping.
- 22 B. Demolition / Removal
- 23 1. Remove existing pavement in accordance with Section 02 41 15 as shown on the
- 24 Drawings.

25 **3.4 INSTALLATION**

- 26 A. General
- 27 1. Produce a completed course of treated material containing:
- 28 a. Uniform Portland cement mixture, free from loose or segregated areas
- 29 b. Uniform density and moisture content
- 30 c. Well bound for full depth
- 31 d. With smooth surface and suitable for placing subsequent courses
- 32 2. Maximum layer depth of 6 inches of cement treatment in single layer.
- 33 3. Minimum layer depth of 2 inches of cement treatment.
- 34 4. For treated subgrade exceeding 6 inches deep, pulverize, apply cement, mix,
- 35 compact, and finish in equal layers not exceeding 4 inches deep.
- 36

1 B. Equipment

- 2 1. Provide machinery, tools, and equipment necessary for proper execution of the
3 work.
- 4 2. Pulverization Equipment
- 5 a. Provide pulverization equipment that:
- 6 1) Cuts and pulverizes material uniformly to the proper depth with cutters
7 plane to a uniform surface over the entire width of the cut
- 8 2) Provides a visible indication of the depth of cut at all times
- 9 3) Uniformly mixes the materials
- 10 3. Compaction
- 11 a. Sheepsfoot roller required for all compaction purposes.
- 12 4. Proof rolling
- 13 a. Use equipment that will apply sufficient load to identify soft spots that rut or
14 pump.
- 15 1) Acceptable equipment includes fully loaded single-axle water truck with
16 minimum 1,500-gallon capacity.
- 17 5. Slurry Equipment
- 18 a. Provide a distributor truck equipped with an agitator, or
- 19 b. Provide a pump for agitating the slurry.
- 20 6. Substitution requests for equipment not indicated above shall be processed in
21 accordance with Section 01 25 00.
- 22 a. City may require Contractor to substitute equipment if production rate and
23 quality requirements of the Contract Documents are not met.

24 C. Pulverization

- 25 1. Pulverize or scarify existing material after shaping so that 100 percent by dry
26 weight passes a 2 1/2 inch sieve, and 80 percent by dry weight passes a No. 4 sieve
27 exclusive of gravel or stone retained in sieves.
- 28 2. No gravel or stone should be greater than 4 inches in maximum dimension.
- 29 3. If the material cannot be uniformly processed to the required depth in a single pass,
30 excavate and windrow the material to expose a secondary grade to achieve
31 processing to depth as specified in the Drawings.

32 D. Application of Cement

- 33 1. General
- 34 a. Uniformly apply cement as specified in the Drawings or as directed by the City.
- 35 b. Spread by an approved dry or slurry method uniformly on the soil at the rate
36 specified in the Drawings.
- 37 c. All the operations are to be continuous and completed in daylight within 6-
38 hours of initial application.
- 39 d. Do not exceed the quantity of cement that permits uniform and intimate mixture
40 of soil and cement during dry-mixing operations
- 41 e. No equipment, except that used in the spreading and mixing, allowed to pass
42 over the freshly spread cement until it is mixed with the soil.
- 43 2. Dry Placement
- 44 a. Before applying cement, bring the prepared roadbed to approximately 2
45 percentage points above optimum moisture content.

- b. If a bulk cement spreader is used, position by string lines or other approved method during spreading to insure a uniform distribution of cement.
 - c. Minimize dust and scattering of lime by wind. Do not apply lime when wind conditions, in the opinion of the City, cause blowing lime to become dangerous to traffic or objectionable to adjacent property owners.
3. Slurry Placement
- a. Apply slurry within 2 hours of adding water and when the roadbed is at a moisture content drier than optimum.
 - b. Make successive passes over a measured surface of roadway until the proper moisture and cement content have been achieved.

E. Mixing

- 1. Thoroughly mix the material and cement using approved equipment.
- 2. Mix until a homogeneous, friable mixture of material and cement is obtained, free from all clods and lumps.
- 3. Keep mixture within moisture tolerances throughout the operation.
- 4. Spread and shape the completed mixture in a uniform layer.
- 5. After mixing City may sample the mixture at roadway moisture and test in accordance with Tex-101-E, Part III, to determine compliance with the gradation requirements:

Sieve Size	Minimum % Passing
1-3/4 in.	100
3/4 in.	85
No. 4	60

F. Compaction

- 1. General
 - a. Begin compaction after mixing, and after gradation and moisture requirements have been met.
 - b. Begin compaction at the bottom and continue until the entire depth of the mixture is uniformly compacted.
 - c. At start of compaction, percentage of moisture in the mixture and in unpulverized soil lumps shall be less than the quantity which shall cause the soil-cement mixture to become unstable during compaction and finishing.
 - d. Reconstruct entire section in accordance with this Section at the sole expense of the Contractor if average moisture content exceeds the tolerance given at the time of final compaction.
 - e. Uniformly compact the mixture to specified density within 2-hours.
 - f. After the soil and cement mixture is compacted uniformly apply water as needed and thoroughly mix in.
 - g. Reshape the surface to the required lines, grades, and cross sections.
 - h. Lightly scarify surface to loosen any imprint left by the compacting or shaping equipment.
- 2. Rolling
 - a. Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one-half the width of the roller unit.
 - b. On superelevated curves, begin rolling at the low side and progress toward the high side.
 - c. Offset alternate trips of the roller.

- 1 d. Operate rollers at a speed between 2 and 6 MPH or as directed.
- 2 e. Proof roll the cement treated base course in accordance with the following:
- 3 1) Proof Rolling
- 4 a) City must be on-site during proof rolling operations.
- 5 b) Make at least 2 passes with the proof roller (down and back = 1 pass).
- 6 c) Offset each trip by at most 1 tire width.
- 7 f. Correct areas of rutting or pumping greater than 3/4 in and unstable or non-
- 8 uniform areas in accordance with Article 3.6.
- 9 3. Density Control
- 10 a. Compact until the entire depth of the mixture has achieved a uniform density of
- 11 not less than 95 percent of the maximum density as determined by ASTM
- 12 D558.
- 13 b. Final moisture content shall be minus 2 percent to plus 4 percent of optimum.
- 14 G. Finishing
- 15 1. Complete after compaction of the final course.
- 16 2. Clip, skin, or tight-blade surface of lime-treated material with a maintainer or
- 17 subgrade trimmer to a depth of approximately 1/4 inch.
- 18 3. Remove loosened material and dispose of at an approved location.
- 19 4. Roll the clipped surface immediately with a pneumatic tire roller adding small
- 20 increments of moisture as needed and until a smooth surface is attained.
- 21 5. Add small amounts of water as needed during rolling. Shape and maintain the
- 22 course and surface in conformity with the typical sections, lines, and grades shown
- 23 in the Drawings or as directed.
- 24 6. Surface compaction and finishing shall proceed in such a manner as to produce, in
- 25 not more than 2-hours, a smooth, closely knit surface, free of cracks, ridges or loose
- 26 material, conforming to the drawn grade and line shown in the Drawings.
- 27 7. After the final layer or course of the cement modified soil has been compacted, it
- 28 shall be brought to the required lines and grades in accordance with the typical
- 29 sections.
- 30 8. The completed section shall then be finished by rolling with a pneumatic tire or
- 31 other suitable roller sufficiently to create micro-fractures.
- 32 H. Micro-fracturing
- 33 1. Maintain moisture content of the finished cement treated base for a period of 24 to
- 34 48 hours.
- 35 2. During this time, but not sooner than 24 hours, roll the finished course with a
- 36 vibratory roller to induce micro-fracturing.
- 37 3. Rolling
- 38 a. Vibratory roller must have a static weight equal to or greater than 12 tons.
- 39 b. Vibratory roller must be at least 20 inches wide.
- 40 c. Make 2 to 4 passes vibrating at maximum amplitude traveling at a speed of 2
- 41 mph.
- 42 d. Additional passes may be required to achieve the desired cracking pattern, as
- 43 directed by the City.
- 44 e. Notify the City 24 hours before the micro-fracturing begins.
- 45 I. Curing

1. General
 - a. Cure for 72 hours after micro-fracturing is complete.
 - b. Maintain the moisture content during curing at no lower than 2 percentage points below optimum.
2. Curing method depends on finished pavement type:
 - a. Concrete pavement:
 - 1) Sprinkle with water
 - 2) Maintain moisture during curing
 - 3) Do not allow equipment on finished course during curing except as required for sprinkling, unless otherwise approved.
 - b. Asphalt Pavement:
 - 1) Apply an asphalt material in accordance with 32 12 16 at a rate of 0.05 to 0.20 gallon per square yard.
 - 2) Do not allow equipment on the finished course during curing
3. Continue curing until paving operations begin.

3.5 RESTORATION [NOT USED]

3.6 RE-INSTALLATION

- A. Remedy any low area of treated subgrade by scarifying the surface to a depth of at least 2 inches, filling the area with treated material and compacting.
- B. Remedy any low area of subbase or base by replacing the material for the full depth of subbase or base treatment rather than adding a thin layer of stabilized material to the completed work.
- C. Reworking a Section
 1. Reworking includes loosening, adding material or removing unacceptable material if necessary, mixing as directed, compacting, and finishing.
 2. Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted.
 - a. Continue until material is in accordance with the requirements of this Section.
 - b. Rework in accordance with this Section.

3.7 FIELD QUALITY CONTROL

- A. Field Test and Inspections
 1. Perform tests in accordance with Section 01 45 23.
 2. Density Test
 - a. City must be on site during density testing
 - b. Measure density of cement treated subgrade in accordance with ASTM D6938.
 - c. Measure density every 100' along corridor.
 - d. City determines density testing locations.
 3. Depth Test
 - a. City must be on site during density testing.
 - b. Measure depth of cement treated subgrade in accordance with Tex-140-E in hand excavated holes.
 - c. Measure depth every 250' along corridor.

1 **3.8 SYSTEM STARTUP [NOT USED]**

2 **3.9 ADJUSTING [NOT USED]**

3 **3.10 CLEANING [NOT USED]**

4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

5 **3.12 PROTECTION [NOT USED]**

6 **3.13 MAINTENANCE**

7 A. Maintenance

- 8 1. Maintain the soil-cement treatment in good condition from the time it first starts
9 work until all work shall is completed.
- 10 2. Maintenance includes immediate repairs of any defect that may occur after the
11 cement is applied.
- 12 3. Maintenance work shall be done by the Contractor at the Contractor's expense and
13 repeated as often as necessary to keep the area continuously intact.

14 **3.14 ATTACHMENTS [NOT USED]**

15 **END OF SECTION**

16

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

17

1 **SECTION 32 12 16**
2 **ASPHALT PAVING**
3

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

6 A. Section Includes:

- 7 1. Material requirements and construction methods for:
8 a. Asphalt Pavement
9 b. Asphalt Level-Up
10 c. Temporary Asphalt Pavement

11 B. Deviations from this City of Denton Standard Specification:

- 12 1. None.

13 C. Related Specification Sections include but are not limited to:

- 14 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
15 Contract.
16 2. Division 1 - General Requirements.
17 3. Section 32 01 17 – Flexible Paving Repair.
18 4. Section 32 11 29 – Lime Treated Base Courses.
19 5. Section 32 12 73 – Asphalt Paving Joint Sealants.
20 6. Section 32 05 16 – Aggregates for Exterior Improvements.
21 7. Section 41 14 00 – Batching Equipment.

22 **1.2 PRICE AND PAYMENT PROCEDURES**

23 A. Measurement and Payment

24 1. Asphalt Pavement (SY)

25 a. Measurement

- 26 1) Measured per square yard of Asphalt Pavement installed.

27 b. Payment

- 28 1) The work performed and materials furnished in accordance with this item
29 and measured as provided under “Measurement” will be paid for at the unit
30 price bid per square yard for “Asphalt Pavement (SY)” for:
31 a) Various types.
32 b) Various depths.
33 c) Various performance grade binders.
34 d) Various SAC requirements.

35 c. The price bid shall include:

- 36 1) Furnishing and installing Asphalt Pavement as specified by the Drawings
37 2) Shaping and fine grading the placement area
38 3) Testing and trial batches

- 1 4) All costs associated with obtaining and submitting the required action and
- 2 informational submittals
- 3 5) Asphalt, aggregate, and additives
- 4 6) Materials and work needed for any corrective action
- 5 7) Tack coat, PCE, Fog Seal, Crack sealant
- 6 8) Removal and/or sweeping excess material
- 7 2. Asphalt Pavement (TON)
- 8 a. Measurement
- 9 1) Measured tons of Asphalt Pavement (TON) installed
- 10 a) Tonnage is based on the rate of 110 lb/SY/in (pounds/square
- 11 yard/pavement inch)
- 12 b. Payment
- 13 1) The work performed and materials furnished in accordance with this item
- 14 and measured as provided under “Measurement” will be paid for at the unit
- 15 price bid per ton for “Asphalt Pavement (TON)” for:
- 16 a) Various types.
- 17 b) Various depths.
- 18 c) Various performance grade binders.
- 19 d) SAC requirements.
- 20 c. The price bid shall include:
- 21 1) Furnishing and installing Asphalt Pavement as specified by the Drawings
- 22 2) Shaping and fine grading the placement area
- 23 3) Testing and trial batches
- 24 4) All costs associated with obtaining and submitting the required action and
- 25 informational submittals
- 26 5) Asphalt, aggregate, and additives
- 27 6) Materials and work needed for any corrective action
- 28 7) Tack coat, PCE, Fog Seal, Crack sealant
- 29 8) Removal and/or sweeping excess material
- 30

- 1 3. Asphalt Level-Up
- 2 a. Measurement
- 3 1) Measured ton of Asphalt Level-Up installed
- 4 a) Tonnage is based on the rate of 110 lb/SY/in (pounds/square
- 5 yard/pavement inch)
- 6 b. Payment
- 7 1) The work performed and materials furnished in accordance with this item
- 8 and measured as provided under “Measurement” will be paid for at the unit
- 9 price bid per ton for “Asphalt Level-Up”.
- 10 c. The price bid shall include:
- 11 1) Furnishing and installing Asphalt Level-Up as specified by the Drawings
- 12 2) Shaping and fine grading the roadbed (as needed)
- 13 3) Testing and trial batches
- 14 4) All costs associated with obtaining and submitting the required action and
- 15 informational submittals
- 16 5) Asphalt, aggregate, and additives
- 17 6) Materials and work needed for any corrective action
- 18 7) Tack coat, PCE, Fog Seal, Crack sealant
- 19 8) Removal and/or sweeping excess material
- 20 4. Temporary Hot-Mix Asphalt Pavement
- 21 a. Measurement
- 22 1) Measured per square yard of Temporary Asphalt Pavement installed.
- 23 b. Payment
- 24 1) The work performed, and materials furnished in accordance with this item
- 25 and measured as provided under “Measurement” will be paid for at the unit
- 26 price bid per square yard for Temporary Hot-Mix Asphalt Pavement for:
- 27 a) Various depths of TY B asphalt pavement.
- 28 b) Various types of subgrade.
- 29 c) Examples:
- 30 (1) Temporary Hot-Mix Asphalt Pavement, 4” of TY B on 6” of
- 31 Flexbase Subgrade
- 32 (2) Temporary Hot-Mix Asphalt Pavement, 6” of TY B on 8” of
- 33 Cement Stabilized Subgrade
- 34 (3) Temporary Hot-Mix Asphalt Pavement, 8” of TY B on 10” of Lime
- 35 Stabilized Subgrade
- 36 c. The price bid shall include:
- 37 1) Furnishing and installing Temporary Hot-Mix Asphalt Pavement as
- 38 specified by the Drawings
- 39 2) Installation and of temporary asphalt
- 40 3) Any subgrade required per the drawings or requested by the Contractor due
- 41 to site conditions. Subgrade could consist of compacted subgrade, treated
- 42 subgrade, or flexible base.
- 43 4) Maintaining temporary asphalt for the duration of the traffic control phase
- 44 it is used for.
- 45 5) Removal of the temporary asphalt is considered subsidiary to the
- 46 installation.
- 47 6) Shaping and fine grading the roadbed (as needed)
- 48 7) Testing and trial batches (as needed)

- 1 8) All costs associated with obtaining and submitting the required action and
- 2 informational submittals
- 3 9) Asphalt, aggregate, and additives
- 4 10) Materials and work needed for any corrective action
- 5 11) Tack coat, PCE, Fog Seal, Crack sealant
- 6 12) Removal and/or sweeping excess material

7 **1.3 REFERENCES**

8 A. Abbreviations and Acronyms

- 9 1. AQMP – Texas Department of Transportation’s Aggregate Quality Monitoring
- 10 Program (Tex-499-A)
- 11 2. BRSQC – Texas Department of Transportation’s *Bituminous Rated Source Quality*
- 12 *Catalog*
- 13 3. HMA – Hot-Mix Asphalt
- 14 4. MPL – Texas Department of Transportation’s Material Producer List
- 15 5. MTD – Material Transfer Device
- 16 6. PCE – Prime, Cure, and Erosion Control
- 17 7. RAP – Reclaimed Asphalt Pavement
- 18 8. RAS – Recycled Asphalt Shingles
- 19 9. SAC – Surface Aggregate Classification
- 20 10. TCEQ – Texas Commission on Environmental Quality
- 21 11. TGC – Texas Gyrotory Compactor
- 22 12. TxDOT – Texas Department of Transportation
- 23 13. VMA – Voids in Mineral Aggregate

24 B. Reference Standards

- 25 1. Reference standards cited in this Section refer to the current reference standard
- 26 published at the time of the latest revision date logged at the end of this Section
- 27 unless a date is specifically cited.
- 28 2. National Institute of Standards and Technology (NIST)
- 29 a. Handbook 44 – Specifications, Tolerances, and Other Technical Requirements
- 30 for Weighing and Measuring Devices.
- 31 3. American Association of State Highway and Transportation Officials (AASHTO)
- 32 Standards:
- 33 a. M323, Standard Specification for Superpave Volumetric Mix Design
- 34 b. R35, Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt
- 35 c. T48, Standard Method of Test for Flash and Fire Points by Cleveland Open
- 36 Cup
- 37 d. T201, Kinematic Viscosity of Asphalts (Bitumens)
- 38 e. T202, Standard Method of Test for Viscosity of Asphalts by Vacuum Capillary
- 39 Viscometer
- 40 f. T315, Standard Method of Test for Determining the Rheological Properties of
- 41 Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
- 42 g. T316, Standard Method of Test for Viscosity Determination of Asphalt Binder
- 43 Using Rotational Viscometer

- 1 h. T313, Test Method for Determining the Flexural Creep Stiffness of Asphalt
- 2 Binder Using the Bending Beam Rheometer (BBR)
- 3 4. TxDOT Test Procedures:
- 4 a. Tex-106-E, Calculating the Plasticity Index of Soils
- 5 b. Tex-107-E, Determining the Bar Linear Shrinkage of Soils
- 6 c. Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates
- 7 d. Tex-204-F, Design of Bituminous Mixtures
- 8 e. Tex-205-F, Laboratory Method of Mixing Bituminous Mixtures
- 9 f. Tex-206-F, Compacting Specimens Using the Texas Gyrotory Compactor
- 10 (TGC)
- 11 g. Tex-207-F, Determining Density of Compacted Bituminous Mixtures
- 12 h. Tex-211-F, Recovery of Asphalt from Bituminous Mixtures by the Abson
- 13 Process
- 14 i. Tex-212-F, Determining Moisture Content of Bituminous Materials
- 15 j. Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse
- 16 Aggregates
- 17 k. Tex-222-F, Sampling Bituminous Mixtures
- 18 l. Tex-226-F, Indirect Tensile Strength Test
- 19 m. Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures
- 20 n. Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the
- 21 Ignition Method
- 22 o. Tex-242-F, Hamburg Wheel-Tracking Test
- 23 p. Tex-243-F, Tack Coat Adhesion
- 24 q. Tex-244-F, Thermal Profile of Hot Mix Asphalt
- 25 r. Tex-406-A, Material Finer than 75 μm (No. 200) Sieve in Mineral Aggregates
- 26 (Decantation Test for Concrete Aggregates)
- 27 s. Tex-499-A, Texas Department of Transportation's Aggregate Quality
- 28 Monitoring Program (AQMP)
- 29 t. Tex-530-C, Effect of Water on Bituminous Paving Mixtures
- 30 u. Tex-540-C, Measurement of Polymer Separation on Heating in Modified
- 31 Asphalt Systems
- 32 v. Tex-541-C, Rolling Thin Film Oven Test for Asphalt Binders
- 33 w. Tex-923-K, Verifying the Accuracy of Liquid Additive Metering Systems

34 1.4 ADMINISTRATIVE REQUIREMENTS

- 35 A. Pre-Paving Meeting
- 36 1. Hold meeting 1 week prior to performing any tasks included under Asphalt Paving.
- 37 2. Invite the City and appropriate representatives.
- 38 3. Prior to pre-paving meeting, prepare the following:
- 39 a. Paving Plan including:
- 40 1) Paving widths
- 41 2) Joint offsets
- 42 3) Lift thicknesses for each paving course
- 43 b. Paving Process including:
- 44 1) Process to balance production, delivery, paving, and compaction to achieve
- 45 continuous placement operations and good ride quality.
- 46 2) Procedures to construct quality longitudinal and transverse joints

- 1 3) Proposed rolling pattern in accordance with Asphalt Placement.
- 2 c. Action and Information Submittals to be reviewed and approved:
- 3 1) Product Data
- 4 2) Hot-Mix Asphalt Mix Design
- 5 3) Trial Batch Testing
- 6 4) Certifications
- 7 5) Testing and Evaluation Reports
- 8 6) Equipment Submittal
- 9 7) Location of all Material Sources
- 10 8) Testing Laboratory

11 **1.5 SUBMITTALS**

- 12 A. Submittals shall be in accordance with Section 01 33 00.
- 13 B. All submittals shall be approved by the City prior to commencement of any Asphalt
- 14 Paving activities.

15 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 16 A. Shop Drawings
- 17 1. Product Data
- 18 a. Provide electronic product data from each manufacturer that is supplying
- 19 asphalt binder, tack coat, Fog Seal, PCE, mineral filler, or additives to be used
- 20 on the project.
- 21 b. Product data sheets will include:
- 22 1) Manufacturer name
- 23 2) Date
- 24 3) Material description
- 25 4) Point of delivery
- 26 5) Produce data and test results as required in this specification
- 27 6) Material Safety Data Sheets (if applicable, required for PCE and all
- 28 additives)
- 29 7) Manufacturer Recommended Storing Data (if applicable)
- 30 8) Application Recommendations (if applicable)
- 31 9) Liquid Antistripping Agent Specific Data:
- 32 a) Specific gravity of the agent at the manufacturer's recommended
- 33 addition temperature
- 34 b) Manufacturer's recommended dosage range
- 35 c) Manufacturer's Recommended Storage and Handling instructions
- 36 2. Hot-Mix Asphalt Mix Design – Provide the project mix design using the template
- 37 provided in Tex-204-F. The submittal will include:
- 38 a. The combined aggregate gradation, source, specific gravity, and percent of each
- 39 material used.
- 40 b. Asphalt binder content and aggregate gradation of Reclaimed Asphalt Paving
- 41 (RAP) and Recycled Asphalt Shingles (RAS) stockpiles.
- 42 c. The target laboratory-molded density.
- 43 d. Results of all applicable tests in accordance with Delivery, Storage, and
- 44 Handling, Materials, and Source Quality Control.

- 1 e. Additive information including type, quantity, addition rate, and moisture
- 2 resistance requirements
- 3 f. The mixing and molding temperatures.
- 4 g. The signature of the person or persons performing the design.
- 5 h. The date the mixture design was performed.
- 6 i. The unique identification number for the mixture design.
- 7 B. Informational Submittals
- 8 1. Source Locations
- 9 a. Provide the location of all material sources
- 10 2. Equipment Information
- 11 a. Submittal for all major equipment to include:
- 12 1) Equipment name
- 13 2) Size
- 14 3) Intended use
- 15 3. Certificates
- 16 a. Provide material certifications for all asphalt paving materials certifying the
- 17 material complies with this Section.
- 18 b. Additional PCE Certifications
- 19 1) Provide a certification letter from an approved analytical lab per TxDOT's
- 20 MPL with the product data sheet for PCE that has been signed by a lab
- 21 official indicating the PCE formulation does not:
- 22 a) Meet any characteristics of a Resource Conservation Recovery Act
- 23 (RCRA) hazardous waste.
- 24 b) Contain any or Polychlorinated Biphenyls (PCBs) in the product.
- 25 4. Test and Evaluation Reports
- 26 a. Provide testing and evaluation reports to the City for each material being used
- 27 to prepare asphalt pavement. Test samples to verify source material complies
- 28 with all requirements in this specification. Materials to be tested include, but
- 29 are not limited to:
- 30 1) Coarse and Fine Aggregate Testing
- 31 a) Provide verification material source location is listed on TxDOT's
- 32 BRSQC. If it is listed, source quality testing may be waived.
- 33 b) If the source location is not listed on TxDOT's BRSQC, provide all
- 34 testing and evaluation reports to verify the source material complies
- 35 with all requirements of Section 32 05 16.
- 36 2) Asphalt Binder
- 37 a) Manufacturer Supplied Testing Reports for Performance Grade Asphalt
- 38 Binder
- 39 b) Daily records of asphalt binder temperatures in accordance with section
- 40 Placement Operations.
- 41 b. Gyrotory Compactor
- 42 1) Supply the City with the gyrotory compactor correlation factor determined
- 43 as part of Source Quality Control.
- 44 c. Trial Batch

- 1) Provide a testing and evaluation report to the City for the trial batch prepared in accordance with Source Quality Control. The trial batch will be a representative sample verifying that the mix design meets the requirements of this specification.
- 2) Provide the mix design that was used to produce the trial batch with the trial batch test and evaluation reports.
- 5. Testing Laboratory
 - a. Submit for review and approval the following information for each testing laboratory used on the project:
 - 1) Testing Laboratory Name
 - 2) Location
 - 3) What tests will be performed at the lab if multiple labs are used.

1.7 CLOSEOUT SUBMITTALS

- A. Test and Evaluation Reports
 - 1. All test reports generated during testing.

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Secure and maintain a location to store the material in accordance with Section 01 66 00.
- B. Storage, Heating, and Application Temperatures of Bituminous Materials
 - 1. Store and apply materials at the lowest temperature yielding satisfactory results.
 - 2. Use storage and application temperatures in accordance with Table 1.
 - 3. No material will be heated above the maximum temperature shown.
 - 4. Follow manufacturer’s instructions for agitation requirements in storage.
 - 5. Manufacturer’s instructions regarding application and storage temperatures supersede those in Table 1.

**Table 1
 Storage and Application Temperatures**

Type – Grade	Application		Storage Maximum Degrees Fahrenheit
	Recommended Range Degrees Fahrenheit	Maximum Allowable Degrees Fahrenheit	
CSS-1h	50 – 130	140	140
PCE	50 – 130	140	140
PG Binders	275 – 350	350	350

- C. Storage and Stockpiling of Recycled Materials
 - 1. Reclaimed Asphalt Pavement (RAP)
 - a. Test any RAP stockpiles (coarse and fine) for decantation in accordance with Tex-406-A, Part 1.
 - b. Determine the plasticity index for RAP stockpiles (coarse and fine) in accordance with Tex-106-E if the decantation value exceeds 5 percent.

- 1 c. Decantation and plasticity index requirements do not apply to RAP samples
- 2 with asphalt removed by extraction or ignition.
- 3 2. Recycled Asphalt Shingles
- 4 a. Stockpile to contain less than 0.5 percent deleterious materials.
- 5 b. Test stockpile in accordance with Tex-217-F, Part 3 to determine deleterious
- 6 material content.

7 D. Storage of Hot-Mix Asphalt

- 8 1. Do not store mixture long enough to affect the quality of the mixture.
- 9 2. Do not store mixture at the plant for longer than 12 hours unless otherwise
- 10 approved by City.
- 11 3. Provide asphalt storage sufficient to meet the plant requirements.
- 12 4. Heat asphalt by steam coils. Steam coils to be tight enough to prevent leakage of
- 13 moisture into the asphalt.
- 14 5. Store asphalt in accordance to the temperature requirements in Table 1.
- 15 6. Direct fire heating will not be permitted.
- 16 7. Agitating asphalt with steam or air will not be permitted.
- 17 8. Steam heating in accordance with the requirements of this Section.

18 E. Storage of Temporary Hot-Mix Asphalt Paving

- 19 1. Store temporary asphalt paving using the same storage requirements as Hot-Mix
- 20 Asphalt Paving.

21 **1.11 SITE CONDITIONS**

22 A. Weather Conditions

- 23 1. Hot-Mix Asphalt Paving
- 24 a. Place mixture when the roadway surface temperature is at or above the
- 25 temperatures listed in Table 2 unless otherwise approved or as specified in the
- 26 Drawings.
- 27 b. Measure the roadway surface temperature with a hand-held thermal camera or
- 28 infrared thermometer.
- 29 c. If roadway temperatures will reach the required temperature within 2 hours, the
- 30 City may allow placement before the roadway surface reaches the required
- 31 temperature.
- 32 d. Place mixtures only when weather conditions and moisture conditions of the
- 33 roadway surface are suitable as determined by the City.
- 34 e. The City may restrict the Contractor from paving if the ambient temperature is
- 35 likely to drop below 32 degrees Fahrenheit within 12 hours of paving.

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**Table 2
 Pavement Surface Temperatures**

High Temperature Binder Grade	Minimum Pavement Surface Temperatures (degrees Fahrenheit)	
	Subsurface Layers or Night Paving Operations	Surface Layers Placed in Daylight Operations
PG 64-22, PG 70-22, And Prime Coat	60	50

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1. Temporary Asphalt Paving
 - a. Install temporary asphalt paving using the same temperature requirements as Hot-Mix Asphalt Paving.
2. Prime Coat
 - a. Apply the mixture in accordance with Table 2.
 - b. Measure the air temperature in the shade away from artificial heat.
 - c. The City will determine when weather conditions are suitable for application.
 - d. Do not permit traffic, hauling, or placement of subsequent courses over freshly constructed prime coats.
 - e. Maintain the primed surface until placement of subsequent courses or acceptance of the work.

14 **1.12 WARRANTY [NOT USED]**

15 **PART 2 - PRODUCTS**

16 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

17 **2.2 MATERIALS**

- 18 A. Use materials shown in Table 3, unless otherwise approved by City or specified in the
 19 Drawings.

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**Table 3
 Typical Material Use**

Material Application	Allowable Material
Hot-Mixed, Hot-Laid Asphalt Mixtures	PG 64-22 ¹ and PG 70-22 ¹
Tack Coat and Fog Seal	Type CSS-1h
Prime Coat	PCE
Erosion Control	PCE

22
 23

1. Refer to Asphalt Binder for information on when each performance grade binder is allowed.

1 B. Aggregate

- 2 1. Provide aggregates in accordance with Section 32 05 16.
3 2. Provide aggregates from sources in accordance with this Section and 32 05 16.
4 3. Notify the City of all source locations and any changes to material source or mix
5 design.
6 4. Aggregates for Asphalt Pavement to be approved by the City prior to use in
7 accordance with this Section.
8 5. Determine aggregate gradations for mixture design and production testing based on
9 the washed sieve analysis given in Tex-200-F, Part 2.
10 6. The Surface Aggregate Classification (SAC) will be SAC-A unless otherwise
11 specified in the Drawings for all surface courses. The SAC will only apply to the
12 aggregate used on the travel lanes unless otherwise specified in the Drawings.
13 Provide aggregates in accordance with all SAC requirements in Section 32 05 16.
14 7. Coarse Aggregate
15 a. Provide aggregates in accordance with the requirements of Section 32 05 16.
16 8. Fine Aggregate
17 a. Provide fine aggregates that consists of crushed stone, crushed gravel, sand,
18 and/or limestone or steel slag screenings in accordance with Section 32 05 16.
19 b. Provide fine aggregate in accordance with the gradation requirements shown in
20 Table 4.
21 c. No more than 15% of the total aggregate may be field sand or other uncrushed
22 fine aggregate.
23 d. Limestone or Steel Slag Screenings
24 1) Limestone or steel slag screenings may constitute part of or all of the fine
25 aggregate.
26 2) Provide screenings that conform to the requirements for Fine Aggregate in
27 Section 32 05 16.

28 **Table 4**
29 **Gradation Requirements for Fine Aggregate**

Sieve Size	percent Passing by Weight or Volume
3/8-inch	100
No. 8	70-100
No. 200	0-30

30 C. Mineral Filler

- 31 1. Mineral filler is allowed unless otherwise specified in the Drawings and should
32 consist finely divided material such as:
33 a. Stone dust
34 b. Crushed fines
35 c. Hydrated lime
36 1) Use no more than 2 percent unless otherwise specified in the Drawings
37 2) Use no more than 1 percent if a substitute binder is used (refer to Table 10)
38 unless otherwise specified in the Drawings
39 d. Portland cement
40 1) Use no more than 2 percent unless otherwise specified in the Drawings
41 e. Fly ash

- 1 2. Provide mineral fillers that:
- 2 a. Are sufficiently dry, free flowing, and free from clumps and foreign matter
- 3 b. Meet the gradation requirements shown in Table 5 when performing Tex-200-F
- 4 Part 1 (based on weight) or Part 3 (based on volume).
- 5 c. In accordance with the requirements listed in Source Quality Control.

6 **Table 5**
7 **Gradation Requirements for Mineral Filler**

Sieve Size	Percent Passing by Weight
No. 8	100
No. 200	55-100

8 D. Asphalt Binder

- 9 1. Asphalt binder will be PG64-22 for TY B mix designs unless otherwise approved
- 10 by the City or specified in the Drawings.
- 11 2. Asphalt binder will be PG70-22 for TY D and TY C mix designs unless otherwise
- 12 approved by the City or specified in the Drawings.
- 13 3. Provide material that:
- 14 a. Is produced from crude petroleum.
- 15 b. Is homogenous and free from water and residue from distillation of coal, coal
- 16 tar, or paraffin oil.
- 17 c. Will not foam when heated to 347 degrees Fahrenheit
- 18 d. In accordance with the requirements shown in Table 6 for performance grade
- 19 asphalt binder.
- 20 e. Shows no separation when tested in accordance with Tex-540-C
- 21

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**Table 6
 Performance Grade Asphalt Binder**

Property and Test Method	Performance Grade	
	PG 64	PG 70
	-22	-22
Average 7-Day Max Pavement Design Temperature, Degrees Celsius ¹	< 64	<70
Min Pavement Design Temperature, Degrees Celsius ¹ (i.e. design temperature shall be greater than shown)	>-22	>-22
Original Binder		
Flash Point Temperature, AASHTO T48: Minimum, degrees Celsius	230	
Viscosity, AASHTO T48 ^{2,3} or T316 ^{2,3} Maximum, 3.0 Pa*s, Test Temperature, Degrees Celsius	135	
Dynamic Shear, AASHTO T315: ⁴ G*/sin(δ), Minimum, 2.00-kPa ⁷ Test Temperature at 10-rad/s, Degrees Celsius	64	70
Elastic Recovery, D 6084, 50 Degrees Fahrenheit, percent minimum	-	30
Rolling Thin Film Oven (Tex-541-C)		
Maximum Loss, maximum percent	1.0	
Dynamic Shear, AASHTO T315: G*/sin(δ), Minimum, 2.20-kPa, Maximum, 5.0-kPa Test Temperature at 10-rad/s, Degrees Celsius	64	70
Pressure Aging Vessel (PAV) Residue (R28)		
PAV Aging Temperature, degrees Celsius	100	
Dynamic Shear, AASHTO T315: G*/sin(δ), Maximum, 5,000-kPa Test Temperature at 10-rad/s, Degrees Celsius	25	25
Creep Stiffness, AASHTO T313: ^{5,6} S, Maximum, 300-MPa m-value, Minimum 0.300 Text Temperature at 60 s, Degrees Celsius	-12	-12
Direct Tension, AASHTO T314: ⁶ Failure Strain, Minimum, 1.0 percent Test Temperature at 1.0-mm/min, Degrees Celsius	-12	-12

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in the TxDOT PGEXCEL3.XLS software program, may be provided by the City, or by following the procedures as outlined in AASHTO MP2 and PP28.
2. This requirement may be waived at the discretion of the City if the supplier warrants that the asphalt binder can be adequately pumped, mixed and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (AASHTO T201 or T202) or rotational viscometry (AASHTO T48 or T316). A waiver will need to be submitted to the City for approval prior to asphalt paving.
3. Viscosity at 135 degrees Celsius is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Be aware that variation could significantly impact mixing and compaction operations. Contractor is responsible for addressing any constructability issues which may arise.

4. For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of $G^*/\sin(\delta)$ at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (AASHTO T201 or T202) or rotational viscometry (AASHTO TP48 or T316).
5. Silicone beam molds as described in AASHTO TP 1-93 are acceptable for use.
6. If creep stiffness is below 300 MPa, direct tension test is not required. If creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

1 E. Emulsified Asphalt for Tack Coat and Fog Seal (CSS-1h)

- 2 1. Use cationic emulsion CSS-1h in accordance with the requirements shown in Table
3 7 unless approved by the City or specified in the Drawings.
- 4 2. The material will be composed of a paving asphalt base uniformly emulsified with
5 water.
- 6 3. The material will be homogenous throughout and when stored will show no signs of
7 separation within 3-days after delivery.
- 8 4. Do not dilute emulsified asphalts at the terminal, in the field, or at any other
9 location before use.
- 10 5. Temperature
- 11 a. Never raise the temperature of the emulsion above 160 degrees Fahrenheit after
12 it is loaded for transportation from refinery to the purchaser.
- 13 b. Tack coat and prime coat may be reheated
- 14 c. Prevent localized overheating when reheating the material.
- 15 d. Do not allow the material to cool to a temperature of less than 40 degrees
16 Fahrenheit.
- 17 e. Apply the material at the manufacturer's recommended temperature.
- 18 f. Provide a thermometer capable of testing the temperature of the asphalt binder
19 on site at all times.
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Table 7
Tests and Properties of Cationic Emulsions

Property	Test Procedure	Slow Setting	
		Type – Grade	
		CSS-1h	
		Min	Max
Viscosity, Saybolt Furol at 77 degrees Fahrenheit, second at 122 degrees Fahrenheit, second	T 72	20 –	100 –
Sieve Test, percent	T 59	–	0.1
Cement Mixing, percent	T 59	–	2.0
Coating Ability and Water Resistance: Coating, Dry Aggregate, After Spraying Coating, Wet Aggregate, After Spraying	T 59	– –	– –
Demulsibility, 35 ml 0.8 percent Sodium dioctyl sulfosuccinate, percent	T 59	–	–
Storage Stability, 1 day, percent	T 59	–	1
Particle Charge Test	T 59	Positive	
Distillation Test: Residue by Distillation, percent by weight Oil Distillate, percent by volume of Emulsion	T 59	60 –	– 0.5
Tests on Residue from Distillation: Penetration at 77 degrees Fahrenheit, 100-g, 5-seconds Solubility in Trichloroethylene, percent Ductility at 77 degrees Fahrenheit, 5 cm/min, cm	T 49 T 44 T 51	70 97.5 80	110 – –

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- F. Emulsified Asphalt for Prime Coat, Curing, and Erosion Control (PCE)
1. Use slow setting PCE in accordance with the requirements shown in Table 8 unless approved by the City or specified in the Drawings.
 2. PCE may be used as a prime coat for base materials, curing seal for stabilized base materials, and erosion control applications such as dust control, soil surface stabilization, or mulch binder.
 3. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use.

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Table 8
Tests and Properties of PCE Emulsions

Property	Test Procedure	Type – Grade	
		Slow Setting	
		PCE ¹	
		Min	Max
Viscosity, Saybolt Furol at 77 degrees Fahrenheit, second at 122 degrees Fahrenheit, second	T 72	10 –	100 –
Sieve Test, percent	T 59	–	0.1
Miscibility	T 59 ²	Pass	–
Demulsibility, 35 mL of 0.10 N CaCl ₂ , percent	T 59	–	–
Storage Stability, 1 day, percent	T 59	–	–
Particle Size ⁵ , percent by volume < 2.5 μm	Tex-238-F ³	90	–
Asphalt Emulsion Distillation to 500 degree Fahrenheit Followed by Cutback Asphalt Distillation of Residue to 680 degrees Fahrenheit Residue after both distillations, percent by weight Total oil distillate from both distillations, percent by volume of emulsion	T 59 & T 78	– –	– –
Residue by Distillation, percent by weight	T59	–	–
Residue by Evaporation, percent by weight	T 59 ⁴	60	–
Tests on Residue after all Distillation(s): Viscosity, 140 degrees Fahrenheit, poise Kinematic Viscosity ⁵ , 140 degrees Fahrenheit, cSt Flash Point C.O.C, degrees Fahrenheit Solubility in Trichloroethylene, percent Float Test, 122 degrees Fahrenheit, seconds	T 202 T 201 T 48 T 44 T 50	– 100 400 – –	– 350 – – –

1. Each PCE shipment will include the information indicated under Source Quality Control
2. Except the dilution shall use 350-mL distilled or deionized water and a 100-mL beaker.
3. Use Tex-238-F, beginning at “Particle Size Analysis by Laser Diffraction”, with distilled or deionized water as a medium and no dispersant, or use another approved method.
4. Except the sample shall remain in the oven until foaming ceases, then cooled and weighed.
5. PCE must meet either the kinematic viscosity requirement or the particle size requirement

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G. Additives

1. General:

- a. Only use additives when they are specified in the Drawings unless otherwise approved by the City.
- b. If additives are used, additive information to be provided as part of the HMA Mix Design Action Submittal.
- c. Stop production if the production mixture does not meet moisture resistance requirements and correct the problem.
- d. Verify when antistripping agents are added at the plant (batch or source location) that:

- 1) The measuring device for the addition of the agent is connected into the automatic plant controls to automatically adjust the supply to the plant production and provide consistent percentage in the mixture.
 - 2) Set automatic plant controls so that an interruption of asphalt antistripping agent's flow causes plant shutdown.
2. Lime Antistripping Agent:
 - a. Do not allow lime to be added directly into the mixing drum at any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime into the drum.
 - b. If lime is used, provide only commercial lime slurry in accordance with Section 32 11 29.
 - c. Add between 0.5 and 2.0 percent commercial lime slurry by weight of the individual aggregate treated.
 - d. Mix the lime slurry in a suitable pug mill mixer with the aggregate.
 - e. Mix with aggregate between the plant cold feeds and the dryer or mixing drum during mixture production.
 3. Liquid Antistripping Agent
 - a. Add to the binder in accordance with the manufacturer's instructions. Do not exceed the manufacturer's maximum recommended dosage rate.
 - b. Provide a liquid antistripping agent uniform and shows no evidence of crystallization, settling, or separation.
 - c. Ensure all liquid antistripping agents arrive in:
 - 1) Properly labeled and unopened containers shipped directly from the manufacturer
 - 2) Sealed tank trucks with an invoice to show contents and quantities
 - d. Handle in accordance with the manufacturer's recommendations.
 - e. Add at the manufacturer's recommended addition temperature.
 - f. Add into the asphalt line by means of an in-line-metering device and a blending device to disperse the agent.
 - g. Furnish a meter that reads in increments of 0.1 gallons or less.
 4. Antistripping Additive Meters
 - a. Provide a means to check the accuracy of meter output for liquid and lime additives.
 - b. For liquid additive meters, verify accuracy of the meter in accordance with Tex-923-K.
 - c. Ensure the accuracy of the meter is within 5.0 percent.

H. Recycled Materials

1. General
 - a. Use of RAP and RAS is permitted unless otherwise specified in the Drawings.
 - b. Do not exceed the maximum allowable percentages of RAP and RAS shown in Table 9 unless specified in the Drawings.
 - c. Determine asphalt binder content and gradation of the RAP and RAS stockpiles for mixture design purposes in accordance with Tex-236-F.
 - d. The City may verify the asphalt binder content of the stockpiles at any time during production.
 - e. Perform all tests specified in the Drawings and listed under Source Quality Control.

- 1 f. Asphalt binder from RAP and RAS is designated as recycled asphalt binder.
- 2 g. Calculate and ensure that the ratio of the recycled asphalt binder to total binder
- 3 does not exceed percentages shown in Table 10 during mixture design and HMA
- 4 production when RAP or RAS is used.
- 5 h. Use a separate cold feed bin for each stockpile of RAP and RAS during HMA
- 6 production.
- 7 i. Surface, intermediate, and base mixes referenced in Table 9 and 10 are defined
- 8 as follows:
- 9 1) Surface – This is the pavement course placed at the top of the pavement
- 10 structure. RAP or RAS will not be permitted for use in the surface course.
- 11 2) Intermediate – TY B asphalt courses placed directly under the surface
- 12 course and above the base course.
- 13 3) Base – TY B asphalt course placed directly under the intermediate course in
- 14 the HMA pavement structure.
- 15 2. Reclaimed Asphalt Pavement (RAP)
- 16 a. Consists of salvaged, milled, pulverized, broken, or crushed asphalt pavement.
- 17 b. Use of RAP is permitted for TY B asphalt courses unless otherwise specified in
- 18 the Drawings.
- 19 c. Crush or break RAP so that 100 percent of the particles pass the No. 2 sieve.
- 20 d. Fractionated RAP is defined as 2 or more RAP stockpiles that are divided into
- 21 coarse and fine fractions.
- 22 e. Ensure that the coarse RAP stockpile contains only material retained on a 3/8
- 23 inch or 1/2 inch sieve unless otherwise approved.
- 24 f. Ensure that the fine RAP stockpile contains only material passing the 3/8 inch
- 25 or 1/2 inch sieve unless otherwise approved.
- 26 g. The maximum percentages of fractionated RAP may be comprised of coarse or
- 27 fine fractionated RAP.
- 28 h. The maximum percentages of fractionated RAP may also be a combination of
- 29 both coarse and fine fractionated RAP.
- 30 i. Provide RAP material free from dirt or other objectionable materials.
- 31 j. Do not use any RAP material if the decantation value exceeds 5 percent and the
- 32 plasticity index is greater than 8.
- 33 k. Conform storing and stockpiling RAP to the requirements under Delivery,
- 34 Storage, and Handling.

Table 9
Maximum Allowable Amounts of RAP¹

Maximum Allowable Fractionated RAP ² (percent)			Maximum Allowable Unfractionated RAP ³ , (percent)		
Surface	Intermediate	Base	Surface	Intermediate	Base
0.0	25.0	30.0	0.0	10.0	10.0

- 1. Must also meet the recycled binder to total binder ratio shown in Table 10.
- 2. Up to 5 percent RAS may be used separately or as a replacement for fractionated RAP
- 3. Unfractionated RAP may not be combined with fractionated RAP or RAS.

- 37 3. Recycled Asphalt Shingles (RAS)
- 38 a. RAS is processed asphalt shingle material from manufacturing of asphalt
- 39 roofing shingles or from re-roofing residential structures.

- b. Post-manufactured RAS is processed manufacturer’s shingle scrap by-product.
- c. Post-consumer RAS is processed shingle scrap removed from residential structures.
- d. Comply with all regulatory requirements stipulated for RAS by the TCEQ.
- e. Use of post-manufactured RAS or post-consumer RAS (tear-offs) is permitted for TY B asphalt courses unless otherwise specified in the Drawings.
- f. RAS may be used separately or in conjunction with RAP.
- g. Up to 5 percent RAS may be used separately or as a replacement for fractionated RAP in accordance with Table 9 and 10.
- h. Process RAP by ambient grinding or granulating such that 100 percent of the particles pass the 3/8 inch sieve when tested in accordance with Tex-200-F, Part 1.
- i. Perform a sieve analysis on processed RAS material before extraction (or ignition) of the asphalt binder.
- j. Add sand meeting the requirements of fine aggregate in Section 32 05 16 and fine aggregate gradation to RAS stockpiles if needed to keep the processed material workable.
- k. Fine RAP may also be added to RAS stockpiles if needed to keep the processed material workable.
- l. Any stockpile that contains RAS will be considered a RAS stockpile.
- m. RAS is limited to no more than 5.0 percent of the HMA mixture in accordance with Table 9.
- n. Certify compliance of the RAS with DMS-11000, “Evaluating Using Nonhazardous Recyclable Materials Guidelines.”
- o. Treat RAS as an established nonhazardous recyclable material if it has not encountered any hazardous materials.
- p. Use RAS from shingle sources on the TxDOT MPL or approved by City.
- q. Substantially remove all materials before use that are not part of the shingle such as wood, paper, metal, plastic, and felt paper.
- r. Do not use RAS if the deleterious materials content is more than 0.5 percent of the stockpiled RAS unless otherwise approved.

Table 10
Allowable Substitute PG Binders and Maximum Recycled Binder Ratios

Originally Specified PG Binder	Allowable Substitute PG Binder	Maximum Ratio of Recycled Binder to Total Binder ¹ , (percent)		
		Surface	Intermediate	Base
PG 64-22 ²	None	0.0	30.0	30.0
PG 70-22 ²	64-22	0.0	20.0	20.0

1. Combined recycled binder from RAP and RAS
2. Use no more than 20.0 percent recycled binder when using this originally specified PG binder.

- I. Hot-Mix Asphalt Paving Mix Design
 1. Prepare a mix design for each asphalt type specified in the Drawings (TY B, C, or D) in accordance with the requirements listed in Table 11.
 2. Design the mixture using a Texas Gyrotory Compactor (TGC).
 3. Provide a mix design after the trial batch tests are complete in accordance with the requirements in this Section.

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- a. Superpave Mix Design: Prepare in accordance with M323 and R35.

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Table 11
Dense Graded Hot-Mix Master Gradation Limits (% Passing by Weight of Volume)
and VMA Requirements

Sieve Size	B Fine Base	C Coarse Surface	D Fine Surface
2 inch	–	–	–
1-1/2 inch	100.0 ¹	–	–
1 inch	98.0 – 100.0	100.0 ¹	–
3/4 inch	84.0 – 98.0	95.0 – 100.0	100.0 ¹
1/2 inch	–	–	98.0 – 100.0
3/8 inch	60.0 – 80.0	70.0 – 85.0	85.0 – 100.0
No. 4	40.0 – 60.0	43.0 – 63.0	50.0 – 70.0
No. 8	29.0 – 43.0	32.0 – 44.0	35.0 – 46.0
No. 30	13.0 – 28.0	14.0 – 28.0	15.0 – 29.0
No. 50	6.0 – 20.0	7.0 – 21.0	7.0 – 20.0
No. 200	2.0 – 7.0	2.0 – 7.0	2.0 – 7.0
Design VMA, Percent Minimum			
–	13.0	14.0	15.0
Production (Plant-Produced) VMA, Percent Minimum			
–	12.5	13.5	14.5
Allowable PG Binder			
-	PG64-22	PG 70-22	PG70-22

1. Defined as maximum sieve size. No tolerances allowed.

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J. Temporary Hot-Mix Asphalt Pavement

1. Temporary HMA Pavement in accordance with all the requirements of TY B asphalt.
2. Submit a mix design if TY B Asphalt Paving is not being used as a pavement course other than for temporary hot-mix asphalt.
3. No trial batches will be required to verify mix design for temporary HMA pavement.

K. Trial Batch Production and Testing

1. Trial Batch
 - a. Produce a trial batch of the mix design based on the requirements of the specified asphalt mix (TY B, C, or D) in a large enough quantity to ensure the mixture meets the Section requirements. Perform testing on the trial batch to verify the mixture produced using the submitted mix design in accordance with the requirements in Table 11, 12, 13, and 14.
 - b. Provide the necessary quantity of each material to the laboratory for testing and production of the trial batch.
 - c. Perform testing on the trial batch to verify the mix design is in conformance with the requirements of this specification.
 - d. If the trial batch does not meet the requirements of this Section, prepare a revised mix design. Produce and test trial batches until a trial batch is produced that meets all of the requirements in this Section.

- 1 e. Use only equipment and materials proposed for use on the project to produce
2 the trial batch.
- 3 f. Use materials to produce the trial batch in accordance with all requirements in
4 this Section.
- 5 g. Use a TxDOT MPL laboratory to perform the Hamburg Wheel test. Refer to
6 Table 18 for requirements.
- 7 h. Provide a new trial batch when the plant or plant location is changed.
- 8 2. Gyratory Compactor
- 9 a. Use a TGC calibrated in accordance with Tex-914-K, Part 2 when designing
10 the mixture in accordance with Tex-204-F, Part 2 for molding production
11 samples.
- 12 b. Use the dense-graded design procedure provided in Tex-204-F.
- 13 c. Use Tex-206-F, Part 2 to perform a gyratory compactor correlation when the
14 City uses a different gyratory compactor during verification testing. Apply the
15 correlation factor to all subsequent production test results when applicable.
- 16 3. Target laboratory-molded density when the TGC is used
- 17 a. Design the mixture at a 96.5 percent target laboratory-molded density. Increase
18 the target laboratory-molded density to 97.0 percent or 97.5 percent at the
19 Contractor's discretion or when specified in the Drawings.
- 20 b. Use an approved laboratory from the TxDOT MPL to perform the Hamburg
21 Wheel test and provide the results with the mix design. Refer to Table 18 for
22 requirements.
- 23 c. The mix design in accordance with the requirements under section Materials
24 and Source Quality Control.
- 25 4. Ignition Oven Correction Factor
- 26 a. Determine the aggregate and asphalt correction factors from the ignition oven
27 in accordance with Tex-236-F.
- 28 b. Provide the City with split samples of the mixtures including all additives
29 (except water) and blank samples used to determine the correction factors for
30 the ignition oven used for QA testing during production.
- 31 5. Boil Test
- 32 a. Perform Tex-530-C and retain the tested sample until completion of the project
33 or as directed.
- 34 b. Use this sample for comparison purposes during production.

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**Table 12
 Laboratory Mixture Design Properties**

Mixture Property	Test Method	Requirement
Target Laboratory-Molded Density (TGC), percent	Tex-207-F	96.5 ¹
Indirect Tensile Strength (dry), psi	Tex-226-F	85-200 ²
Boil test ³	Tex-530-C	—

1. Increase to 97.0 percent or 97.5 percent at the Contractor's discretion or when specified in the Drawings.
2. The City may allow the IDT strength to exceed 200 psi if the corresponding Hamburg Wheel rut depth is greater than 3.0 mm and less than 12.5 mm.
3. Used to establish baseline for comparison to production results. May be waived when approved.

**Table 13
 Operational Tolerances for Mix Design and Trial Batch Testing**

Description	Test Method	Allowable Difference Between Trial Batch and Mix Design
Individual percent retained for No. 8 sieve and larger	Tex-200-F Or Tex-236-F	Must be Within Master Grading Limits in Table 11
Individual percent retained for sieves smaller than No. 8 and larger than No. 200		
Percent passing the No. 200 sieve		
Asphalt binder content, percent	Tex-236-F	+/- 0.5
Laboratory-molded density, percent	Tex-207-F	+/- 1.0
In-place air voids, percent		N/A
Laboratory-molded bulk specific gravity		N/A
VMA, percent, minimum	Tex-204-F	Note 1
Theoretical maximum specific (Rice)gravity	Tex-227-F	N/A

1. Test and verify Table 11 requirements are met.

L. Production Operations

1. General

- a. Take corrective action and receive approval to proceed after any production suspension for noncompliance to the specification.
- b. Submit a new mix design and perform a new trial batch when the asphalt binder content of:
 - 1) Any RAP stockpile used in the mix more than 0.5 percent higher than the value shown on the mixture design report.
 - 2) Any RAS stockpile used in the mix more than 2.0 percent higher than the value shown on the mixture design report.

2. Mixture and Discharge of Materials

- a. Notify the City of the target discharge temperature and produce the mixture within 25 degrees Fahrenheit of the target.
- b. Monitor the temperature of the material in the truck before shipping to ensure temperature does not exceed 350 degrees Fahrenheit and does not fall lower than 215 degree Fahrenheit.
- c. The City will not pay for or allow placement of any mixture produced above 350 degree Fahrenheit.

- d. Control the mixing time and temperature so that all moisture is substantially removed from the mixture before discharging from the plant.
- e. Production Testing – Obtain the sample immediately after discharging the mixture into the truck and perform the production testing in accordance with Source Quality Control promptly.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections

1. Verification Testing

- a. Verification testing will be performed in accordance with Tex-500-C, Part 3

2. Material Source Testing and Submittals

- a. Perform testing on all materials that have changed source locations to verify the material conforms to all requirements in this specification.
- b. Provide new submittals for all materials produced from a new source location.
- c. Perform all Source Quality Control tests required. Use the test results from the Source Quality Control tests as a comparison during construction.
- d. Aggregate Quality Requirements
 - 1) Perform all aggregate testing in accordance with Section 32 05 16.
- e. Mineral Filler
 - 1) Refer to Table 14 for testing requirements.
- f. Asphalt Binder Quality Requirements
 - 1) Provide manufacturer testing reports in accordance with Action Submittals.
 - 2) Refer to Table 14 and Materials for testing requirements.
- g. Emulsified Asphalt for Tack Coat and Fog Seal (CSS-1h)
 - 1) Provide manufacturer testing reports in accordance with Action Submittals.
 - 2) Testing will be done in accordance with Tex-500-C, Part 3
 - 3) Refer to Table 14 and Materials for testing requirements.
- h. Emulsified Asphalt for Prime Coat, Curing, and Erosion Control (PCE)
 - 1) Provide manufacturer testing reports in accordance with Action Submittals.
 - 2) Refer to Table 14 and Materials for testing requirements.

**Table 14
 Material Source Quality Testing**

Material	Characteristic	Test Method	Requirement
Aggregate	Perform all aggregate testing in accordance with Section 32 05 16		
Mineral Filler	Linear Shrinkage	Tex-107-E	3 percent maximum
Asphalt Binder	Perform all tests specified under Materials and Source Quality Control. Provide testing and evaluation reports in accordance with Action Submittals		
Tack Coat and Fog Seal (CSS-1h)			
Prime Coat, Curing, and Erosion Control (PCE)			

3. HMA Mix Design and Trial Batch

- a. Perform the required tests specified under Materials and provide testing and evaluation reports in accordance with Action Submittals.

- 1 4. Temporary Asphalt Pavement
- 2 a. Source Quality Control testing and inspections is not required for temporary
- 3 HMA pavement.
- 4 5. Asphalt Production Acceptance
- 5 a. General
- 6 1) Perform Tex-226-F on the first day of production to confirm the indirect
- 7 tensile strength does not exceed 200 psi.
- 8 2) Take corrective action to bring the mixture within specification compliance
- 9 if the indirect tensile strength exceeds 200 psi unless otherwise directed.
- 10 b. Production Lot
- 11 1) A production lot consists of 4 equal sublots.
- 12 2) The default quantity of a lot is:
- 13 a) 1,000 tons
- 14 b) 9,000 SY for 2" pavement course thickness
- 15 c) 4,500 SY for 4" pavement course thickness
- 16 d) 3,000 SY for 6" pavement course thickness
- 17 e) 2,500 SY for 8" pavement course thickness
- 18 f) 1,500 SY for 12" pavement course thickness
- 19 3) The City may change the standard lot size based on the anticipated daily
- 20 production to ensure there are 3 or 4 sublots produced each day.
- 21 c. Production Sampling
- 22 1) Mixture Sampling
- 23 a) Obtain hot-mix samples from trucks at the plant in accordance with
- 24 Tex-222-F.
- 25 b) Blind Samples
- 26 (1) The City may select "blind" samples throughout the project for
- 27 verification testing.
- 28 (2) Test the blind sample in accordance with asphalt production testing
- 29 and provide testing and evaluation reports to the City in accordance
- 30 with Action Submittals.
- 31 2) Asphalt Binder Sampling
- 32 a) Obtain a 1 quart sample of the asphalt binder at approximately the same
- 33 time the mixture sample is obtained for regular samples and blind
- 34 samples.
- 35 b) Sample from a port located immediately upstream from the mixing
- 36 drum or pug mill in accordance with Tex-500-C, Part 2.
- 37 c) Label the can with the date and sequential testing number that
- 38 corresponds with the mixture sample obtained at the same time.
- 39 d. Production Testing
- 40 1) General
- 41 a) Control the production process and perform production tests to verify
- 42 the asphalt produced is within the operational tolerances listed in Table
- 43 15.
- 44 b) The City may sample and test at any time during production to verify
- 45 compliance.
- 46 c) Take immediate corrective action if the laboratory-molded density on
- 47 any test is less than 95 percent or greater than 98 percent to bring the
- 48 mixture within these tolerances.

- 1 d) The City may suspend work at any time if a sample does not conform
2 to the requirements in this specification.
3 e) The City may suspend operations if the Contractor's corrective actions
4 do not produce acceptable results.
5 f) The City will allow production to resume when test results or other
6 information indicates that the next mixture produced will be within
7 operational tolerances.
- 8 e. Operational Tolerances
- 9 1) Gradation
- 10 a) Suspend operation and take corrective action if any aggregate is
11 retained on the maximum sieve size shown for Dense Graded Hot-Mix
12 Master Gradation Limits.
- 13 b) Production will be suspended when test results for gradation exceed the
14 operational tolerances for:
- 15 (1) 3 consecutive tests on the same sieve
16 (2) 4 consecutive tests on any sieve unless otherwise directed
- 17 2) Asphalt Binder Content
- 18 a) Suspend production and shipment of the mixture if the test results
19 deviate from the mix design by more than the operational tolerance
20 shown in Table 15 for any asphalt binder content test.
- 21 3) Voids in Mineral Aggregate (VMA)
- 22 a) Take immediate action if the VMA for any test is less than the
23 minimum VMA requirement shown for Dense Graded Hot-Mix Master
24 Gradation Limits.
- 25 b) Suspend production and shipment of the mixture if the City's VMA
26 results:
- 27 (1) On 2 consecutive tests are below the minimum VMA requirement.
28 (2) Is more than 0.5 percent below the minimum VMA requirement
- 29 c) For asphalt installed with non-conforming VMA, the City may:
- 30 (1) Require removal and replacement of any asphalt installed
31 (2) Allow the asphalt to remain in place without payment.
- 32 f. Moisture Content
- 33 1) Determine the moisture content, if requested, by oven-drying in accordance
34 with Tex-212-F, Part 2 and verify that the mixture conforms to the
35 requirements in Table 15.
- 36 g. Individual Loads of Hot-Mix
- 37 1) The City may reject individual truckloads of hot-mix at any time if the City
38 suspects the load does not conform to the requirements of this specification.
- 39 2) When a load of hot-mix is rejected for reasons other than temperature,
40 contamination, or excessive uncoated particles, the Contractor may request
41 that the rejected load be tested within 4 hours of rejection.
- 42 3) Sample and test the mixture. If the test results are within the operational
43 tolerances in Table 15, payment will be made for the load. If the test results
44 are not within operational tolerances, no payment will be made.

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Table 15
Production Testing

Description	Test Method	Operational Tolerances	Contractor Testing Frequency	City Verification Testing Frequency	
Individual percent retained for No. 8 sieve and larger	Tex-200-F Or Tex-236-F	+/- 5.0 ¹	1 per subplot	The City may request the Contractor to perform additional verification testing throughout the project. No more than an additional 10 percent of each test performed will be requested	
Individual percent retained for sieves smaller than No. 8 and larger than No. 200		+/- 3.0 ¹			
Percent passing the No. 200 sieve		+/- 2.0 ¹			
Asphalt binder content, percent	Tex-236-F	0.5	1 per subplot		
VMA, percent, minimum	Tex-204-F	Note 2	1 per subplot		
Laboratory-molded density, percent	Tex-207-F	+/- 1.0	1 per subplot		
Laboratory-molded bulk specific gravity		N/A	1 per subplot		
Theoretical maximum specific (Rice) gravity	Tex-227-F	N/A	1 per subplot		The City may perform verification testing utilizing a third party testing laboratory.
Recycled asphalt shingles (RAS)	Tex-217-F, Part 3	N/A	As requested		
Moisture content, maximum percent	Tex-212-F	0.2			
Boil test ⁴	Tex-530-C	—			
Hamburg wheel test	Tex-242-F	See Table 18			

1. When within these tolerances, mixture production gradations may fall outside the master grading limits. The percent passing the No. 200 will be considered out of tolerance when outside the mater grading limits.
2. Test and verify that mix design requirements are met.
3. For all tests that have N/A for tolerances, material must conform to requirements provided within this specification. No tolerances are allowed.
4. The City may wave the sampling and testing requirements.

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B. Non-Conforming Work

1. General

- a. The City may at any time reject a material if it is found to be non-conforming to this specification.
- b. The City may require the Contractor at any time to remove and replace installed Asphalt Pavement if any material it was made with is found to be non-conforming. This would be at no cost to the City.

2. Aggregates

- a. Aggregates that fail to meet the requirements of Section 32 05 16 will be rejected by the City.
- b. Any rejection of materials or source locations will be at no cost to the City. It is the responsibility of the Contractor to provide materials that comply with the requirements of this specification.

3. Asphalt Binder

- 1 a. Material may be rejected at any time based on the following:
 - 2 1) If the certified letters provided by the manufacturer indicate the supplied
 - 3 asphalt binder is not in conformance with the Products section of this
 - 4 specification.
 - 5 2) For failure to meet requirements of this specification.
 - 6 3) For any defect causing it to be unsuitable for the intended use.
 - 7 b. If during verification testing, the material does not conform to the requirement
 - 8 of this specification, the City may stop work until the Contractor can determine
 - 9 the source of the problem at no cost to the City. The City may require that the
 - 10 area installed using the non-conforming asphalt binder be removed and
 - 11 replaced at no cost to the City.
- 12 4. HMA Mix Design and Verification
 - 13 a. The City may reject the mix design if it does not conform to the requirements
 - 14 of this specification. Any asphalt installed using a non-conforming mix design
 - 15 will be subject to removal and replacement at no cost to the City.
 - 16 b. If the trial batch does not conform to the requirements specified in this
 - 17 specification, the Contractor will produce trial batches at no cost to the City
 - 18 until the trial batch meets the requirements specified.
 - 19 c. The City may perform verification testing on all trial batches to verify the
 - 20 conformance of the mixture.
- 21 5. Temporary Hot-Mix Asphalt Paving
 - 22 a. If the temporary HMA pavement fails due to materials non-conforming to the
 - 23 requirements of TY B asphalt, the City may require the Contractor to remove
 - 24 and replace the temporary asphalt pavement.

25 **PART 3 - EXECUTION**

26 **3.1 INSTALLERS [NOT USED]**

27 **3.2 EXAMINATION [NOT USED]**

28 **3.3 PREPARATION**

29 **A. Hauling**

- 30 1. Equipment for Lay-Down Operations
 - 31 a. Use belly dumps, live bottom, or end dump trucks to haul and transfer mixture.
 - 32 b. Except for miscellaneous areas, end dump trucks are only allowed when used in
 - 33 conjunction with a Material Transfer Device (MTD) with remixing capability
 - 34 unless otherwise allowed.
 - 35 c. When end dump trucks are used, ensure the bed does not contact the paver
 - 36 when raised.
- 37 2. Operations
 - 38 a. Clean all truck beds before use to ensure the mixture is not contaminated.
 - 39 b. Provide trucks with enclosed sides to prevent asphalt mixture loss.
 - 40 c. Cover each load of mixture with waterproof tarpaulins.
 - 41 d. Coat the inside truck beds, when necessary, with a City approved release agent.
 - 42 e. Petroleum based products, such as diesel fuel will not be allowed.

1 B. Surface Preparation

2 1. Asphalt Placement

3 a. Prepare the surface by removing raised pavement markers and objectionable
4 material such as moisture, dirt, sand leaves, and other loose impediments from
5 the surface before placing.

6 b. Remove vegetation from pavement edges.

7 2. Prime Coat

8 a. Prepare the surface by sweeping or other approved methods.

9 b. When directed lightly sprinkle the surface with water before applying prime
10 coat to control dust and ensure application.

11 **3.4 INSTALLATION**

12 A. Equipment

13 1. General

14 a. Provide equipment that does not damage underlying pavement.

15 b. Comply with laws and regulations concerning overweight vehicles

16 c. Use other equipment that will consistently produce satisfactorily results when
17 approved.

18 2. Batching Equipment

19 a. Batching equipment shall be in accordance with the requirements of Section 41
20 14 00.

21 3. Asphalt Paver

22 a. General

23 1) Furnish a paver that will produce a finished surface that meets longitudinal
24 and transverse profile, typical section, and placement requirements

25 2) Ensure the paver does not support the weight of any portion of hauling
26 equipment other than the connection.

27 3) Provide loading equipment that does not transmit vibrations or other
28 motions to the paver that adversely affect the finished pavement quality.

29 4) Equip the paver with an automatic, dual, longitudinal-grade control system
30 and an automatic, transverse-grade control system.

31 b. Tractor Unit

32 1) The tractor unit will be able to push or propel vehicles dumping directly
33 into the finishing machine to obtain the desired lines and grades to
34 eliminate any hand finishing.

35 2) Equip the unit with a hitch that is able to maintain contact between the
36 hauling equipment's rear wheels and the finishing machine's pusher rollers
37 while mixture is loaded.

38 c. Screed

39 1) Provide a heated compacting screed that will produce a finished surface
40 that meets the longitudinal and transverse profile, typical section, and
41 placement requirements.

42 2) Screed extensions must provide the same compacting action and heating as
43 the main unit unless otherwise approved.

44 d. Grade Reference

45 1) Provide a grade reference with enough support that the maximum
46 deflection does not exceed 1/16 inch between supports.

- 1 2) Ensure that the longitudinal controls operate from any longitudinal grade
2 reference including a string line, ski, mobile reference, or joint matching
3 shoes.
- 4 4. Material Transfer Devices (MTD)
 - 5 a. Provide the specified type of device if showed on drawings.
 - 6 b. Ensure the devices provide a continuous, uniform mixture flow to the paver.
- 7 5. Remixing Equipment
 - 8 a. Provide equipment that includes a pug mill, variable pitch augers, or variable
9 diameter augers operating under a storage unit with a minimum capacity of 8
10 tons.
- 11 6. Motor Grader
 - 12 a. Provide a self-propelled grader with a blade length of at least 12 feet and a
13 wheelbase of at least 16 feet.
- 14 7. Hand-Held Thermal Camera or Thermal Imaging System
 - 15 a. Provide a hand-held thermal camera or thermal imaging system meeting the
16 requirements of Tex-244-F.
 - 17 b. A thermal imaging system is the preferred method for obtaining temperatures.
- 18 8. Rollers
 - 19 a. Provide rolling equipment required to achieve adequate compaction based on
20 site conditions. If compaction is not achieved based on Site Quality Testing due
21 to inadequate rollers, provide new rolling equipment. Any rolled utilizing
22 inadequate rollers is subject to removal and replacement at no cost to the City.
 - 23 b. Use a pneumatic-tire roller to seal the surface unless excessive pickup of fines
24 occurs.
 - 25 c. Provide rollers meeting the requirements in Table 16 for each type of roller
26 required for compaction.

Table 16
Roller Requirements¹

Roller Type	Materials to be Compacted	Load (Tons)	Contact Pressure	Roller Speed (MPH)
Steel Wheel	Asphalt	Greater than or equal to 10	Greater than or equal to 325 pounds per inch of wheel width	2 – 3
Vibratory	Asphalt	Type A < 6 Type B > 6 Type C as specified in the Drawings	Per equipment specification and as approved	As approved
Light Pneumatic	Asphalt, Prime Coat, Tack Coat, Fog Seal	4.5 – 90	Greater than or equal to 45 psi	4 – 12
Medium Pneumatic	Asphalt	12 – 25	Greater than or equal to 80 psi, as directed	4 – 12

1. Unless otherwise specified by the City or the drawings.

9. Straightedges and Templates

- a. Furnish 10 foot straightedges and other templates as required or approved.

10. Distributor Vehicles

- a. Furnish vehicles that can achieve a uniform placement
- b. The nozzle patterns, spray bar height, and distribution pressure must work together to produce uniform application.
- c. The vehicle should be set to provide a “double lap” or “triple lap” coverage.
- d. Nozzle spray patterns should be identical to one another along the distributor spray bar.
- e. Spray bar height should remain constant.
- f. Pressure within the distributor must be able to force the tack coat, fog seal, and/or PCE material out of spray nozzles at a constant rate.

B. Coring Equipment

- 1. Provide equipment suitable to obtain a pavement specimen meeting the dimensions for testing when coring is required.

C. Ride Quality Equipment

1. Surface Test Type A

- a. Provide a 10-foot straightedge
- b. A high-speed or lightweight inertial profiler certified at the Texas A&M Transportation Institute may be used when approved by the City.

2. Surface Test Type B

- a. Provide a high-speed or lightweight inertial profiler certified at the Texas A&M Transportation Institute.
- b. Provide equipment certification documentation.

- 1 c. Display a current decal on the equipment indicating the certification expiration
2 date.
3 d. Use a certified profiler operator from TxDOT's MPL or as approved by the
4 City. When requested, furnish documentation for the person certified to operate
5 the profiler.
- 6 3. Diamond Grinding Equipment
7 a. Provide self-propelled powered grinding equipment specifically designed to
8 smooth and texture pavements using circular diamond blades when grinding is
9 required.
10 b. Provide equipment with automatic grade control capable of grinding at least 3
11 feet of width longitudinally in each pass without damaging the pavement.
- 12 D. Placement Operations
13 1. General
14 a. Collect haul tickets from each load of mixture delivered to the project and
15 provide to the City as directed.
16 b. Measure and record the internal temperature of the asphalt mixture using a
17 hand-held thermal camera or an infrared thermometer when a thermal imaging
18 system is not used. A thermal imaging system is the City's preferred method for
19 measuring temperatures.
20 c. Measure the temperature as it is discharged from the truck or Material Transfer
21 Device (MTD) to the paver. Do not measure the temperature after the mix has
22 already entered the paver.
23 d. Record an approximate station number or GPS coordinate on each ticket.
24 e. Calculate the daily yield and cumulative yield for the specified lift and provide
25 to the City at the end of paving operations for each day unless otherwise
26 directed.
27 f. The City may suspend production if the Contractor fails to produce and provide
28 haul tickets and yield calculations by the end of paving operations for each day.
29 g. Place the mixture to meet the typical section requirements and produce a
30 smooth finished surface with a uniform appearance and texture.
31 h. Offset longitudinal joints of successive courses of hot-mix asphalt between 3
32 and 5 feet. The City may require any successive course that is not placed with
33 an offset to be removed and replaced at no cost to the City.
34 i. Place mixture so that longitudinal joints on the surface course coincide with
35 lane lines or as directed.
36 j. Ensure that all finished surfaces will drain properly.
37 k. Placement can be performed by hand in situations where the paver cannot place
38 it adequately due to space restrictions.
39 l. Receive approval from the City prior to placing any asphalt pavement by hand.
40 m. Hand-placing should be minimized to prevent aggregate segregation and
41 surface texture issues.
42 n. All hand placement will be checked with a straightedge or template before
43 rolling to ensure uniformity.
44 o. Place the mixture at the rate or thickness specified in the Drawings.
45 p. The specified layer thickness is based on the rate of 110 pounds per square yard
46 per inch of pavement unless another rate is specified in the Drawings.

- 1 q. Install asphalt lifts in accordance with the recommended thicknesses shown on
 2 Table 17.

3 **Table 17**
 4 **Compacted Lift Thickness and Required Core Height**

Mixture Type	Compacted Lift Thickness Guidelines			Minimum Untrimmed Core Height (inch) Eligible for Testing
	Minimum (inch)	Maximum (inch)	Recommended (inch)	
B (Intermediate and Base Course)	2.50	5.0	3.0	1.75
C (Surface Course)	2.0	4.0	3.0	1.50
D (Residential Only Surface Course)	1.50	3.0	2.0	1.25

- 5 1. Testing
 6 a. Perform coring and testing in accordance with Site Quality Control.
 7 2. Tack Coat
 8 a. Tack coat is required when the current lift is not paved the same day as the
 9 previous lift, during overlay procedures, or any time an asphalt layer is added
 10 on top of cold asphalt.
 11 b. Clean the surface before placing the tack coat.
 12 c. Tack coat is subsidiary to the appropriate corresponding asphalt bid item when
 13 used.
 14 d. Distribute the material smoothly at a rate of 0.10 gallons of residual asphalt per
 15 square yard of surface area unless otherwise approved by the City or specified
 16 in the Drawings.
 17 e. Apply a uniform tack coat at the specified rate unless otherwise directed.
 18 f. Apply the tack coat in a uniform manner to avoid streaks and other irregular
 19 patterns.
 20 g. Apply a thin, uniform tack coat to curbs, gutters, vertical faces of existing
 21 pavements, and all structures in actual contact with asphaltic mixes.
 22 h. Allow adequate time for emulsion to break completely before placing any
 23 material.
 24 i. Prevent splattering of tack coat onto adjacent features or structures.
 25 j. The City may use Tex-243-F to verify that the tack coat has adequate adhesive
 26 properties and may suspend paving operations if the tack coat is considered
 27 non-conforming.
 28 k. Place the tack coat in advance of paving to allow enough time to break or set
 29 before applying hot-mix asphalt layers.
 30 l. Roll the tack coat with a pneumatic-tire roller to remove streaks and other
 31 irregular patterns when directed.
 32 m. Do not allow traffic on tack coat unless covered with blotter material.
 33 n. Blotter Material
 34 1) Blotter material is subsidiary to tack coat when used.

- 1 2) Provide blotter material consisting of either base course sweepings obtained
2 from cleaning the base or native sand unless otherwise specified in the
3 Drawings or directed by the City.
4 3) A typical application rate for blotter material is 4 to 8 pounds per square
5 yard.
- 6 3. Prime Coat
7 a. Prime coat is required to be placed on any subgrade that is not paved
8 immediately.
9 b. Prime coat is subsidiary to the appropriate corresponding asphalt bid item when
10 used.
11 c. Apply material within 15 degrees Fahrenheit of the approved temperature in
12 accordance with Deliver, Storage, and Handling.
13 d. Do not exceed maximum temperatures in accordance with Delivery, Storage,
14 and Handling.
15 e. Distribute the material smoothly at a rate of 0.10 gallons per square yard of
16 surface area unless otherwise approved by the City or specified in the
17 Drawings.
18 f. Roll the freshly applied prime coat with a pneumatic-tire roller to ensure
19 penetration when directed.
20 g. Before allowing traffic to use a primed surface, apply asphalt base course or
21 blotter material.
22 h. Provide blotter material in accordance with Tack Coat.
- 23 4. Lay-Down Operations
24 a. Thermal Profile
25 1) General
26 a) Use a hand-held thermal camera or thermal imaging system to obtain a
27 continuous thermal profile in accordance with Tex-244-F.
28 b) Use a thermal imaging system where possible. The use of a hand-held
29 thermal camera is only permitted when it is not feasible to use a
30 thermal imaging system. Receive approval from the City before using a
31 hand-held thermal camera.
32 2) Thermal Segregation
33 a) Moderate
34 (1) Any areas that have a temperature differential greater than 25
35 degrees Fahrenheit, but not exceeding 50 degrees Fahrenheit are
36 deemed as having moderate thermal segregation.
37 b) Severe
38 (1) Any areas that have a temperature differential greater than 50
39 degrees Fahrenheit are deemed as having severe thermal
40 segregation.
41 3) Thermal Imaging System
42 a) This is the preferred method by the City to prepare thermal profiles and
43 measure thermal segregation.
44 b) Review the output results when a thermal imaging system is used.
45 c) Provide the automated report described in Tex-244-F to the City daily
46 unless otherwise directed.

- 1 d) Modify the paving process as necessary to eliminate any recurring
- 2 (moderate or severe) thermal segregation identified by the thermal
- 3 imaging system.
- 4 e) The City may suspend paving operations if the Contractor cannot
- 5 successfully modify the paving process to eliminate recurring severe
- 6 thermal segregation.
- 7 f) Density profiles are not required when using a thermal imaging system.
- 8 g) Provide the City with electronic copies of all daily data files that can be
- 9 used with the thermal imaging system software to general temperature
- 10 profile plots upon completion of the project or as requested.
- 11 4) Thermal Camera
- 12 a) Refer to Asphalt Production Acceptance for size of lots and sublots.
- 13 b) Take immediate corrective action to eliminate recurring moderate
- 14 thermal segregation when a hand-held thermal camera is used.
- 15 c) Provide the City with the thermal profile produced in accordance with
- 16 Tex-244-F of every subplot within one working day of the completion of
- 17 each lot in accordance with Site Quality Control.
- 18 d) Suspend operations and take immediate corrective action to eliminate
- 19 severe thermal segregation unless otherwise directed.
- 20 e) Resume operations when the City determines that subsequent
- 21 production will meet the requirements of this specification.
- 22 f) Evaluate areas with severe thermal segregation by performing density
- 23 profiles in accordance with Site Quality Control.
- 24 g) Remove and replace the material in any areas that have both severe
- 25 thermal segregation and a failing result for Segregation (Density
- 26 Profile) unless otherwise directed.
- 27 h) Any asphalt removed and replaced due to non-conformance with the
- 28 requirements of this specification will be at no cost to the City.
- 29 b. Screed Heaters
- 30 1) Turn off screed heaters to prevent overheating of the mat if the paver stops
- 31 for more than 5 minutes.
- 32 2) The City may evaluate the suspect area in accordance with Site Quality
- 33 Control if the screed heater remains on for more than 5 minutes while the
- 34 paver is stopped.
- 35 E. Compaction
- 36 1. General
- 37 a. Compact the pavement uniformly to contain between 3.8 percent and 8.5
- 38 percent in-place air voids.
- 39 b. Take immediate corrective action to bring the operation within 3.8 percent and
- 40 8.5 percent when the in-place air voids exceed the range of these tolerances.
- 41 c. The City will allow paving to resume when the proposed corrective action is
- 42 likely to yield between 3.8 percent and 8.5 percent in-place air voids.
- 43 2. Rollers
- 44 a. Provide rollers that meet the Equipment requirements of this specification.
- 45 b. Use additional rollers as required to remove any roller marks.
- 46 c. Use only water or an approved release agent on rollers, tamps, and other
- 47 compaction equipment unless otherwise directed.

- 1 d. Use the control strip method shown in Tex-207-F, Part 4 on the first day of
- 2 production to establish the rolling pattern that will produce the desired in-place
- 3 air voids unless otherwise directed.
- 4 e. Use the approved rolling pattern for the remainder of the project unless
- 5 otherwise directed.
- 6 3. Tamps
- 7 a. Use tamps to thoroughly compact the edges of the pavement along curbs,
- 8 headers, and similar structures.
- 9 b. Use tamps only in locations that will not allow thorough compaction with
- 10 rollers.
- 11 c. The City may require rolling with a trench roller on widened areas, in trenches,
- 12 and in other limited areas.
- 13 4. Temperature
- 14 a. Complete all compaction operations before the pavement temperature drops
- 15 below 160 degrees Fahrenheit unless otherwise allowed.
- 16 b. The City may allow compaction with a light finish roller operated in static
- 17 mode for pavement temperatures below 160 degrees Fahrenheit.
- 18 c. Allow the compacted pavement to cool to 160 degrees Fahrenheit or lower
- 19 before opening to traffic unless otherwise directed.
- 20 d. When directed, sprinkle the finished mat with water or limewater to expedite
- 21 opening the roadway to traffic.

22 3.5 REPAIR

- 23 A. Repair flexible pavement in accordance with Section 32 01 17.

24 3.6 RE-INSTALLATION [NOT USED]

25 3.7 SITE QUALITY CONTROL

- 26 A. Placement Acceptance

- 27 1. General

- 28 a. Shoulders, Ramps, Etc

- 29 1) Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and
- 30 turn lanes are subject to in-place air void determination unless otherwise
- 31 specified in the Drawings.

- 32 2) Intersections may be considered miscellaneous areas when determined by
- 33 the City.

- 34 3) Production Lot – Refer to Production Acceptance

- 35 b. Miscellaneous Areas

- 36 1) Areas that typically involve significant handwork or discontinuous paving
- 37 operations. These would include:

- 38 a) Temporary detours

- 39 b) Driveways

- 40 c) Mailbox turnouts

- 41 d) Crossovers

- 42 e) Gores

- 43 f) Spot level-up areas

- 44 g) Other similar areas

- 1 2) Miscellaneous areas also include level-ups and thin overlays when the layer
2 thickness specified on the plans is less than the minimum untrimmed core
3 height eligible for testing shown in Table 17.
- 4 3) Miscellaneous areas are not eligible for random placement sampling
5 locations.
- 6 4) Compact miscellaneous areas in accordance with Compaction.
- 7 5) Miscellaneous areas are not subject to in-place air void determination,
8 thermal profiles testing, segregation (density profiles), or longitudinal joint
9 density evaluations.
- 10 2. Placement Sampling
- 11 a. General
- 12 1) Provide the equipment and means to obtain and trim roadway cores on-site.
- 13 2) Obtain the cores within 1 working day of the time the placement area is
14 completed unless otherwise approved.
- 15 3) Random coring locations may be requested by the City based on visual
16 irregularities in the pavement.
- 17 4) Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and
18 turn lanes are always eligible for selection as a random sample location.
- 19 b. Coring Location, Sizes, and Identification
- 20 1) Coring Set:
- 21 a) Is defined as all of the pavement cores across the full width of the
22 roadway for the station location determined at the beginning of each
23 day.
- 24 b) Provide one core on the inside an outside edge of each travel lane
25 across the full width of the roadway.
- 26 c) Provide a 2 foot clearance from a longitudinal joint or edge of
27 pavement.
- 28 2) Location
- 29 a) Mark station locations where core sampling is to be taken at the
30 beginning of each day.
- 31 b) For projects placing more than 1,000 tons of asphalt per day:
32 (1) Perform tests in accordance with Table 19 and Site Quality
33 Control.
- 34 c) For projects placing less than 1,000 tons of asphalt per day:
35 (1) Provide a Coring Set at only one location per day unless additional
36 cores are requested by the City based on irregularities or suspicion
37 that the pavement is non-conforming.
38 (2) Request approval from the City for the core location prior to
39 coring.
- 40 d) For projects placing less than 100 tons of asphalt per day:
41 (1) City may exempt the Contractor from collecting pavement cores
42 each day.
43 (2) Coordinate with the City to determine how many pavement core
44 sets will be required for testing.
45 (3) The City may request pavement cores at any time for verification
46 testing.
- 47 3) Sizes
- 48 a) For TY D pavement, cores will be 4 inch in diameter

- 1 b) For TY B and TY C pavement, cores will be 6 inch in diameter.
- 2 4) Identification:
- 3 a) Identification number
- 4 b) Station location
- 5 c) The untrimmed core height
- 6 c. Pavement Cores
- 7 1) The City inspector will witness the coring operation and measurement of
- 8 the core thickness.
- 9 2) The inspector should visually inspect each core to verify current paving
- 10 layer is bonded to the underlying layer.
- 11 3) Take corrective action if an adequate bond does not exist between the
- 12 current and underlying layer to ensure an adequate bond will be achieved
- 13 during subsequent placement operations.
- 14 4) The untrimmed core height must be in accordance with the requirements in
- 15 Table 17.
- 16 5) If the cores are an acceptable height, trim the cores immediately after
- 17 obtaining the cores in accordance with Tex-207-F.
- 18 6) Any core that does not meet the requirements in Table 17 will be rejected.
- 19 7) The City may request additional cores to be taken within the area. If more
- 20 than 2 cores are non-conforming, the pavement area may be subject to
- 21 removal and replacement at no cost to the City.
- 22 8) Trim the cores on-site in the presence of the inspector. The cores may be
- 23 trimmed by the testing lab if approved by the City.
- 24 9) Blind Coring Locations
- 25 a) The City may select “blind” coring locations throughout the project for
- 26 verification testing.
- 27 b) Test the blind pavement cores in accordance with asphalt placement
- 28 testing and provide testing and evaluation reports to the City in
- 29 accordance with Action Submittals.
- 30 d. Core Hole repair
- 31 1) Dry the core holes and tack the sides and bottom immediately after
- 32 obtaining the cores.
- 33 2) Fill the hole with the same type of mixture and properly compact the
- 34 mixture.
- 35 3) Holes may be repaired with other methods approved by the City.
- 36 3. Placement Testing
- 37 a. General
- 38 1) Perform placement tests in accordance with Table 19 and 20.
- 39 2) The City may suspend work at any time if any of the test results are non-
- 40 conforming with the requirements of this specification.
- 41 3) Verification Testing
- 42 a) The City may request the Contractor to perform additional testing to
- 43 verify compliance, or the City may perform verification testing
- 44 utilizing a third-party testing laboratory.
- 45 b) The City may request verification testing at any time if production is
- 46 suspected to be non-conforming.
- 47 b. In-Place Air Voids
- 48 1) Measure in-place air voids in accordance with Tex-207-F and Tex-227-F.

- 1) Before drying to a constant weight, cores may be pre-dried using a Corelok or similar vacuum device to remove excess moisture.
 - 2) Average the values obtained for all cores taken during each production day to determine the theoretical maximum specific gravity.
 - 3) Use the average air void content for in-place air voids.
 - 4) Use the vacuum method to seal the core if required by Tex-207-F.
 - 5) Remove and replace any area with in-place air voids less than 2.8 percent or greater than 9.5 percent.
- c. Segregation (Density Profile)
- 1) Test for segregation using density profiles in accordance with Tex-207-F, Part 5. Density profiles are not required if a thermal imaging system is used.
 - 2) Perform a density profile every time the paver stops for more than 60 seconds on areas that are identified by either the Contractor or the City as having thermal segregation. Perform density profiles on any visibly segregated areas unless otherwise approved.
 - 3) Perform a minimum of one profile per subplot if the paver does not stop for more than 60 seconds and there are no visibly segregated areas or areas that are identified as having thermal segregation.
 - 4) Provide the City with the density profiles of every subplot in the lot within one working day of the completion of each lot.
 - 5) The density profile is considered failing if it exceeds the tolerances in Table 20.
 - 6) The City may require the Contractor to remove and replace the area in question if the area fails the density profile and has surface irregularities as defined in Irregularities. Remove and replace the failing area at no cost to the City.
 - 7) Investigate density profile failures and take corrective actions during production and placement to eliminate the segregation.
 - 8) Suspend production if 2 consecutive density profiles fail unless otherwise approved.
 - 9) Resume production after the City approves changes to production or placement methods.
- d. Longitudinal Joint Density
- 1) Informational Tests
 - a) Perform joint density evaluations while establishing the rolling pattern and verify that the joint density is no more than 3.0 pounds per cubic foot below the density taken at or near the center of the mat.
 - b) Adjust the rolling pattern, if needed, to achieve the desired joint density.
 - c) Perform additional joint density evaluations as directed by the City.
 - 2) Record Tests
 - a) Perform a joint density test 2 to 4 times a day or as directed by the City along all joints that will become a longitudinal joint.
 - b) Joint density evaluations are not applicable in areas described as Miscellaneous Areas.
 - c) Determine the joint density in accordance with Tex-207-F, Part 7.
 - d) Record the joint density information and submit results to the City.

- e) The evaluation is considered failing if the joint density is more than 3.0 pounds per cubic foot below the density taken at the nearest core sample location and the correlated joint density is less than 90 percent.
 - f) Provide the City with the density profile of every test within 1 working day of the completion of each working day.
 - g) Investigate joint density failures and take corrective actions during production and placement to improve joint density. Suspend production if the evaluations on 2 consecutive tests fail unless otherwise approved.
 - h) Resume production after Engineer approves changes to production or placement methods.
- e. Hamburg Wheel Test
- 1) The City may perform a Hamburg Wheel test at any time during production or placement including when the boil test indicates a change in quality from the materials submitted for the trial batch.
 - 2) The City may request additional cores to be taken and the Hamburg Wheel test to be performed where rutting is observed.
 - 3) Suspend production until further Hamburg Wheel tests meet the specified values when the production or core samples fail the Hamburg Wheel test criteria in Table 18.
 - 4) Obtain core samples from the center of the finished mat or other areas excluding the vehicle when path.
 - 5) The City may require up to the entire area of any mixture failing the Hamburg Wheel test to be removed and replaced at the Contractor's expense.
 - 6) If the City determines the material to be removed and replaced, the Contractor may request the City re-test the failing material.

Table 18
Hamburg Wheel Test Requirements

High-Temperature Binder Grade	Test Method	Minimum Number of Passes at 12.5 mm ¹ Rut Depth, Tested at 50 degrees Celsius
PG 64	Tex-242-F	10,000 ²
PG 70		15,000 ³

- 1. When the rut depth at the required minimum number of passes is less than 3 mm, the City may require the Contractor to increase the target laboratory-molded density (TGC) by 0.5 percent to no more than 97.5 percent.
- 2. May be decreased to no less than 5,000 passes when specified in the Drawings.
- 3. May be decreased to no less than 10,000 passes when specified in the Drawings

- f. Recovered Asphalt Dynamic Shear Rheometer (DSR) and Aging Ratio
- 1) The aging ratio is the DSR value of the extracted binder divided by the DSR value of the original unaged binder.
 - 2) The City may request an aging ratio test be performed on production samples or cores from suspect areas of the project to determine recovered asphalt properties.
 - 3) Asphalt binders with an aging ratio greater than 3.5 do not meet the requirements for recovered asphalt properties and may be deemed defective.
 - 4) Obtain DSR values in accordance with AASTO T 315 at the specified high temperature performance grade of the asphalt.

- 1 5) Recover the asphalt binder for testing from production samples or cores in
2 accordance with Tex-211-F.
3 6) The City may require removal and replacement of the defective material at
4 the Contractor's expense.
5 g. Irregularities
6 1) Identify and correct irregularities including segregation, rutting, raveling,
7 flushing, fat spots, mat slippage, irregular color, irregular texture, roller
8 marks, tears, gouges, streaks, uncoated aggregate particles, or broken
9 aggregate particles.
10 2) If the City determines that the irregularity will adversely affect pavement
11 performance, the City may require the Contractor remove and replace the
12 non-conforming area at no cost to the City.
13 3) If irregularities are detected, the City may require the Contractor to
14 immediately suspend operations. The City may allow the Contractor to
15 continue operations for more than one day while the Contractor is taking
16 appropriate corrective action.

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**Table 19
 Placement Testing**

Description	Test Method	Allowable Tolerances	Contractor Testing Frequency ¹	City Verification Testing Frequency
In-place air voids, percent	Tex-207-F and Tex-227-F	+/- 1.0	1 per subplot	The City may request the Contractor to perform additional verification testing throughout the project. No more than an additional 10 percent of each test performed will be requested
Segregation (density profile)	Tex-207-F, Part 4	N/A	1 per subplot	
Longitudinal joint density	Tex-207-F, Part 7	N/A	1 per subplot	
Recycled asphalt shingles (RAS)	Tex-217-F, Part 3	N/A	As requested	
Thermal profile ²	Tex-244-F	N/A	1 per subplot	
Asphalt binder sampling and testing	Tex-500-C	N/A	1 per subplot	
Tack coat sampling and testing	Tex-500-C, Part 3	N/A	As requested	The City may perform verification testing utilizing a third party testing laboratory.
Aging ratio, maximum ratio	AASHTO T315	3.5	As requested	
Establish a Rolling Pattern	Tex-207-F	See Compaction		
Ride quality	Tex-1001-S	See Ride Quality		

1. For projects placing less than 700 tons of asphalt pavement per day, refer to Placement Sampling.
2. If using a thermal imaging system, provide the automated report daily unless otherwise directed. If using a thermal camera, provide a thermal profile per subplot daily unless otherwise directed.
3. For all tests that have N/A for tolerances, material must conform to requirements provided within this specification. No tolerances are allowed.

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**Table 20
 Segregation (Density Profile) Acceptance Criteria**

Mixture Type	Maximum Allowable Density Range (Highest to Lowest)	Maximum Allowable Density Average (Average to Lowest)
Type B	8.0 pounds per cubic foot	5.0 pounds per cubic foot
Type C and Type D	6.0 pounds per cubic foot	3.0 pounds per cubic foot

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B. Ride Quality

1. General
 - a. Provide pavement to have a finished grade that is smooth and true to the established line, grade, and cross-section.
 - b. Ride quality will be measured parallel (longitudinal) and perpendicular (transverse) to the centerline of the roadway for pavement surfaces.
2. Transverse Profile Measurements
 - a. Use a 10-foot straightedge to perform ride quality tests or a high-speed or lightweight inertial profiler that has been certified at the Texas A&M Transportation Institute.

- 1) If using an inertial profiler, provide equipment certification documentation, display a current decal on the equipment indicating the certification expiration date, and use a certified profiler operator from TxDOT's Material Producer List.
 - 2) Use an inertial profiler when requested by the City.
 - 3) Provide documentation of profiles when requested by the City.
 - b. Perform tests daily throughout the duration of the project.
 - c. Perform tests on the finished surface of the completed project or at the completion of a major stage of construction as approved.
 - d. Perform testing during off-peak traffic flow. Operate the inertial profiler in a manner that does not disrupt traffic flow as directed.
 - e. When measuring the ride quality on a surface open to traffic, use a moving traffic control plan in accordance with Part 6 of the TMUTCD and the drawings.
3. Acceptance Plan
- a. General
 - 1) Evaluate longitudinal and transverse profiles to verify there is not more than 1/8-inch variation between any 2 contacts. Perform corrective action on surface areas that have more than 1/8-inch variation between any 2 contacts
 - 2) Fog seal the aggregate exposed by diamond grinding or other approved work methods.
 - 3) When a fog seal is required, use a fog seal that conforms to the requirements for cationic emulsified asphalt, CSS-1h, within this specification.
 - b. Localized Roughness
 - 1) Determine areas of localized roughness using the individual profile from each wheel path.
 - 2) Use a 10-foot straightedge to locate areas that have more than 1/8-inch variation between any 2 contacts on the straightedge.
 - 3) The City may waive localized roughness requirements for deficiencies resulting from manholes or other similar appurtenances near the wheel paths.
 - c. Corrective Action
 - 1) Use diamond grinding to correct variations in the pavement surface or localized roughness.
 - 2) After making corrections, reprofile the pavement section to verify that corrections have produced the required improvements.
 - 3) If corrective action does not produce the required improvement, the City may require:
 - a) Continued corrective action
 - b) Removal and replacement of area at no cost to the City. The City may negotiate a reduced payment amount for the defective area to remain in place.
- C. Temporary Hot-Mix Asphalt Paving
1. Does not require any placement sampling or testing.
 2. Acceptance Plan

- 1 a. Acceptable ride quality includes:
2 1) A maximum depth of potholes to be 0.25 inches.
3 2) Maintain temporary hot-mix asphalt in accordance with 32 01 17.

4 **3.8 SYSTEM STARTUP [NOT USED]**

5 **3.9 ADJUSTING [NOT USED]**

6 **3.10 CLEANING [NOT USED]**

7 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

8 **3.12 PROTECTION [NOT USED]**

9 **3.13 MAINTENANCE [NOT USED]**

10 **3.14 ATTACHMENTS [NOT USED]**

11 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 32 12 73
ASPHALT PAVING CRACK SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sealant for cracks in asphalt paving.
- B. Deviations from this City of Denton Standard Specification
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 32 12 16 – Asphalt Paving
 - 4. Section 32 01 17 – Flexible Paving Repair

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. Crack sealant materials, equipment, tools, testing, and incidentals are subsidiary to the installation of asphalt paving and paving repair in accordance with Section 32 12 16 and 32 01 17.
 - 2. Payment
 - a. The work performed and materials furnished in accordance with this item are subsidiary to the unit prices bid for various items which require the use of crack sealant, and will not be measured or paid for separately.

1.3 REFERENCES

- A. Reference Standards
 - 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically sited.
 - 2. American Society for Testing and Materials (ASTM):
 - a. D4-86, Standard Test Method for Bitumen Content.
 - b. D113, Standard Test Method for Ductility of Asphalt Materials.
 - c. D5329, Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.

1 B. All submittals shall be approved by the City prior to delivery.

2 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

3 A. Product Data

- 4 1. Provide electronic product data from each manufacturer supplying asphalt crack
5 sealant.
- 6 2. Product data sheets including:
- 7 a. Manufacturer name
 - 8 b. Date
 - 9 c. Material description
 - 10 d. Point of delivery
 - 11 e. Provide data and test results in accordance with this Section
 - 12 f. Material Safety Data Sheets (if applicable, required for PCE and all additives)
 - 13 g. Manufacturer Recommended Storing Data (if applicable)
 - 14 h. Application Recommendations (if applicable)
 - 15 i. Liquid Antistripping Agent Specific Data:
 - 16 1) Specific gravity of the agent at manufacturer's recommended addition
17 temperature
 - 18 2) Manufacturer's recommended dosage range
 - 19 3) Manufacturer's recommended storage and handling instructions

20 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

21 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

22 **1.9 QUALITY ASSURANCE [NOT USED]**

23 **1.10 DELIVERY, STORAGE, AND HANDLING**

24 A. Storage and Handling Requirements

- 25 1. Secure and maintain a location to store the material in accordance with Section 01
26 66 00.
- 27 B. Keep material stored in a clean condition at all times to prevent contamination with
28 foreign matter.
- 29 C. Follow any manufacturer recommendations for delivery, storage, and handling.

30 **1.11 FIELD CONDITIONS**

31 A. Ambient Conditions

- 32 1. Ambient temperature must be between 40 degrees Fahrenheit and 105 degrees
33 Fahrenheit.

34 B. Suspend sealing activities if:

- 35 1. Ambient condition requirements are not met, or
36 2. City determines that weather conditions are unsuitable.

37 **1.12 WARRANTY [NOT USED]**

1 **PART 2 - PRODUCTS**

2 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

3 **2.2 MATERIALS**

4 **A. Manufacturers**

5 1. Manufacturer List

6 a. Rubberized Crack Seal

7 1) Poly Flex 3 made by Crafcoc, Inc

8 2) Approved equal

9 b. Provide rubber used to make sealant free from fabric, wire, core, or other
10 contaminating material. Recycled rubber is not allowed.

11 2. Substitution requests for manufacturers or models not indicated above shall be
12 processed in accordance with Section 01 25 00.

13 **B. Material Requirements**

14 1. Provide rubberized crack seal meeting the following requirements:

15 **Table 1**

Criteria		ASTM Specification
Softening Point	210°F (99°C)	N/A
Ductility at 77°F (25°C)	30 cm min.	ASTM D113
Cone Penetration	15-45 mm	ASTM D5329
Resilience	30% min.	ASTM D5329
Bitumen Content	60% min.	ASTM D4-86
Tensile Adhesion	400% min.	ASTM D5329

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17 **2.3 ACCESSORIES [NOT USED]**

18 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

19 **PART 3 - EXECUTION**

20 **3.1 INSTALLERS [NOT USED]**

21 **3.2 EXAMINATION [NOT USED]**

22 **3.3 PREPARATION**

23 A. Use crack cleaning equipment to clean and prepare the cracks for sealing.

24 **3.4 INSTALLATION**

25

1 A. General

- 2 1. Clean and seal cracks greater than 1/16 inch in width.
- 3 2. Clean cracks to a minimum depth of at least twice the crack width using an air
- 4 compressor with an air lance to remove debris and moisture from the crack.
- 5 3. Cracks must be free of moisture before sealing.
- 6 4. Apply sealant to cleaned cracks as directed by the manufacturer.
- 7 5. Level sealant with a squeegee in a narrow band not to exceed 2 inches wide and 1/8
- 8 inch above the pavement surface.
- 9 6. Prevent tracking material offsite using an application of fine aggregate as specified
- 10 in the Drawings and directed by the City.
- 11 7. Do not apply sealant over existing sealant in good condition.
- 12 8. Disposal of Materials:
- 13 a. Dispose of any excess material produced from cleaning of cracks.

14 B. Equipment

- 15 1. Hot Pour Sealing Equipment
- 16 a. Heat in a double-jacketed heater using a heat transfer oil so no direct flame
- 17 meets shell of the vessel containing the sealing compound.
- 18 b. Provide a heater capable of circulating and agitating the sealant during heating
- 19 process to achieve a uniform temperature rise and maintain desired temperature.
- 20 c. Provide gauges to monitor temperature of the vessel contents and avoid
- 21 overheating the material.
- 22 d. Provide a heater equipped with a gear-driven asphalt pump with adequate
- 23 pressure to dispense sealant.
- 24 2. Crack Cleaning Equipment
- 25 a. Provide equipment capable of delivering dry compressed air at 185 cubic feet
- 26 per minute to remove all loose debris from cracks in accordance with depth
- 27 specified in Article 3.4 of this Section.
- 28 b. Provide at least one handheld pressure wand per crew to clean cracks.
- 29 3. Condition of Equipment
- 30 a. Provide equipment in good repair and operating condition.
- 31 b. Subject to the approval of City.
- 32 c. If equipment is found to be insufficient, the Contractor is responsible for
- 33 replacing non-conforming equipment at no cost to City.
- 34 d. Any sealant installed using non-conforming equipment is subject to removal
- 35 and replacement at no cost to City.

36 **3.5 REPAIR [NOT USED]**

37 **3.6 RE-INSTALLATION [NOT USED]**

38 **3.7 FIELD QUALITY CONTROL [NOT USED]**

39 **3.8 SYSTEM STARTUP [NOT USED]**

40 **3.9 ADJUSTING [NOT USED]**

41 **3.10 CLEANING [NOT USED]**

1 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

2 **3.12 PROTECTION [NOT USED]**

3 **3.13 MAINTENANCE [NOT USED]**

4 **3.14 ATTACHMENTS [NOT USED]**

5 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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1 **SECTION 32 13 13**
2 **CONCRETE PAVING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Material requirements and construction methods for:
7 a. Concrete pavement classes
8 b. Concrete pavement
9 c. Concrete street header

10 B. Deviations from this City of Denton Standard Specification:

- 11 1. None.

12 C. Related Specification Sections include but are not limited to:

- 13 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
14 Contract.
15 2. Division 1 - General Requirements.
16 3. Section 03 00 00 – Concrete and Concrete Reinforcing.
17 4. Section 32 01 29 – Concrete Paving Repair.
18 5. Section 32 05 16 – Aggregates for Exterior Improvements.
19 6. Section 32 13 73 – Concrete Paving Joint Sealants.
20 7. Section 41 14 00 – Batching Equipment.

21 **1.2 PRICE AND PAYMENT PROCEDURES**

22 A. Measurement and Payment

23 1. Concrete Pavement

24 a. Measurement

- 25 1) Measured per square yard from back of curb to back of curb or edge of
26 concrete to edge of concrete for Concrete Pavement installed.

27 b. Payment

- 28 1) The work performed and materials furnished in accordance with this item
29 and measured as provided under “Measurement” will be paid for at the unit
30 price bid per square yard for Concrete Pavement installed for:
31 a) Various depths.

32 c. The price bid shall include:

- 33 1) Furnishing and installing Concrete Pavement as specified by the Drawings
34 2) Shaping and fine grading the placement area
35 3) Water
36 4) Loading
37 5) Unloading
38 6) Storing
39 7) Hauling
40 8) Handling of materials

- 1 9) Traffic control for all testing
- 2 10) Trial batches (as needed)
- 3 11) Materials and work needed for any corrective action
- 4 12) Concrete
- 5 13) Aggregate
- 6 14) Supplementary cementing materials
- 7 15) Concrete additives
- 8 16) Mixing
- 9 17) Placement of concrete
- 10 18) Finishing of concrete
- 11 19) Curing and curing compounds
- 12 20) Sawing
- 13 21) Joint sealant
- 14 22) Reinforcing steel and reinforcement chairs
- 15 23) Disposal of excess material
- 16 24) Clean-up
- 17 2. Concrete Pavement (HES)
- 18 a. Measurement
- 19 1) Measured per square yard from back of curb to back of curb or edge of
- 20 concrete to edge of concrete for Concrete Pavement (HES) installed.
- 21 b. Payment
- 22 1) The work performed and materials furnished in accordance with this item
- 23 and measured as provided under “Measurement” will be paid for at the unit
- 24 price bid per square yard for Concrete Pavement (HES) installed for:
- 25 a) Various depths.
- 26 c. The price bid shall include:
- 27 1) Furnishing and installing Concrete Pavement (HES) as specified by the
- 28 Drawings
- 29 2) Shaping and fine grading the placement area
- 30 3) Water
- 31 4) Loading
- 32 5) Unloading
- 33 6) Storing
- 34 7) Hauling
- 35 8) Handling of materials
- 36 9) Traffic control for all testing
- 37 10) Trial batches (as needed)
- 38 11) Materials and work needed for any corrective action
- 39 12) Concrete
- 40 13) Aggregate
- 41 14) Supplementary cementing materials
- 42 15) Concrete additives
- 43 16) Mixing
- 44 17) Placement of concrete
- 45 18) Finishing of concrete
- 46 19) Curing and curing compounds
- 47 20) Sawing
- 48 21) Joint sealant
- 49 22) Reinforcing steel and reinforcement chairs

- 1 23) Disposal of excess material
- 2 24) Clean-up
- 3 3. Concrete Street Header
- 4 a. Measurement
- 5 1) Measured per linear foot of Concrete Street Header installed.
- 6 b. Payment
- 7 1) The work performed and materials furnished in accordance with this item
- 8 and measured as provided under “Measurement” will be paid for at the unit
- 9 price bid per linear foot for Concrete Street Header installed.
- 10 c. The price bid shall include:
- 11 1) Furnishing and installing Concrete Street Header as specified by the
- 12 Drawings
- 13 2) Shaping and fine grading the placement area
- 14 3) Water
- 15 4) Loading
- 16 5) Unloading
- 17 6) Storing
- 18 7) Hauling
- 19 8) Handling of materials
- 20 9) Traffic control for all testing
- 21 10) Trial batches (as needed)
- 22 11) Materials and work needed for any corrective action
- 23 12) Concrete
- 24 13) Aggregate
- 25 14) Supplementary cementing materials
- 26 15) Concrete additives
- 27 16) Mixing
- 28 17) Placement of concrete
- 29 18) Finishing of concrete
- 30 19) Curing and curing compounds
- 31 20) Sawing
- 32 21) Joint sealant
- 33 22) Reinforcing steel and reinforcement chairs
- 34 23) Disposal of excess material
- 35 24) Clean-up

36 **1.3 REFERENCES**

- 37 A. Abbreviations and Acronyms
- 38 1. ACI – American Concrete Institute
- 39 2. AASHTO – American Association of State Highway and Transportation Officials
- 40 3. ASTM – American Society for Testing and Materials
- 41 4. HES – High Early Strength
- 42 5. TxDOT – Texas Department of Transportation
- 43 6. W/C – Water to cement ratio
- 44 7. SCM – Supplementary Cementing Materials
- 45 8. UFFA – Ultra-Fine Fly Ash

- 1 9. MFFA – Modified Class F Fly Ash
- 2 10. PSI – Pounds per Square Inch
- 3 11. KSI – Kilopound per Square Inch
- 4 B. Reference Standards
- 5 1. Reference standards cited in this Section refer to the current reference standard
- 6 published at the time of the latest revision date logged at the end of this Section
- 7 unless a date is specifically cited.
- 8 2. American Association of State Highway and Transportation Officials (AASHTO)
- 9 a. AASHTO T26, Standard Method of Test for Quality of Water to be Used in
- 10 Concrete
- 11 3. American Society for Testing and Materials (ASTM):
- 12 a. C31, Standard Practice for Making and Curing Concrete Test Specimens in the
- 13 Field
- 14 b. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete
- 15 Specimens
- 16 c. C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed
- 17 Beams of Concrete
- 18 d. C1602, Standard Specification for Mixing Water Used in the Production of
- 19 Hydraulic Cement Concrete
- 20 4. American Concrete Institute (ACI):
- 21 a. ACI 305.1-14, Standard Specification for Hot Weathering Concreting
- 22 b. ACI 306.1-90, Standard Specification for Cold Weathering Concreting
- 23 c. ACI 301-16, Specifications for Structural Concrete
- 24 d. ACI 318, Building Code Requirements for Structural Concrete
- 25 5. Texas Department of Transportation (TxDOT) Departmental Material
- 26 Specifications (DMS)
- 27 a. DMS-4515, Multiple-Piece Tie Bars for Concrete Pavement
- 28 b. DMS-4600, Hydraulic Cement
- 29 c. DMS-4640, Chemical Admixtures for Concrete
- 30 d. DMS-4650, Hydraulic Cement Concrete Curing Materials and Evaporation
- 31 Retardants
- 32 e. DMS-6100, Epoxies and Adhesives
- 33 f. DMS-6310, Joint Sealants and Fillers
- 34 6. TxDOT Test Procedures:
- 35 a. Tex-422-A, Measuring Temperature of Freshly Mixed Portland Cement
- 36 b. Tex-423-A, Determining Concrete Thickness by Direct Measurement
- 37 c. Tex-424-A, Obtaining and Testing Drilled Cores of Concrete
- 38 d. Tex-470-A, Optimized Aggregate Gradation for Hydraulic Cement Concrete
- 39 Mix Designs
- 40 e. Tex-472-A, Uniformity of Concrete
- 41 f. Tex-612-J, Acid Insoluble Residue for Fine Aggregate

42 1.4 ADMINISTRATIVE REQUIREMENTS

43 A. Pre-Paving Meeting

- 44 1. Hold meeting 1 week prior to performing any tasks included under Concrete
- 45 Paving.

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2. Invite the City and appropriate representatives.
 3. Prior to pre-paving meeting, prepare the following:

- 1 a. Paving Plan
- 2 1) Paving widths
- 3 2) Jointing plan:
- 4 a) Locations and labels for all joint types including longitudinal and
- 5 transverse construction joint locations
- 6 3) Confirm rebar sizes for pavement reinforcing.
- 7 4) Confirm hand-pour location and equipment to be used for forming,
- 8 pouring, compacting, and finishing concrete.
- 9 5) Texturizing method (broom or tining) and direction (longitudinal or
- 10 transverse)
- 11 6) Consolidation methods at joints
- 12 b. Paving Process
- 13 1) Process to balance production, delivery, paving, and compaction to achieve
- 14 continuous placement operations and good ride quality.
- 15 c. All Action and Information Submittals to be reviewed and approved prior to
- 16 Pre-Paving Meeting.
- 17 4. During the Pre-Paving Meeting, determine whether tining or a broom finish is
- 18 preferred by the City unless otherwise specified in the Drawings.
- 19 B. Night Work and Noise
- 20 1. Comply with all City Noise Ordinance in accordance with the General Conditions.
- 21 2. Night work will require prior City approval in accordance with the General
- 22 Conditions.

23 1.5 SUBMITTALS

- 24 A. Submittals shall be in accordance with Section 01 33 00.
- 25 B. All submittals shall be approved by the City prior to commencement of any Concrete
- 26 Paving activities.

27 1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- 28 A. Shop Drawings:
- 29 1. Concrete Mix Design
- 30 a. In accordance with Section 03 00 00.
- 31 b. Statement from the concrete supplier verifying concrete has been tested and
- 32 handled in accordance with ASTM C94.
- 33 2. Jointing Layout
- 34 a. Provide a jointing layout if one is not provided in the Drawings.
- 35 3. Product Data
- 36 a. Provide the following from each manufacturer supplying the following in
- 37 accordance with Section 03 00 00:
- 38 1) Curing compounds
- 39 2) Evaporation retardant
- 40 3) Joint fillers
- 41 4) Chemical additives
- 42 5) Epoxy
- 43

1 B. Informational Submittals:

2 1. Source Locations

- 3 a. Location of all material sources

4 2. Testing Laboratory

- 5 a. Submit for review and approval the following information for each testing
6 laboratory used on the project:

7 1) Testing Laboratory Name

8 2) Location

9 3) What tests will be performed at the lab if multiple labs are used.

10 4) ACI Certification – All labs and Contractor personnel performing concrete
11 testing must be ACI certified.

12 3. Equipment Information

- 13 a. Submittal for all major equipment to include:

14 1) Equipment name and description

15 2) Size

16 3) Intended use

17 **1.7 CLOSEOUT SUBMITTALS**

18 A. Test and Evaluation Reports

- 19 1. All test reports generated during testing.

20 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

21 **1.9 QUALITY ASSURANCE [NOT USED]**

22 **1.10 DELIVERY, STORAGE, AND HANDLING**

23 A. Secure and maintain a location to store the material in accordance with Section 01 66
24 00.

25 B. Storage and Stockpiling

26 1. Cement and Supplementary Cementitious Material

- 27 a. In accordance with Section 03 00 00.

28 2. Steel Reinforcement

29 a. Store reinforcement above ground surface on skids, platforms, or other support.

30 b. Protect reinforcement from mechanical damage and surface deterioration
31 caused by exposure to conditions that could cause rust.

32 3. Chemical Admixture, Epoxy, Curing Compound, and Other Materials

- 33 a. Follow manufacturer's instructions regarding storage and application at
34 temperatures of material.

35 4. Epoxy

36 a. Package components in airtight containers and protect from light and moisture.

37 b. Include detailed instructions for the application of the material and all safety
38 information and warnings regarding contact with the components.

39 c. Store epoxy and adhesive components at temperatures recommended by the
40 manufacturer.
41

1 **1.11 FIELD CONDITIONS**

2 A. Weather Conditions

- 3 1. Do not place concrete when the ambient temperature exceeds 95 degrees
4 Fahrenheit.
- 5 2. Do not place concrete when the ambient temperature in the shade is below 40
6 degrees Fahrenheit and falling unless approved in writing by the City.
- 7 3. Concrete may be placed when the ambient temperature in the shade is above 35
8 degrees Fahrenheit and rising or above 40 degrees Fahrenheit.
- 9 4. Protect the pavement with an approved insulating material capable of protecting the
10 concrete for the specified curing period when temperatures warrant protection
11 against freezing.
- 12 5. Submit proposed measure to protect the concrete from anticipated freezing weather
13 for the first 72 hours after a concrete pour to the City for review.
- 14 6. Repair or replace all concrete damaged by freezing at no cost to the City.

15 **1.12 WARRANTY [NOT USED]**

16 **PART 2 - PRODUCTS**

17 **2.1. CITY-SUPPLIED PRODUCTS [NOT USED]**

18 **2.2. MATERIALS**

19 A. Concrete Production Materials

- 20 1. Produce Class P1, P2, or HES concrete for concrete paving in accordance with 03
21 00 00.
- 22 a. Temperature
- 23 1) Pour concrete that is between 40 degrees and 95 degrees Fahrenheit when
24 measured in accordance with Tex-422-A at the time of discharge.
- 25 2) Take immediate corrective action or cease concrete placement when the
26 concrete temperature exceeds 95 degrees Fahrenheit.
- 27 2. Provide Cementitious Material and Water in accordance with Section 03 00 00.
- 28 3. Aggregate
- 29 a. General
- 30 1) Recycled crushed concrete may be used as coarse or fine aggregate in Class
31 A, B, E, and P concrete.
- 32 2) A maximum of 20 percent of the fine aggregate may consist of recycled
33 crushed concrete.
- 34 b. Coarse Aggregates
- 35 1) Provide coarse aggregate in accordance with Tex-470-A and Section 03 00
36 00 for P1, P2, or HES concrete based on the concrete classes specified on
37 the Drawings.
- 38 c. Fine Aggregates
- 39 1) Fine aggregate will consist of clean, hard, durable fragments in accordance
40 with Section 32 05 16.

- 1 2) Use fine aggregate with an acid insoluble residue of at least 60 percent by
 2 weight when tested in accordance with Tex-612-J in all concrete subject to
 3 direct traffic.
 4 3) Use the following equation to determine if aggregate combination meets the
 5 acid insoluble residue requirement when blending fine aggregate:

$$\frac{(A_1 \times P_1) + (A_2 \times P_2)}{100} \geq 60 \text{ percent}$$

Where:

A₁ = acid insoluble (percent) of fine aggregate 1

A₂ = acid insoluble (percent) of fine aggregate 2

P₁ = percent by weight of fine aggregate 1 of the fine aggregate blend

P₂ = percent by weight of the fine aggregate 2 of the fine aggregate blend

- a) Instead of using the above equation, the following blending may be done.

- (1) Blend fine aggregate with a micro-deval loss of less than 12 percent when tested in accordance with Tex-461-A with at least 40 percent of a fine aggregate that has an acid insoluble residue of at least 60 percent.

- 4) Provide fine aggregates in accordance with gradation shown in Table 1.

Table 1
Fine Aggregate Gradation Chart

Sieve Size	Percent Passing by Weight
3/8"	100
#4	95– 100
#8	80– 100
#16	50– 85
#30	25– 65
#50	10– 35 ¹
#100	0– 10
#200	0– 3 ²

1. 6 – 35 when sand equivalent value is greater than 85 when tested in accordance with Tex-203-F.
 2. 0 – 6 for manufactured sand.

4. Chemical Admixtures

a. General

- 1) Provide chemical admixtures in accordance with Section 03 00 00.
 b. Water Reducing Admixture
 1) Provide water-reducing admixtures in accordance with Section 03 00 00.
 c. Air-Entraining Admixture
 1) Provide air-entraining admixtures in accordance with Section 03 00 00.

B. Concrete Placement Materials

1. Reinforcing Steel

- a. Provide in accordance with Section 03 00 00.

2. Tie Bars

- a. General

- 1) Provide in accordance with Section 03 00 00.
- 2) Use tie bars in longitudinal contraction and longitudinal construction joints.
- 3) Use support baskets to support the tie bars during concrete placement. Do not use chairs or other support devices without prior approval from the City.
- 4) Refer to this Section for installation requirements.
- b. Multiple Piece Tie Bars
 - 1) Use multiple piece tie bars along all longitudinal construction joints unless otherwise approved by the City.
 - 2) Do not use multiple piece tie bars for contraction joints or any transverse joints.
 - 3) Provide multiple piece tie-bars conforming to DMS-4515.
- c. Single Piece Tie Bars
 - 1) Use single piece tie bars for contraction joints only.
 - 2) Single piece tie bars will only be accepted for longitudinal construction joints when the existing concrete is already hardened in widening projects or when performing maintenance work such as panel replacement or concrete repair.
3. Dowel Bars
 - a. General
 - 1) Provide dowel bars and dowel caps in accordance with Section 03 00 00.
 - 2) Use dowel bars in transverse contraction joints and expansion joints.
 - 3) Refer to this Section for installation requirements.
4. Reinforcement Supporting Devices
 - a. Provide in accordance with Section 03 00 00.
5. Epoxy
 - a. Provide in accordance with Section 03 00 00.
6. Evaporation Retardant
 - a. Provide in accordance with Section 03 00 00.
7. Curing
 - a. Provide in accordance with Section 03 00 00.
8. Joint Fillers (Expansion Joints)
 - a. Provide boards at the size, shape, and type specified in the Drawings. Use redwood if the type of board is not specified in the Drawings.
 - 1) Provide redwood timber boards for expansion joints in accordance with DMS-6310.
 - b. Provide wood boards free of deformities and are smooth, flat, straight throughout, and sufficiently rigid to allow for easy installation.
9. Joint Sealants
 - a. Provide joint sealants in accordance with Section 32 13 73.

2.3. ACCESSORIES [NOT USED]

2.4. SOURCE QUALITY CONTROL

A. Tests and Inspections

1. Material Source Testing and Submittals

- 1
 - 2
 - 3
- a. Resubmit Action Submittals affected if any material source locations or concrete supplier is changed.

- 1 b. Cementitious Materials
- 2 1) Provide manufacturer testing reports in accordance with this Section.
- 3 2) Perform testing in accordance with DMS-4600
- 4 3) Furnish in accordance with Section 03 00 00.
- 5 c. Water
- 6 1) Perform testing to verify the water is in accordance with the requirements
- 7 of AASHTO T26.
- 8 2) Mix water in accordance with ASTM C1602.
- 9 d. Aggregate Quality Requirements
- 10 1) Provide aggregates in accordance with all requirements in Section 32 05 16
- 11 and this Section.
- 12 e. Chemical Admixtures
- 13 1) Provide manufacturer testing reports in accordance with this Section.
- 14 2) Perform testing in accordance with DMS-4640
- 15 f. Epoxy, Evaporation Retardants, Curing Compounds, Joint Fillers, and Joint
- 16 Sealants
- 17 1) Provide manufacturer testing reports and product data in accordance with
- 18 this Section.
- 19 2) Perform testing in accordance with DMS-4650, DMS-6100, and DMS-
- 20 6310.

21 **PART 3 - EXECUTION**

22 **3.1. INSTALLERS [NOT USED]**

23 **3.2. EXAMINATION [NOT USED]**

24 **3.3. PREPARATION**

25 A. Class P1, P2, and HES Preparation

- 26 1. Hauling
- 27 a. Clean delivery equipment as necessary to prevent accumulation of old concrete
- 28 before loading fresh concrete.
- 29 b. Deliver concrete to the site in accordance with Section 41 14 00.
- 30 c. Maintain concrete delivery and placement rates to prevent cold joints and in
- 31 accordance with Section 03 00 00.
- 32 d. Any concrete not placed within the time limits specified under Section 03 00 00
- 33 will be rejected.
- 34 e. Adding Water or Chemical Admixtures
- 35 1) Adding chemical admixtures is not permitted at the jobsite.
- 36 2) Water may be added to the truck until the slump test is conducted. Once the
- 37 slump test is conducted, the addition of water or admixtures is not
- 38 permitted unless the slump is too low or otherwise permitted.
- 39 3) When water or an admixture is added, turn the drum or blades at least 30
- 40 additional revolutions at mixing speed to ensure thorough and uniform
- 41 mixing of the concrete.
- 42 4) When water is added, do not exceed the approved mix design water to
- 43 cementitious material ratio.

- 5) Do not add water or chemical admixtures after any concrete has been discharged.
- f. Provide the delivery ticket for the concrete in accordance with Section 41 14 00.

2. Subgrade

- a. Hot-Mix Asphalt Base
 - 1) Prepare surface by removing, sweeping, or other approved methods.
- b. Lime, Cement or Flexible Base Subgrade:
 - 1) Correct all irregularities in the subgrade of more than 1/2 inch., as shown by straightedge or template.
 - 2) Verify subgrade meets all requirements for the applicable subgrade type.
 - 3) Spray prepared subgrade with water, if needed, in advance of placing the pavement to ensure it is in a firm and moist condition.
 - 4) Take density tests no more than 72-hours prior to placement of concrete.
- c. If rain or other conditions may have adversely affected the condition of the subgrade or base, additional tests may be required as directed by the City.

3.4. INSTALLATION

A. Class P1, P2, and HES Equipment

1. General

- a. Furnish and maintain all equipment necessary for the construction of concrete pavement in good working condition.
- b. The equipment to include spreading devices (augers), internal vibration, tamping, and surface floating necessary to finish the freshly placed concrete shall provide a dense and homogeneous pavement.

2. Forming Equipment

a. Pavement Forms

- 1) Pavement forms shall only be used when hand-pouring concrete. Use a slip-form paver for all machine-poured concrete unless otherwise approved by the City.
- 2) Provide metal or wood side forms unless otherwise approved by the City.
- 3) Provide side forms of sufficient cross-section, strength, and rigidity to support paving equipment and resist the impact and vibration of the operation without visible springing, settling, or deflection.
- 4) Use forms that extend the full depth of concrete and shall be:
 - a) a minimum of 1.5 inches in thickness when wooden forms are used
 - b) of a gauge that provides equivalent rigidity and strength when metal forms are used.
- 5) Use forms that are clean, oiled, and free from detrimental kinks, bends, or warps that could affect ride quality or alignment.
- 6) Provide flexible or curved forms made of metal or wood for curves that have a radius of 250 feet or less.
- 7) Secure forms on a base or firm subgrade accurately graded and that provides stable support without deflection and movement.
- 8) Pin every form at a minimum in the middle and near each end. Tightly join and key form sections together to prevent displacement.
- 9) Forms to be reset using heavy stakes or other additional supports if subgrade becomes unstable.

- 1 10) Obtain approval of formwork from the City prior to placement of concrete.
- 2 11) Forms are to be placed to provide pavement at final grade as specified in
- 3 the Drawings.
- 4 12) Check conformity of the grade, alignment, and stability of forms
- 5 immediately before pouring concrete and make necessary corrections.
- 6 13) Use a straight edge or other approved method to test the top of forms to
- 7 ensure ride quality requirements for the completed pavement will be met.
- 8 14) Submit a request to the City for any alternative pavement form equipment
- 9 for review.
- 10 b. Curb Forms
- 11 1) Provide curb forms for separately placed curbs not slip-formed in
- 12 accordance with the requirements of Section 31 16 00.
- 13 c. Settling
- 14 1) Stop paving operations if forms settle or deflect more than 1/8 inch under
- 15 finishing operations.
- 16 2) Reset the forms and refinish concrete surface to correct grade.
- 17 3. Paving, Consolidating, and Finishing Equipment
- 18 a. Do not add water to concrete after discharged from delivery equipment unless
- 19 approved by the City.
- 20 b. Misting/fogging only allowed during Finishing. Refer to this Section for
- 21 additional information.
- 22 c. Machine-Poured Concrete Pavement
- 23 1) Use a slip-form paver with a stringline that uniformly distributes the
- 24 concrete with minimal segregation and provides a smooth finish in
- 25 accordance with the plan line and grade for machine-poured concrete.
- 26 2) The Contractor is responsible for establishing the location and elevation of
- 27 the stringline to ensure pavement will be at the correct final grade specified
- 28 in the Drawings.
- 29 3) Provide mechanically-operated finishing floats capable of producing a
- 30 uniformly smooth pavement surface.
- 31 4) Provide watering equipment capable of providing a fine, light, water fog
- 32 mist.
- 33 5) Provide a stake line for the stringline every 25 feet and at every horizontal
- 34 and vertical geometry point as specified in the Drawings.
- 35 d. Hand-Poured Concrete Pavement
- 36 1) Receive approval of all equipment used for hand-pouring concrete during
- 37 Pre-Paving Meeting.
- 38 2) Refer to this Section for additional requirements.
- 39 e. Consolidating
- 40 1) Provide mechanically-operated vibratory equipment capable of adequately
- 41 consolidating the concrete.
- 42 2) Provide immersion vibrators on paving equipment at sufficiently close
- 43 intervals to provide uniform vibration and consolidation of the concrete
- 44 over the entire width and depth of the pavement and in accordance with the
- 45 manufacturer's recommendations.
- 46 3) Provide immersion vibrator units that operate at a frequency in air of at
- 47 least 8,000 cycles per minute on the paving equipment.

- 1 4) Provide enough hand-operated immersion vibrators for timely and proper
2 consolidation of the concrete along forms, at all joints, and in areas not
3 covered by other vibratory equipment.
4 5) Surface vibrators may be used to supplement equipment-mounted
5 immersion vibrators.
6 6) Provide tachometers to verify the proper operation of all vibrators.
- 7 f. Finishing
8 1) Floats
9 a) Use a float attached to the slip-form paver or as a separate machine
10 where possible.
11 b) When using a hand float or trowel, take care to not distort the surface.
12 The City may require any concrete that has a non-uniform surface due
13 to the improper use of a float to be removed and replaced at no cost to
14 the City.
15 2) Straightedge
16 a) Use a 10 or 15 foot long square tube straightedge made of magnesium
17 or steel.
18 b) The City may require any concrete that has a non-uniform surface due
19 to the improper use of a straightedge to be removed and replaced at no
20 cost to the City.
- 21 4. Texturing Equipment
22 a. A baker broom or tining are the approved methods for texturizing concrete.
23 b. Provide a baker broom of sufficient transverse length to span the full width of
24 pavement being placed.
25 c. Request approval to use an evaporation retardant if there is concern the
26 concrete surface will dry too quickly before texturing and curing can occur.
27 d. Tining Equipment
28 1) Provide a self-propelled metal tine device equipped with steel tines to
29 obtain groves that are 1/12-inch-wide and a depth of 1/8 inch to 3/16 inch.
30 2) Tine Spacing:
31 a) Transverse tining spaced at approximately 1-inch center-to-center.
32 b) Longitudinal tining spaced at approximately 3/4-inch center-to-center.
33 3) Manual methods may be used that produce an equivalent texture when it is
34 impractical to use self-propelled equipment. However, manual methods
35 should be minimized. Obtain approval before using manual tining methods.
- 36 5. Curing Equipment
37 a. Provide a self-propelled machine for applying membrane curing compound
38 using mechanically-pressurized spraying equipment with atomizing nozzles
39 where possible.
40 b. If manually applying a curing compound, use equipment with a nozzle capable
41 of producing the desired coverage based on the requirements of this
42 specification.
43 c. Provide equipment and controls that maintain the required uniform rate of
44 application over the entire paving area.
45 d. When reinforcing is exposed, provide plastic covers to prevent the bars from
46 being coated in curing compound. Remove any curing compound on exposed
47 reinforcing with a steel brush or by sand blasting.
- 48 6. Sawing Equipment

- 1 a. Provide power-driven concrete saws to saw joints specified in the Drawings.
- 2 7. Grinding Equipment
- 3 a. Provide grinding equipment specifically designed to smooth and texture
- 4 concrete pavement using circular diamond blades when required.
- 5 b. Provide equipment with an automatic grade control capable of grinding at least
- 6 a 3-foot width longitudinally in each pass without damaging the concrete.
- 7 8. Coring Equipment
- 8 a. Provide coring equipment capable of extracting cores in accordance with Tex-
- 9 424-A.
- 10 9. Miscellaneous Equipment
- 11 a. Provide both a 5-foot and a 10-foot steel or magnesium long-handled, standard
- 12 straightedge.
- 13 b. Provide enough work bridges long enough to span the pavement for finishing
- 14 and inspection operations.
- 15 10. The City may reject equipment and stop operation if equipment does not meet
- 16 requirements.
- 17 B. Class P1, P2, and HES Concrete Placement
- 18 1. General
- 19 a. This section outlines the requirements for the placement of Class P1, P2, and
- 20 HES concrete. Refer to other specifications for the placement requirement of
- 21 other concrete items.
- 22 b. Contractor to notify the City at least two working days in advance of
- 23 installation of concrete pavement.
- 24 c. Take care when placing concrete to keep all foreign material out.
- 25 d. Remove any foreign material from concrete pavement without damaging the
- 26 concrete.
- 27 e. Concrete may be poured by hand in situations where a slip-form paver cannot
- 28 be used due to space restrictions.
- 29 f. Receive approval from the City prior to hand pouring concrete. Hand pouring
- 30 should be minimized.
- 31 g. Do not allow pavement edge to deviate from the established paving line by
- 32 more than 1/2 inches at any point.
- 33 h. Place the concrete as near as possible to its final location and minimize
- 34 segregation and re-handling.
- 35 i. Distribute concrete using shovels where hand spreading is necessary. Do not
- 36 use rakes or vibrators to distribute concrete.
- 37 2. Removing Forms
- 38 a. Cleaning
- 39 1) Clean forms thoroughly after each use.
- 40 b. Removal
- 41 1) Forms to remain in place until the concrete is set and the removal will not
- 42 cause damage to the concrete. Leave the forms in place for 12 hours after
- 43 concrete has been poured unless approved by the City.
- 44 2) If forms are removed before 72 hours after concrete placement, promptly
- 45 apply membrane curing compound to the edge of the concrete pavement.
- 46 3) Avoid damage to the edge of the pavement when removing forms.

- 1 4) Repair damage resulting from form removal and honeycombed areas with a
- 2 mortar mix within 24 hours after form removal unless otherwise approved.
- 3 5) Remove and replace any damaged concrete that was not repaired within 24
- 4 hours at no cost to the City.
- 5 3. Reinforcing Steel and Joint Assemblies
- 6 a. General
- 7 1) Place reinforcing steel, dowels, and tie bars in position specified in the
- 8 Drawings.
- 9 2) Provide reinforcing in accordance with the requirements of this Section.
- 10 3) Secure reinforcing bars at alternate intersections with wire ties or locking
- 11 support chairs.
- 12 4) Tie all splices with wire.
- 13 5) Install all bars in their required position as specified in the Drawings.
- 14 b. Splicing
- 15 1) Provide standard reinforcement splices by lapping and tying ends.
- 16 2) In accordance with ACI 318 for minimum lap of spliced bars where not
- 17 specified in the Drawings.
- 18 c. Installing and Supporting Reinforcing Steel
- 19 1) Layout reinforcing steel in accordance with Drawings. Support reinforcing
- 20 steel using approved chairs or baskets.
- 21 2) Do not allow construction personnel to walk on the reinforcement bars.
- 22 Replace any chair that is broken prior to concrete placement.
- 23 3) Steel pins may also be used to hold the reinforcement in place.
- 24 4) If reinforcing steel is found to be at incorrect depth:
- 25 a) Prior to concrete being poured, Contractor to adjust steel to correct
- 26 depth as specified in the Drawings.
- 27 b) If concrete has been poured, Contractor to remove and replace at no
- 28 cost to the City.
- 29 4. Joints
- 30 a. General
- 31 1) Place joints shown on the Drawings. If jointing layout is not provided on
- 32 the Drawings, submit a jointing layout for review and approval to the City.
- 33 2) Maintain a right angle with the surface of the pavement for all joints.
- 34 3) Maintain an angle of greater than 75 degrees between all joints if 90
- 35 degrees is not achievable unless otherwise shown on the Drawings.
- 36 4) If uncontrolled cracking occurs during sawing, the City may require the
- 37 panel with the crack to be removed and replaced at no cost to the City.
- 38 5) Use dowel baskets to support dowels and tie bars in the location shown on
- 39 the Drawings. Do not manually or mechanically insert tie bars or dowels
- 40 into wet or hardened concrete unless otherwise approved by the City.
- 41 6) Secure the dowel baskets into the subgrade or hot-mix asphalt base so that
- 42 the baskets to not tip or move during concrete placement. Set up rebar and
- 43 support baskets at least 12 hours prior to concrete placement for inspection.
- 44 7) Use the appropriate bar based on the Drawings and the requirements under
- 45 Materials.
- 46 8) Clean and seal all joints before opening the pavement to traffic.
- 47 9) Joint Dimensions and Spacing
- 48 a) Match width and depth of the joint shown on the Drawings.

- 1 b) Dimensions of the sealant reservoir to match manufacturer's
- 2 recommendations.
- 3 c) Ensure the joint depth after curing is 1/8 inch to 1/4 inch below the
- 4 pavement surface at the center of the joint. If joint depth exceeds 1/4
- 5 inch, The City may request corrective action to be taken that may
- 6 include remove and replace at no cost to the City.
- 7 d) Maintain a maximum 15 foot longitudinal joint spacing.
- 8 e) Ensure longitudinal joints follow the proposed lane lines where
- 9 possible.
- 10 b. Contraction Joints
- 11 1) Transverse Contraction Joints
- 12 a) Only used in plain-jointed concrete pavement.
- 13 b) Maintain joint spacing as shown on the Drawings.
- 14 c) Do not install transverse contraction joints in continuously reinforced
- 15 concrete pavement.
- 16 d) Use dowel bars that are coated with a thin film of grease or other
- 17 approved de-bonding material to prevent concrete from bonding to the
- 18 bar. See Materials.
- 19 e) Use the appropriate bar size, length, and spacing shown on the
- 20 Drawings.
- 21 f) Maintain a sawcut depth of 1/3 of the slab thickness.
- 22 2) Longitudinal Contraction Joints
- 23 a) Used in plain-jointed and continuously reinforced concrete.
- 24 b) Maintain joint spacing as specified in the Drawings.
- 25 c) Use single piece tie bars. See Materials.
- 26 d) Use the appropriate bar size, length, and spacing specified in the
- 27 Drawings.
- 28 e) Maintain a sawcut depth of 1/3 of the slab thickness.
- 29 c. Construction Joints
- 30 1) General
- 31 a) Use reinforcing support chairs to hold reinforcing bars that extend
- 32 through the bulkhead in place.
- 33 b) Splicing is not allowed within 10 feet of a transverse construction joint.
- 34 c) Use the appropriate bar size, length, and spacing specified in the
- 35 Drawings.
- 36 2) Transverse Construction Joints
- 37 a) A transverse construction joint shall be formed at the close of each
- 38 day's work or when the placing of concrete has been stopped for 30-
- 39 minutes or longer.
- 40 b) Provide a bulkhead (header) of sufficient cross-sectional area to prevent
- 41 deflection and accurately notched to allow longitudinal rebar to
- 42 continue through the bulkhead.
- 43 c) Provide bulkheads cut true to the section of the finished pavement and
- 44 cleaned.
- 45 d) Plain-Jointed Concrete
- 46 (1) Select the construction joint location to be either at planned
- 47 transverse contraction joint or halfway between two planned
- 48 transverse contraction joints.
- 49 e) Continuously Reinforced Concrete

- 1 (1) Additional steel may be required. See Drawings for additional
2 information.
3 (2) Ensure longitudinal steel is supported and protected to prevent
4 damage, vibration, and impact.
- 5 3) Longitudinal Construction Joints
6 a) Use multiple piece tie bars where possible. See Materials.
7 b) Bent tie bars are not permitted.
8 c) Drill and epoxy single piece tie bars only for widening or maintenance
9 projects where new concrete is being poured adjacent to existing
10 concrete.
11 d) Inserting Tie Bars
12 (1) When approved, insert tie bars per this Section.
13 (2) Fresh Concrete Installation:
14 (a) Mechanically insert the tie bars using the paving machine when
15 possible.
16 (b) If the tie bar is inserted manually, check the insertion depth and
17 location to ensure proper placement and evaluate if there has
18 been any surface drop down.
19 (c) If any surface drop down has occurred, repair concrete to the
20 City's satisfaction.
21 (d) Take care to avoid moving the reinforcing mat or any other
22 reinforcing in the concrete when inserting the tie bar.
23 (3) Hardened Concrete Installation:
24 (a) Mark tie bar location and drill holes into the hardened concrete
25 at least 10-inches deep with a drill bit that is 1/8-inch greater in
26 diameter than the tie bar diameter.
27 (b) Clean the hole with a wire brush and compressed air to remove
28 all the dust and moisture.
29 (c) Follow the epoxy manufacturer's instruction to apply the
30 epoxy. Fill the entire hole with Type 3, Class C epoxy before
31 inserting the tie bars.
32 (d) When installing tie bars into hardened concrete, perform a
33 pullout test.
34 (4) Pullout Test:
35 (a) Perform pullout tests on tie bars designated by the City.
36 (b) Install the tie bar in accordance with this Section and the
37 Drawings.
38 (c) Perform a pullout test in accordance with ASTM E488 within
39 the epoxy manufacturer's recommended curing time.
40 (d) Verify the tie bar meets a pullout strength of at least 3/4 of the
41 yield strength of the tie bar.
42 (5) Corrective Measures
43 (a) Perform corrective measures to provide adequate pullout
44 resistance if any of the tests do not meet the required minimum
45 pullout strength.
46 (b) Repair any damage caused by testing at no cost to the City.
47 (c) Acceptable corrective measures include, but are not limited to,
48 installation of additional or longer tie bars.
- 49 d. Expansion Joints

- 1) Install expansion joints perpendicularly to the surface at the locations shown on the Drawings, or as approved by the City.
- 2) Use dowels for expansion joints with a thin film of grease or other approved de-bonding material with dowel caps on the lubricated end of each dowel bar.
- 3) Use the appropriate bar size, length, and spacing shown on the Drawings.
- 4) When the proposed pavement is adjacent to or around existing structures, install expansion joints along the entire length of an existing structure.
- 5) Joint Filler
 - a) Provide joint fillers that conform to the requirements under Materials and Source Quality Control.
 - b) Provide timber boards that are accurately notched to allow rebar to continue through the expansion joint as needed.
 - c) Extend joint filler past or slightly below the bottom of concrete slab.
 - d) Use timber boards that span the length of the pavement width. Take care to ensure the timber board does not break, crack, or shift during concrete placement.
 - e) If the timber boards cracks, breaks, or shifts, remove and replace the adjacent pavement panels and reconstruct the pavement with a compliant timber board at no cost to the City.
- e. Curb Joints
 - 1) Provide joints in the curb of the same type and location as the adjacent pavement.
 - 2) Extend expansion joints through the curb.
 - 3) Extend sawed joints through the curb.
 - 4) Construct curb joints at all transverse pavement joints.
 - 5) For non-monolithic curbs, drill and epoxy tie bars as specified in the Drawings.
- f. Sawing Joints
 - 1) Joints to be sawed into concrete as soon as can be accomplished without damage to the pavement within 24 hours of concrete pavement placement as shown on Drawings.
 - 2) Saw joints to the depth and spacing shown on the Drawings.
 - 3) Use a chalk line, stringline, saw template, or other approved method to provide a true joint alignment.
- g. Joint Sealing
 - 1) See Section 32 13 73.
5. Concrete Placement
 - a. General
 - 1) Use a slip-form paving machine. Hand paving is only permitted in areas such as intersections or other areas where use of paving machine is not practical.
 - 2) If hand-pouring does not produce the required consolidation and finishing results, take immediate action. The City may require corrective action that may include removal and replacement of concrete at no cost to the City.
 - a) Do not use rakes or vibrators to move concrete. Only use shovels or the augers on the spreader and paver to move the concrete.
 - 3) Do not allow the pavement edge to deviate from the established paving line by more than 1/2 inch at any point.

- 1 a) Consistency
- 2 4) Provide concrete with following consistency qualities:
- 3 a) Mortar clings to coarse aggregate
- 4 b) Aggregate does not segregate in concrete when transported to the place
- 5 of deposit
- 6 c) Concrete should flatten out at the center of the pile with edges standing
- 7 and not flowing when dropped directly from the discharge chute of the
- 8 mixer.
- 9 d) Concrete and mortar shows no free water when removed from the
- 10 mixer
- 11 e) Concrete to slide and not flow into place when transported in metal
- 12 chutes at an angle of 30 degrees with the horizontal
- 13 f) Surface of the finished concrete to be free from a surface film or
- 14 laitance
- 15 b. Honeycombing
- 16 1) Prevent honeycombing by taking special care placing and spading the
- 17 concrete against forms and joints.
- 18 2) The City may reject concrete with excessive voids and honeycombing on
- 19 the edge of the pavement. The City may request corrective action to be
- 20 taken that may include removal and replacement at no cost to the City
- 21 6. Consolidation
- 22 a. Consolidate all concrete by approved mechanical vibrators in accordance with
- 23 the requirements of this Section.
- 24 b. Ensure the vibrators don't dislodge or disturb the reinforcement.
- 25 c. Use hand-operated vibrators to consolidate concrete along forms, at all joints,
- 26 and in areas not accessible to the machine-mounted vibrators.
- 27 d. Do not operate machine-mounted vibrators while the paving equipment is
- 28 stationary.
- 29 7. Curb
- 30 a. Construct concrete curb in accordance with Section 32 16 13.
- 31 8. Spreading and Finishing
- 32 a. General
- 33 1) Finish concrete using approved finishing equipment per this specification.
- 34 2) If excessive surface slurry or bleeding occurs:
- 35 a) Do not finish concrete
- 36 b) Contact concrete supplier and review on-site conditions to verify too
- 37 much water is not being added to the concrete mix by the Contractor or
- 38 at the plant.
- 39 c) A fine mist of water may be used during dry conditions when approved
- 40 by the City and only when under City supervision.
- 41 3) Use minimal amount of water to maintain a moist surface.
- 42 4) Reduce misting if float or straightedge finishing operations result in an
- 43 excess amount of surface slurry.
- 44 5) Do not apply water from a nozzle or a garden-type hose.
- 45 6) Do not finish the concrete if there is free standing water on the surface of
- 46 the concrete. Wait until the water evaporates before finishing.
- 47 7) Hand finishing permitted only in intersections and areas inaccessible to a
- 48 finishing machine.

- 1 b. Quality Checks
- 2 1) Perform sufficient checks with a long-handled 10-foot or 15-foot
- 3 straightedge on fresh concrete to ensure the final surface is within the
- 4 tolerances specified in Ride Quality.
- 5 a) Verify there is not more than 1/16-inch variation between the
- 6 straightedge and the surface of the pavement.
- 7 b) Rework and refinish any surface not within the tolerance limits.
- 8 2) Edging
- 9 a) Tool all edges of slabs and all joints with an edger of the radius
- 10 specified in the Drawings.
- 11 b) All concrete work to be left smooth and true to lines.
- 12 9. Texturing
- 13 a. Complete final texturing using approved texturing equipment in accordance
- 14 with this Section.
- 15 10. Curing
- 16 a. Surface Moisture
- 17 1) Prevent surface drying of pavement before application of the curing
- 18 compound by means that may include water fogging/misting, wind screens,
- 19 and evaporation retardants. Obtain approval from the City before using any
- 20 of these methods.
- 21 2) If an evaporation retardant is approved, reapply as needed to maintain the
- 22 concrete surface in a moist condition until the curing compound is applied.
- 23 3) Do not use evaporation retardant as a finishing aid.
- 24 4) If there is pavement failure due to poor surface moisture, City may require
- 25 corrective action that could include removal and replacement at no cost to
- 26 the City.
- 27 b. A curing day is defined as a 24-hour period when either the temperature taken
- 28 in the shade away from artificial heat is above 50 degrees Fahrenheit for at least
- 29 19 hours or the surface temperature of the concrete is maintained above 40
- 30 degrees Fahrenheit for 24 hours.
- 31 c. Curing begins when the concrete curing compound or system has been applied.
- 32 d. Maintain and promptly repair damage to curing materials on exposed surfaces
- 33 of concrete pavement continuously for at least 3 curing days.
- 34 e. Ensure curing compound does not disintegrate, peel, or crack.
- 35 f. The City may reject the curing compound based on visual and odor inspection.
- 36 g. Application
- 37 1) Apply the curing compound in accordance with DMS-4650.
- 38 2) Manage finishing and texturing operations to ensure placement of curing
- 39 compound on a moist concrete surface relatively free of water.
- 40 3) Maintain curing compounds in a uniformly agitated condition free of
- 41 settlement before and during application.
- 42 4) Do not thin or dilute the curing compound.
- 43 5) Apply two coats of the curing compound.
- 44 6) Apply to damp concrete as a fine mist through atomizing nozzles, at a rate
- 45 of no more than 180 square feet per gallon, that covers entire surfaces
- 46 thoroughly and completely with a uniform film.
- 47 7) Coat sides of concrete slab after side forms are removed and earth is
- 48 banked against them.

1 h. Alternative Curing Methods

- 2 1) If an alternative curing method is preferred, submit a request to City with
3 all product data needed at least 72 hours prior to a concrete pour.
4 2) If the alternative method for curing does not produce desired results, cease
5 concrete paving activities and implement another method of curing.

6 11. Protection of Pavement and Opening to Traffic

7 a. Protection of Pavement

- 8 1) Erect and maintain barricades and other standard and approved devices,
9 excluding all vehicles and equipment from the newly placed pavement for
10 the periods specified.
11 2) Maintain an adequate supply of sheeting or other material to cover and
12 protect fresh concrete surface from weather damage. Apply as needed to
13 protect the pavement surface from weather.

14 b. Opening to Traffic

- 15 1) All traffic to be excluded from new concrete pavement for a minimum of
16 14 days.
17 2) Early Opening to Traffic
18 a) If traffic needs to be open earlier than 14 days post pavement activities,
19 use HES concrete.
20 b) Perform concrete cylinder breaks at 24 hours. If the compressive
21 strength is 3,200 psi or higher, pavement may be opened to traffic after
22 72 hours.
23 3) Emergency Opening to Traffic
24 a) Open the pavement to traffic under emergency conditions when
25 directed in writing by the City and the pavement is at least 72 hours
26 old.
27 b) Remove all obstructing materials, place stable material against the
28 pavement edges, and perform other work involved in providing for the
29 safety of traffic as required for emergency opening.

30 c. Clean and fill all joints prior to opening pavement to traffic.

31 12. Pavement Leaveouts

- 32 a. Provide pavement leaveouts as necessary for local traffic at locations specified
33 in the Drawings or as directed by the City.
34 b. Provide a suitable crossover connection for traffic movements based on a
35 location that is determined in the field by the City.

36 C. Batching Equipment

- 37 1. Batching equipment shall be in accordance with the requirements of Section 41 14
38 00.

39 **3.5. REPAIR**

40 A. Repair concrete pavement in accordance with 32 01 29.

41 B. Repair the following items to remain at no cost to the City if any damage is caused due
42 to concrete paving activities:

- 43 1. Adjacent concrete or asphalt pavement to remain
44 2. Adjacent sidewalk to remain
45 3. Adjacent curb or curb and gutter to remain

- 1 4. Subgrade or base material
- 2 5. Utility pipe
- 3 6. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe.
- 4 7. Landscape beds or planters
- 5 8. Sod
- 6 9. Decorative hardscape or landscape features
- 7 10. Retaining walls

8 **3.6. RE-INSTALLATION [NOT USED]**

9 **3.7. SITE QUALITY CONTROL**

10 A. Verification Testing

- 11 1. General:
 - 12 a. At the request of the City, the Contractor is to perform additional testing to
 - 13 verify compliance, or the City may perform verification testing utilizing a third-
 - 14 party testing laboratory.
 - 15 b. The City may request verification testing at any time if production is suspected
 - 16 to be non-conforming.
 - 17 c. Verification testing will be performed in accordance with ASTM C42.
 - 18 d. Verification testing will be performed by the Contractor at no cost to the City.
- 19 2. Concrete Mix Design and Verification
 - 20 a. Perform required tests specified under Section 03 00 00 and provide testing and
 - 21 evaluation reports.
 - 22 b. Any concrete installed using a non-conforming mix design will be subject to
 - 23 removal and replacement at no cost to the City.
- 24 3. Concrete Production Acceptance
 - 25 a. During production and placement of concrete, perform testing to verify the
 - 26 concrete is in conformance with the requirements in Section 03 00 00 for the
 - 27 admixtures, mix design, slump, and compressive strength.
 - 28 b. Aggregate Moisture Testing
 - 29 1) In accordance with Section 32 05 16.
- 30 4. Concrete Placement Acceptance
 - 31 a. Perform required tests specified under Section 03 00 00 and provide testing and
 - 32 evaluation reports.
 - 33 b. If concrete is suspected of having foreign material, City may reject at any time
 - 34 and the concrete may be removed and replaced at no cost to the City.
 - 35 c. Acceptance will be based on attaining the strength and the fresh concrete tests
 - 36 in accordance with Section 03 00 00.

37 B. Class P1, P2, and HES Pavement Thickness Test

- 38 1. Sampling
 - 39 a. Perform strength testing for all projects containing more than 60 cubic yards of
 - 40 concrete.
 - 41 b. Obtain pavement cores in accordance with Tex-424-A. Check the pavement
 - 42 thickness in accordance with Tex-423-A.

- 1 c. Collect pavement cores every 500 feet at the center of each concrete paving
- 2 run. If lanes are paved separately, collect a pavement core at the center of each
- 3 set of paved lanes.
- 4 d. For hand poured concrete collect pavement cores every 250 feet.
- 5 e. Fill core holes using an approved concrete mixture and method.
- 6 2. Acceptance
- 7 a. The Contractor will not be paid over the contract unit price for any pavement
- 8 that is thicker than what is specified in the Drawings.
- 9 b. For pavement thickness deficiencies greater than 0.2 inches but less than 0.5-
- 10 inches less than the thickness designated on the Drawings:
- 11 1) Obtain additional cores every 150 feet at locations designated by the City.
- 12 2) Additional cores may be requested by the City if the pavement is suspected
- 13 to be deficient.
- 14 3) Obtain cores until the variation between the thickness designated on the
- 15 Drawings is less than 0.2-inches.
- 16 4) For deficit concrete limit:
- 17 a) Remove limits of deficient concrete and replace at no cost to the City,
- 18 or
- 19 b) Concrete to remain and City will pay the Contractor 50 percent of the
- 20 unit price of concrete specified in the bid documents.
- 21 c. For pavement thickness deficiencies greater than 0.5 inches less than the
- 22 thickness designated on the Drawings:
- 23 1) Remove and replace deficient concrete at no cost to the City.
- 24 C. Class P1, P2, and HES Concrete Ride Quality
- 25 1. General
- 26 a. Provide a pavement to have a finished grade smooth and true to the established
- 27 line, grade, and cross-section.
- 28 b. Ride quality will be measured parallel (longitudinal) and perpendicular
- 29 (transverse) to the centerline of the roadway for pavement surfaces.
- 30 2. Profile Measurements
- 31 a. Use a 10-foot straightedge to perform ride quality tests or a high-speed or
- 32 lightweight inertial profiler certified at the Texas A&M Transportation
- 33 Institute.
- 34 1) If using an inertial profiler, provide equipment certification documentation,
- 35 display a current decal on the equipment indicating the certification
- 36 expiration date, and use a certified profiler operator from TxDOT's
- 37 Material Producer List.
- 38 2) Use an inertial profiler when requested by the City.
- 39 3) Provide documentation of the profiles when requested by the City.
- 40 b. Perform tests daily throughout the duration of the project.
- 41 c. Perform tests on the finished surface of the completed project or at the
- 42 completion of a major stage of construction as approved.
- 43 d. Perform testing during off-peak traffic flow. Operate the inertial profiler in a
- 44 manner that does not disrupt traffic flow as directed.
- 45 e. When measuring the ride quality on a surface open to traffic, use a moving
- 46 traffic control plan in accordance with Part 6 of the TMUTCD and the
- 47 Drawings.
- 48 3. Acceptance Plan

- 1 a. General
- 2 1) Evaluate longitudinal and transverse profiles to verify not more than 1/8-
- 3 inch variation between any 2 contacts.
- 4 2) Perform corrective action on surface areas that have more than 1/8-inch
- 5 variation between any 2 contacts.
- 6 b. Localized Roughness
- 7 1) Determine areas of localized roughness using the individual profile from
- 8 each wheel path.
- 9 2) Use a 10-foot straightedge to locate areas that have more than 1/8-inch
- 10 variation between any 2 contacts on the straightedge.
- 11 3) The City may waive localized roughness requirements for deficiencies
- 12 resulting from manholes or other similar appurtenances near the wheel
- 13 paths.
- 14 c. Corrective Action
- 15 1) Use diamond grinding to correct variations in the pavement surface or
- 16 localized roughness.
- 17 2) Reprofile the corrected area and provide results indicating the corrective
- 18 action was successful.
- 19 3) After making corrections, reprofile the pavement section to verify
- 20 corrections have produced the required improvements.
- 21 4) If corrective action does not produce the required improvement, the City
- 22 may require:
- 23 a) Continued corrective action, or
- 24 b) Removal and replacement of area at no cost to the City. The City may
- 25 negotiate a reduced payment amount for the defective area to remain in
- 26 place.
- 27 D. Non-Conforming Work
- 28 1. General
- 29 a. The City may at any time reject a material if it is found to be non-conforming to
- 30 this specification.
- 31 b. The City may require the Contractor at any time to remove and replace installed
- 32 Concrete Pavement if any material it was made with is found to be non-
- 33 conforming. This would be at no cost to the City.
- 34 c. Any rejection of materials or source locations will be at no cost to the City.
- 35 2. Aggregates
- 36 a. Aggregates that fail to meet the requirements of Section 32 05 16 will be
- 37 rejected by the City.
- 38 3. Concrete Mix Design and Production Materials
- 39 a. The City may reject the mix design if it does not conform to the requirements
- 40 of this specification and section 03 00 00.
- 41 b. Any concrete installed using a non-conforming mix design will be subject to
- 42 removal and replacement at no cost to the City.
- 43 c. The City may perform verification testing on all materials verify the
- 44 conformance of the mixture.

- 1 **3.8. SYSTEM STARTUP [NOT USED]**
- 2 **3.9. ADJUSTING [NOT USED]**
- 3 **3.10. CLEANING [NOT USED]**
- 4 **3.11. CLOSEOUT ACTIVITIES [NOT USED]**
- 5 **3.12. PROTECTION [NOT USED]**
- 6 **3.13. MAINTENANCE [NOT USED]**
- 7

1 **3.14. ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 32 13 16**
2 **DECORATIVE CONCRETE PAVING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Material requirements and construction methods for Decorative Concrete Pavement

7 B. Deviations from this City of Denton Standard Specification:

- 8 1. None.

9 C. Related Specification Sections include but are not limited to:

- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
11 Contract.
12 2. Division 1 - General Requirements.
13 3. Section 03 00 00 – Concrete and Concrete Reinforcing.
14 4. Section 32 13 13 – Concrete Paving.
15 5. Section 32 16 00 – Curbs, Gutters, Sidewalks, and Driveways.
16 6. Section 32 84 00 – Irrigation Installation and Repair.
17 7. Section 32 93 00 – Plantings.

18 **1.2 PRICE AND PAYMENT PROCEDURES**

19 A. Measurement and Payment

20 1. Decorative Concrete

21 a. Measurement

- 22 1) Measured per square yard of Decorative Concrete installed.

23 b. Payment

- 24 1) The work performed and materials furnished in accordance with this item
25 and measured as provided under “Measurement” will be paid for at the unit
26 price bid per square yard for Decorative Concrete Pavement installed for:
27 a) Various depths

28 c. The price bid shall include:

- 29 1) Furnishing and installing Decorative Concrete as specified by the Drawings
30 1) Shaping and fine grading the placement area
31 2) Water
32 3) Loading
33 4) Unloading
34 5) Storing
35 6) Hauling
36 7) Disposal of excess materials
37 8) Testing and trial batches
38 9) Materials and work needed for any corrective action
39 10) All costs associated with obtaining and submitting the required action and
40 informational submittals.

- 11) Concrete, aggregate, supplementary cementing materials, and additives
- 12) Stamps and color
- 13) Mixing, placing, and finishing
- 14) Curing and curing compounds
- 15) Reinforcing steel and chairs
- 16) All reinforcing and materials required for joints
- 17) Joint sealant
- 18) Removal and/or sweeping excess material
- 19) Tools, equipment, and labor and incidentals needed to execute work

1.3 REFERENCES

A. Reference Standards

- 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
- 2. American Society for Testing and Materials (ASTM):
 - a. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - b. C979, Standard Specification for Pigments for Integrally Colored Concrete.
 - c. C1315 Type 1, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-Hardscape and Landscape Meeting

- 1. Prior to installing decorative concrete (hardscape) and landscape, conduct a meeting. Invite the City and their appropriate representatives. Prior to the meeting, the following need to be prepared or approved:
 - a. Product Data and Concrete Mix Design in accordance with this Section
 - b. Mock sample in accordance with this Section
 - c. Paving Plan
 - 1) Jointing locations
 - 2) Paving Schedule
 - d. All irrigation and planting requirements in accordance with Sections 32 84 00 and 32 93 00.

1.5 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00.

B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Shop Drawing

- 1. Concrete Mix Design
 - a. In accordance with Section 03 00 00
- 2. Product Data
 - a. Provide electronic product data from each manufacturer supplying stamps, color, antiquing releases, and curing compounds Provide the following data for all product data sheets:

- 1) Manufacturer name
- 2) Date
- 3) Material description
- b. Data and test results as specified in this Section
 - 1) Material Safety Data Sheets (if applicable, required for Epoxy and Curing Compounds)
 - 2) Stamp pattern and size
 - 3) Integral color shade name and number
 - 4) Dosage recommendations
 - 5) Manufacturer recommended storing data (if applicable)
 - 6) Application recommendations (if applicable)
 - 7) Manufacturer's recommended storage and handling instructions
 - 8) Manufacturer's curing and sealing recommendations.
3. Integral Color Concrete Mix Design
 - a. Provide concrete mix design that in accordance with the requirements of Section 03 00 00.

B. Samples

1. Provide 3-foot by 3-foot square mock-up 4-inches thick of the integral stamped and stained concrete of selected color and stamp pattern with specified releasing agents at the site for review by City.
 - a. If the sample is not satisfactory, City may request up to 3 additional samples to be prepared.
 - b. Leave sample on-site until decorative concrete has been completed.
 - c. Remove sample within 72 hours after decorative concrete activities have been completed.

C. Information Submittals:

1. Source Locations
 - a. Location of all material sources
2. Testing and Evaluation Reports
 - a. Provide test results required in accordance with this Section and any other related Sections.
3. Equipment Submittals
 - a. Submittal for all major equipment to include:
 - 1) Equipment name
 - 2) Size
 - 3) Intended use

1.7 CLOSEOUT SUBMITTALS

A. Test and Evaluation Reports

1. All test reports generated during testing.

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

- 1 1. Secure and maintain a location to store the material in accordance with Section 01
2 66 00.

3 **1.11 FIELD CONDITIONS**

- 4 A. Refer to Section 32 13 13 for field condition requirements.

5 **1.12 WARRANTY [NOT USED]**

6 **PART 2 - PRODUCTS**

7 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

8 **2.2 MATERIALS**

9 A. Concrete Production and Placement Materials

- 10 1. Refer to the following Sections based on uses:
11 a. Roadway Paving and Crosswalks - Section 32 13 13
12 b. Sidewalks or Driveways – Section 32 16 00
13 c. General Concrete and Concrete Reinforcing – Section 03 00 00

14 B. Integral Color

- 15 1. Provide integrally colored concrete. Do not use surface stains or dyes to color the
16 concrete unless otherwise approved by the City or specified in the Drawings.
17 2. Use non-fading synthetic iron oxide pigments with resistance to ultraviolet
18 radiation.
19 3. Provide pigments for colored concrete in accordance with ASTM C979.
20 4. Add integral concrete colorant according to manufacturer's instructions. Provide a
21 copy of manufacturer instructions to City in accordance with this Section.
22 5. Provide SCOFIELD Integral Colors SG or approved equal.
23 a. Provide the following approved colors in the designated locations unless
24 otherwise specified in the Drawings or by the City:
25 1) Median Areas:
26 a) SCOFIELD Integral Color SG: Red Brick or approved equal
27 b) SCOFIELD LITHOTEX Antiquing Release Pro: A-24, Russet
28 2) Other locations:
29 a) Integral color and antiquing release in accordance with the Drawings

30 C. Curing Compound

- 31 1. Use SCOFIELD Cureseal-W Concrete Curing Compound and Sealer or approved
32 equal.
33 a. Any approved equal needs to be clear with a low-gloss finish that complies
34 with ASTM C309 and ASTM C1315 Type 1 requirements for liquid membrane
35 forming compounds.
36 b. Provide product data in accordance with this Section.
37 2. No other curing methods will be allowed.

38 D. Admixtures

- 39 1. Furnish admixtures designed for use with and compatible with colored concrete
40 pigments.

1 2. Do not use calcium chloride or other admixtures containing chlorides.

2 E. Decorative Concrete Mix Design

3 1. Concrete Classes

- 4 a. Provide concrete in accordance with the requirements of Section 03 00 00 for
5 the designated concrete class specified in the Drawings.
6 b. If no class is specified, provide decorative concrete based on the following
7 uses:
8 1) Roadway Paving and Crosswalks - Class P1, P2, HES, or as specified in the
9 Drawings.
10 2) Sidewalks or Driveways – Use Class A or the concrete specified in the
11 Drawings.
12 c. Mix Design Options: No variations or substitutions will be approved for
13 cementitious material, slump, additives, or mix design options. Conform to all
14 requirements in Section 03 00 00 unless otherwise specified in this Section or
15 in the Drawings.

16 2. Decorative Concrete Mix Design

- 17 a. Provide the amount of color to be added to the concrete during production with
18 the concrete mix design. Provide a concrete mix design that conforms to the
19 requirements of Section 03 00 00.
20 b. Obtain City approval for colored concrete mixes before placing decorative
21 concrete.
22 c. Maintain mix characteristics for colored concrete requiring a matching finish.
23 d. Use the same source, brand, type, and color of Portland cement, supplementary
24 cementitious materials, aggregates, and admixtures for colored concrete
25 throughout the project.
26 e. Use constant cement content, supplementary cementitious material content, and
27 water/cementitious materials ratio to maintain consistent color.

28 3. Trail Batches

- 29 a. The contractor may use preliminary laboratory or field trial batching to
30 establish the mix proportions necessary to conform to the contract-required
31 color.
32 b. Provide samples in accordance with Action Submittals and discuss during the
33 Pre-Hardscape and Landscape Meeting
34 1) Produce samples using the same workers and materials designated to
35 perform the contract work.
36 c. Produce at least 2 cubic yards of the colored concrete to make the sample.
37 d. Submit the final mix design including color after the City has approved the
38 decorative concrete sample.

39 **2.3 ACCESSORIES [NOT USED]**

40 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

41 **PART 3 - EXECUTION**

1 **3.1 INSTALLERS [NOT USED]**

2 **3.2 EXAMINATION [NOT USED]**

3

4 **3.3 PREPARATION**

5 A. In accordance with preparation requirements in Section 32 13 13.

6 **3.4 DECORATIVE CONCRETE PLACEMENT**

7 A. Imprinting Tools

8 1. Stamped Concrete

9 a. Use SCOFIELD stamp tools or approved equal to install the stamp pattern
10 designated on the Drawings or by the City.

11 b. Any approved equal tool needs to provide the texture, stamp, and finish that is
12 specified in the Drawings. If the required affect is not produced by the tools
13 provided, as determined by City, stop work immediately, identify the problem,
14 and supply different tools capable of producing the texture, stamp, and finish
15 specified.

16 c. Provide the following approved patterns in the designated locations:

17 1) Median Areas:

18 a) Pattern: New Brick – Running Bond (SCOFIELD LITHOTEX
19 Pavecrafters)

20 2. If specified texture is baker’s broom or tining, provide tools and equipment

21 a. in accordance with requirements for P1, P2, and HES concrete in Section 32 13
22 13 for any decorative concrete that will be used by vehicular traffic.

23 b. in accordance with requirements for sidewalks and driveways in Section 32 16
24 00 for any decorative concrete that will be used in medians, sidewalks, or
25 driveways.

26 B. Concrete Placement

27 1. In accordance with the requirements for P1, P2, and HES concrete in Section 32 13
28 13 for any decorative concrete used by vehicular traffic.

29 2. In accordance with the requirements for sidewalks and driveways in Section 32 16
30 00 for any decorative concrete used in medians, sidewalks, or driveways.

31 3. The following additions to Section 32 13 13 apply:

32 a. Schedule placement to minimize exposure to rapid drying conditions, wind, and
33 full sun, before applying curing compound.

34 b. Do not place colored concrete if rain, snow, or freezing temperatures are
35 forecast within 24-hours.

36 c. Cover or otherwise protect adjacent concrete work from discoloration and
37 spillage while placing and curing colored concrete.

38 d. Remove and replace discolored concrete as directed by the City.

39 C. Spreading and Finishing

40 1. In accordance with the requirements for P1, P2, and HES concrete in Section 32 13
41 13 for any decorative concrete that will be used by vehicular traffic.

- 1 2. In accordance with the requirements for sidewalks and driveways in Section 32 16
- 2 00 for any decorative concrete that will be used in medians, sidewalks, or
- 3 driveways.
- 4 3. The following additions to Section 32 13 13 apply:
- 5 a. Perform finishing operations consistently to avoid color variation.
- 6 b. Do not begin finishing while bleed water is present.
- 7 c. City will order removal and replacement of colored concrete if the contractor
- 8 adds water to the surface to aid in finishing.
- 9 d. Apply strokes in the same direction during final finishing and texturing.

10 D. Texturing

- 11 1. Reference Drawings for location of texturing and stamping used for decorative
- 12 concrete.
- 13 2. If the decorative concrete requires a baker's broom or tining:
- 14 a. In accordance with the requirements for P1, P2, and HES concrete in Section
- 15 32 13 13 for any decorative concrete that will be used by vehicular traffic.
- 16 b. In accordance with the requirements for sidewalks and driveways in Section 32
- 17 16 00 for any decorative concrete that will be used in medians, sidewalks, or
- 18 driveways.
- 19 3. If the decorative concrete requires a stamp pattern:
- 20 a. Apply the stamp pattern using approved tools that produce the texture, stamp,
- 21 and finish specified in the Drawings.
- 22 b. If the required affect is not produced by the tools provided, stop work
- 23 immediately, identify the problem, and supply different tools capable of
- 24 producing the texture, stamp, and finish specified.
- 25 c. Use the manufacturer's recommendation for:
- 26 1) Using release agents
- 27 a) Approved release agents include:
- 28 (1) Designated antiquing release: Follow the manufacturer's
- 29 instructions when using an antiquing release and stamping.
- 30 (2) LITHOTEX Liquid Release
- 31 (3) SCOFIELD Liquid Release SG
- 32 (4) Or approved equal
- 33 2) Antiquing agents
- 34 3) Aligning, placing, and removing the tools
- 35 4) Any other manufacturer requirements or recommendations not listed.

36 E. Curing

- 37 1. Apply approved curing compound in accordance with manufacturer's
- 38 recommendations.
- 39 2. Protect colored concrete from premature drying and excessive cold or hot
- 40 temperatures by promptly applying curing compound.
- 41 a. Do not allow plastic sheeting to come in contact with colored concrete.

42 F. Protection of Pavement and Opening to Traffic

- 43 1. In accordance with the requirements in Section 32 13 13.
- 44 2. Follow manufacturer's recommendations for allowing traffic onto decorative
- 45 concrete.

3. If traffic is allowed onto decorative concrete prior to sealing, patch and touch-up any chips in the decorative concrete.
4. Where possible, finish placing, stamping, and sealing large sections of decorative concrete before opening to traffic.

3.5 REPAIR

- A. In accordance with Section 32 01 29.
- B. Repair the following items to remain at no cost to the City if any damage is caused due to decorative concrete paving activities:
 1. Adjacent concrete or asphalt pavement
 2. Adjacent sidewalk
 3. Adjacent curb or curb and gutter
 4. Subgrade or base material
 5. Utility pipe
 6. Irrigation systems including but not limited to sprinkler heads, conduit, and pipe.
 7. Landscape beds or planters
 8. Sod
 9. Decorative hardscape or landscape features
 10. Retaining walls

3.6 RE-INSTALLATION [NOT USED]

3.7 SITE QUALITY CONTROL

- A. Tests and Inspections
 1. Perform all testing in accordance with Sections 01 45 23, 03 00 00, and 32 13 13.
- B. Non-Conforming Work
 1. Decorative Concrete Production Acceptance
 - a. Produce consistently colored concrete.
 - b. Any concrete that has visible variations in color, texture, or stamp pattern will be subject to removal and replacement at no cost to the City

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 32 13 73**
2 **CONCRETE PAVING JOINT SEALANTS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Sealants for Concrete Joints.

7 B. Deviations from this City of Denton Standard Specification:

- 8 1. None.

9 C. Related Specification Sections include but are not limited to:

- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
11 Contract.
12 2. Division 1 - General Requirements.

13 **1.2 PRICE AND PAYMENT PROCEDURES**

- 14 A. Joint sealant materials, equipment, tools, and incidentals will not be measured or paid
15 for directly. All items included with the testing and furnishing of joint sealants are
16 subsidiary to other pertinent items.

17 **1.3 REFERENCES**

18 A. Reference Standards

- 19 1. Reference standards cited in this Section refer to the current reference standard
20 published at the time of the latest revision date logged at the end of this Section
21 unless a date is specifically cited.
22 2. American Society for Testing and Materials (ASTM):
23 a. ASTM D5249 – Standard Specification for Backer Material for Use with Cold
24 and Hot Applied Joint Sealants in Portland-Cement Concrete and Asphalt
25 Joints.
26 3. TxDOT Standards:
27 a. DMS-6310 – Joint Sealants and Seals.

28 **1.4 SUBMITTALS**

- 29 A. Submittals shall be in accordance with Section 01 33 00.
30 B. All submittals shall be approved by the City prior to delivery.

31 **1.5 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

32 A. Product Data

- 33 1. Provide electronic product data from each manufacturer that is supplying concrete
34 joint sealants to be used on the project.
35 2. Product data sheets will include:
36 a. Manufacturer name

- 1 b. Date
- 2 c. Material description
- 3 d. Point of delivery
- 4 e. Produce data and test results in accordance with this Section
- 5 f. Material Safety Data Sheets, if applicable, required for PCE and all additives
- 6 g. Manufacturer Recommended Storing Data, if applicable
- 7 h. Application Recommendations, if applicable
- 8 i. Liquid Antistripping Agent Specific Data:
 - 9 1) Specific gravity of the agent at the manufacturer's recommended addition
 - 10 temperature
 - 11 2) Manufacturer's recommended dosage range
 - 12 3) Manufacturer's Recommended Storage and Handling instructions

13 **1.6 CLOSEOUT SUBMITTALS [NOT USED]**

14 **1.7 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

15 **1.8 QUALITY ASSURANCE [NOT USED]**

16 **1.9 DELIVERY, STORAGE, AND HANDLING**

17 A. Storage and Handling Requirements

- 18 1. Secure and maintain a location to store the material in accordance with Section 01
- 19 66 00.

- 20 B. Keep the material stored in a clean condition at all times to prevent contamination with
- 21 foreign matter.

- 22 C. Follow any manufacturer recommendations for delivery, storage, and handling.

23 **1.10 FIELD CONDITIONS**

24 A. Ambient Conditions

- 25 1. In accordance with manufacturer's recommendations.

26 **1.11 WARRANTY [NOT USED]**

27 **PART 2 - PRODUCTS**

28 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

29 **2.2 MATERIALS**

30 A. Joint Sealant

- 31 1. Provide joint sealants in accordance with DMS-6310 types 4, 5, 7, or 8 unless
- 32 otherwise specified in the Drawings or as directed by the City.

33 B. Backer Rod

- 34 1. Provide heat resistant backer rods conforming to ASTM D5249. The preferred
- 35 product is CERA-ROD by W.R. Meadows or approved equal.

- 1 2. The Contractor may request to use an alternative backer rod product in writing. If
- 2 requesting an alternative material, the alternative backer rod must comply with the
- 3 following:
- 4 a. The backer rod must not react with or bond to the sealant and must meet the
- 5 requirements of the sealant manufacturer.
- 6 b. Provide a backer rod with a diameter of at least 25 percent larger than the joint
- 7 reservoir width.
- 8 c. Backer rod materials must include closed-cell resilient foam; sponge rubber
- 9 stock of vinyl, butyl, or neoprene; and polyethylene or polyurethane. Backer
- 10 rods must also be flexible, lightweight, non-staining, heat-resistant, chemical-
- 11 resistant, ultraviolet-stable, non-absorbent, low density, and compressible foam.

12 **2.3 ACCESSORIES [NOT USED]**

13 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

14 **PART 3 - EXECUTION**

15 **3.1 EQUIPMENT**

16 **A. Condition of Equipment**

- 17 1. Provide equipment in good repair and operating condition.
- 18 2. The condition is subject to the approval of the City.
- 19 3. If the equipment is found to be insufficient, the Contractor is responsible for
- 20 replacing the non-conforming equipment with conforming equipment at no cost to
- 21 the City.
- 22 4. Any sealant installed using non-conforming equipment is subject to removal and
- 23 replacement at no cost to the City.

24 **3.2 EXAMINATION [NOT USED]**

25 **3.3 PREPARATION**

- 26 A. Make a groove along the cracks to be sealed and rout the groove approximately 1/2-
- 27 inch-deep and 5/8-inch-wide, unless otherwise specified in the Drawings or directed by
- 28 the City.
- 29 B. Remove all foreign material from the joint or groove reservoir.
- 30 C. Clean the joint by sandblasting or other approved methods. If directed, saw joint sides
- 31 to remove embedded foreign material in the concrete not removed by sandblasting.
- 32 D. Do not place sealant in a wet or damp joint or groove. Use approved drying method if
- 33 joints or grooves are sealed within 24 hours of rain.
- 34 E. Apply primer when required by the sealant manufacturer. Blow out joint or groove with
- 35 high pressure air or other approved methods before placing sealant.

36 **3.4 INSTALLATION**

- 37 A. After the joint is prepped, install sealant material. See Table 1 for different types of
- 38 joints and sealants to be used.

- 1 B. Install joint sealant per manufacturer's recommendations. If backer rods are required,
- 2 install backer rods and sealant in accordance with the manufacturer's recommendations
- 3 and this Section.
- 4

- 1 C. Backer Rods:
- 2 1. Install backer rod with a single-wheeled or three-wheeled roller, depending on
- 3 application.
- 4 2. Avoid stretching or puncturing the material.
- 5 3. Hold the backer rod in compression.
- 6 4. Provide a backer rod with a diameter 1/8 inch larger than the width of the joint for
- 7 joint widths up to 3/4 inch. For joints 3/4 inch and larger, add 1/4 inch to diameter
- 8 rod selection.
- 9 5. After backer rods are installed, apply sealants as necessary.
- 10 D. Remove and replace sealant when placed flush with or above the pavement surface.

Table 1
Types of Joints Requirements

Joint Type	Requirement
Transverse Contraction Joints	Backer Rods and Sealant
Longitudinal Contraction Joint	Sealant
Longitudinal Construction Joints	Sealant
Expansion Joints	Backer Rods and Sealant

- 13 E. Disposal of Materials:
- 14 1. Dispose of any excess material produced from cleaning of cracks.

- 15 **3.5 REPAIR [NOT USED]**
- 16 **3.6 RE-INSTALLATION [NOT USED]**
- 17 **3.7 FIELD QUALITY CONTROL [NOT USED]**
- 18 **3.8 SYSTEM STARTUP [NOT USED]**
- 19 **3.9 ADJUSTING [NOT USED]**
- 20 **3.10 CLEANING [NOT USED]**
- 21 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 22 **3.12 PROTECTION [NOT USED]**
- 23 **3.13 MAINTENANCE [NOT USED]**
- 24

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 32 16 00**
2 **CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Curbs
- 7 2. Gutters
- 8 3. Sidewalks
- 9 4. Curb Ramps
- 10 5. Driveways

11 B. Deviations from this City of Denton Standard Specification:

- 12 1. None.

13 C. Related Specification Sections include but are not limited to:

- 14 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
15 Contract.
- 16 2. Division 1 - General Requirements.
- 17 3. [Section 03 00 00 - Concrete and Concrete Reinforcing.](#)
- 18 4. [Section 32 12 16 – Asphalt Paving.](#)
- 19 5. [Section 32 13 13 – Concrete Paving.](#)

20 **1.2 PRICE AND PAYMENT PROCEDURES**

21 A. Measurement and Payment

- 22 1. Concrete Curb
 - 23 a. Measurement
 - 24 1) Measured per linear foot of Concrete Curb installed.
 - 25 b. Payment
 - 26 1) The work performed and materials furnished in accordance with this item
27 and measured as provided under “Measurement” will be paid for at the unit
28 price bid per linear foot for “Concrete Curb” installed.
 - 29 c. The price bid shall include:
 - 30 1) Furnishing and installing Concrete Curb as specified by the Drawings
 - 31 2) Shaping and fine grading the placement area
 - 32 3) Water
 - 33 4) Loading
 - 34 5) Unloading
 - 35 6) Storing
 - 36 7) Hauling
 - 37 8) Handling of materials
 - 38 9) Traffic control for all testing
 - 39 10) Trial batches (as needed)

- 1 11) Materials and work needed for any corrective action
- 2 12) Concrete
- 3 13) Aggregate
- 4 14) Supplementary cementing materials
- 5 15) Concrete additives
- 6 16) Mixing
- 7 17) Placement of concrete
- 8 18) Finishing of concrete
- 9 19) Curing and curing compounds
- 10 20) Sawing
- 11 21) Joint sealant
- 12 22) Reinforcing steel and reinforcement chairs
- 13 23) Disposal of excess material
- 14 24) Clean-up
- 15 2. Concrete Curb and Gutter
- 16 a. Measurement
- 17 1) Measured per linear foot of Concrete Curb and Gutter installed.
- 18 b. Payment
- 19 1) The work performed and materials furnished in accordance with this item
- 20 and measured as provided under "Measurement" will be paid for at the unit
- 21 price bid per linear foot for "Concrete Curb and Gutter" installed.
- 22 c. The price bid shall include:
- 23 1) Furnishing and installing Concrete Curb and Gutter as specified by the
- 24 Drawings
- 25 2) Shaping and fine grading the placement area
- 26 3) Water
- 27 4) Loading
- 28 5) Unloading
- 29 6) Storing
- 30 7) Hauling
- 31 8) Handling of materials
- 32 9) Traffic control for all testing
- 33 10) Trial batches (as needed)
- 34 11) Materials and work needed for any corrective action
- 35 12) Concrete
- 36 13) Aggregate
- 37 14) Supplementary cementing materials
- 38 15) Concrete additives
- 39 16) Mixing
- 40 17) Placement of concrete
- 41 18) Finishing of concrete
- 42 19) Curing and curing compounds
- 43 20) Sawing
- 44 21) Joint sealant
- 45 22) Reinforcing steel and reinforcement chairs
- 46 23) Disposal of excess material
- 47 24) Clean-up
- 48 3. Concrete Valley Gutter

- 1 a. Measurement
- 2 1) Measured per linear foot of Concrete Valley Gutter installed.
- 3 b. Payment
- 4 1) The work performed and materials furnished in accordance with this item
- 5 and measured as provided under “Measurement” will be paid for at the unit
- 6 price bid per linear foot for “Concrete Valley Gutter” installed.
- 7 c. The price bid shall include:
- 8 1) Furnishing and installing Concrete Valley Gutter as specified by the
- 9 Drawings
- 10 2) Excavation
- 11 3) Loading
- 12 4) Unloading
- 13 5) Hauling
- 14 6) Disposal of excess material
- 15 7) Furnishing, placement and compaction of backfill
- 16 8) Clean-up
- 17 4. Concrete Ribbon Curb
- 18 a. Measurement
- 19 1) Measured per linear foot of Concrete Ribbon Curb installed.
- 20 b. Payment
- 21 1) The work performed, and materials furnished in accordance with this item
- 22 and measured as provided under “Measurement” will be paid for at the unit
- 23 price bid per linear foot for “Concrete Ribbon Curb” installed.
- 24 c. The price bid shall include:
- 25 1) Furnishing and installing Concrete Ribbon Curb as specified by the
- 26 Drawings
- 27 2) Shaping and fine grading the placement area
- 28 3) Water
- 29 4) Loading
- 30 5) Unloading
- 31 6) Storing
- 32 7) Hauling
- 33 8) Handling of materials
- 34 9) Traffic control for all testing
- 35 10) Trial batches (as needed)
- 36 11) Materials and work needed for any corrective action
- 37 12) Concrete
- 38 13) Aggregate
- 39 14) Supplementary cementing materials
- 40 15) Concrete additives
- 41 16) Mixing
- 42 17) Placement of concrete
- 43 18) Finishing of concrete
- 44 19) Curing and curing compounds
- 45 20) Sawing
- 46 21) Joint sealant
- 47 22) Reinforcing steel and reinforcement chairs
- 48 23) Disposal of excess material
- 49 24) Clean-up

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- 5. Concrete Sidewalk
 - a. Measurement
 - 1) Measured per square yard of Concrete Sidewalk installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard for “Concrete Sidewalk” installed for:
 - a) Various depths.
 - c. The price bid shall include:
 - 1) Furnishing and installing Concrete Sidewalk as specified by the Drawings
 - 2) Shaping and fine grading the placement area
 - 3) Water
 - 4) Loading
 - 5) Unloading
 - 6) Storing
 - 7) Hauling
 - 8) Handling of materials
 - 9) Traffic control for all testing
 - 10) Trial batches (as needed)
 - 11) Materials and work needed for any corrective action
 - 12) Concrete
 - 13) Aggregate
 - 14) Supplementary cementing materials
 - 15) Concrete additives
 - 16) Mixing
 - 17) Placement of concrete
 - 18) Finishing of concrete
 - 19) Curing and curing compounds
 - 20) Sawing
 - 21) Joint sealant
 - 22) Reinforcing steel and reinforcement chairs
 - 23) Disposal of excess material
 - 24) Clean-up
- 6. Concrete Sidewalk with Curb
 - a. Measurement
 - 1) Measured per square yard of Concrete Sidewalk with Curb installed to the back of curb.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard for “Concrete Sidewalk with Curb” installed for:
 - a) Various depths.
 - c. The price bid shall include:
 - 1) Furnishing and installing Concrete Sidewalk with Curb as specified by the Drawings
 - 2) Shaping and fine grading the placement area

- 1 3) Water
- 2 4) Loading
- 3 5) Unloading
- 4 6) Storing
- 5 7) Hauling
- 6 8) Handling of materials
- 7 9) Traffic control for all testing
- 8 10) Trial batches (as needed)
- 9 11) Materials and work needed for any corrective action
- 10 12) Concrete
- 11 13) Aggregate
- 12 14) Supplementary cementing materials
- 13 15) Concrete additives
- 14 16) Mixing
- 15 17) Placement of concrete
- 16 18) Finishing of concrete
- 17 19) Curing and curing compounds
- 18 20) Sawing
- 19 21) Joint sealant
- 20 22) Reinforcing steel and reinforcement chairs
- 21 23) Disposal of excess material
- 22 24) Clean-up
- 23 7. Concrete Sidewalk with Retaining Wall
- 24 a. Measurement
- 25 1) Measured per square yard of Concrete Sidewalk installed to the face of
- 26 Retaining Wall.
- 27 2) Retaining Wall portion will be measured and paid for under [Section 32 32](#)
- 28 [13.](#)
- 29 b. Payment
- 30 1) The work performed and materials furnished in accordance with this item
- 31 and measured as provided under “Measurement” will be paid for at the unit
- 32 price bid per square yard for “Concrete Sidewalk” installed for:
- 33 a) Various depths.
- 34 c. The price bid shall include:
- 35 1) Furnishing and installing Concrete Sidewalk with Retaining Wall as
- 36 specified by the Drawings
- 37 2) Shaping and fine grading the placement area
- 38 3) Water
- 39 4) Loading
- 40 5) Unloading
- 41 6) Storing
- 42 7) Hauling
- 43 8) Handling of materials
- 44 9) Traffic control for all testing
- 45 10) Trial batches (as needed)
- 46 11) Materials and work needed for any corrective action
- 47 12) Concrete
- 48 13) Aggregate
- 49 14) Supplementary cementing materials

- 1 15) Concrete additives
- 2 16) Mixing
- 3 17) Placement of concrete
- 4 18) Finishing of concrete
- 5 19) Curing and curing compounds
- 6 20) Sawing
- 7 21) Joint sealant
- 8 22) Reinforcing steel and reinforcement chairs
- 9 23) Disposal of excess material
- 10 24) Clean-up
- 11 8. Curb Ramp
- 12 a. Measurement
- 13 1) Measured by Each of Curb Ramp installed.
- 14 b. Payment
- 15 1) The work performed, and materials furnished in accordance with this item
- 16 and measured as provided under "Measurement" will be paid for at the unit
- 17 price bid per each for "Curb Ramp" installed for:
- 18 a) Type specified.
- 19 c. The price bid shall include:
- 20 1) Furnishing and installing Curb Ramp as specified by the Drawings
- 21 2) Shaping and fine grading the placement area
- 22 3) Water
- 23 4) Loading
- 24 5) Unloading
- 25 6) Storing
- 26 7) Hauling
- 27 8) Handling of materials
- 28 9) Traffic control for all testing
- 29 10) Trial batches (as needed)
- 30 11) Materials and work needed for any corrective action
- 31 12) Concrete
- 32 13) Aggregate
- 33 14) Supplementary cementing materials
- 34 15) Concrete additives
- 35 16) Mixing
- 36 17) Placement of concrete
- 37 18) Finishing of concrete
- 38 19) Curing and curing compounds
- 39 20) Sawing
- 40 21) Joint sealant
- 41 22) Reinforcing steel and reinforcement chairs
- 42 23) Disposal of excess material
- 43 24) Clean-up
- 44 25) Landing and detectable warning surface as shown on the Drawings
- 45 26) Adjacent flares or side curb
- 46 9. Driveway Approach
- 47 a. Measurement
- 48 1) Measured per square yard of Driveway Approach installed.

- 1 b. Payment
- 2 1) The work performed and materials furnished in accordance with this item
- 3 and measured as provided under “Measurement” will be paid for at the unit
- 4 price bid per square yard for “Driveway Approach” installed for:
- 5 a) Various types.
- 6 b) Various depths.
- 7 c. The price bid shall include:
- 8 1) Furnishing and installing Driveway Approach as specified by the Drawings
- 9 2) Shaping and fine grading the placement area
- 10 3) Water
- 11 4) Loading
- 12 5) Unloading
- 13 6) Storing
- 14 7) Hauling
- 15 8) Handling of materials
- 16 9) Traffic control for all testing
- 17 10) Trial batches (as needed)
- 18 11) Materials and work needed for any corrective action
- 19 12) Concrete
- 20 13) Aggregate
- 21 14) Supplementary cementing materials
- 22 15) Concrete additives
- 23 16) Mixing
- 24 17) Placement of concrete
- 25 18) Finishing of concrete
- 26 19) Curing and curing compounds
- 27 20) Sawing
- 28 21) Joint sealant
- 29 22) Reinforcing steel and reinforcement chairs
- 30 23) Disposal of excess material
- 31 24) Clean-up
- 32 10. Driveway
- 33 a. Measurement
- 34 1) Measured per square yard of Driveway installed.
- 35 b. Payment
- 36 1) The work performed and materials furnished in accordance with this item
- 37 and measured as provided under “Measurement” will be paid for at the unit
- 38 price bid per square yard for “Driveway” installed for:
- 39 a) Various types.
- 40 b) Various depths.
- 41 c. The price bid shall include:
- 42 1) Furnishing and installing Driveway as specified by the Drawings
- 43 2) Shaping and fine grading the placement area
- 44 3) Water
- 45 4) Loading
- 46 5) Unloading
- 47 6) Storing
- 48 7) Hauling
- 49 8) Handling of materials

- 1 9) Traffic control for all testing
- 2 10) Trial batches (as needed)
- 3 11) Materials and work needed for any corrective action
- 4 12) Concrete
- 5 13) Aggregate
- 6 14) Supplementary cementing materials
- 7 15) Concrete additives
- 8 16) Mixing
- 9 17) Placement of concrete
- 10 18) Finishing of concrete
- 11 19) Curing and curing compounds
- 12 20) Sawing
- 13 21) Joint sealant
- 14 22) Reinforcing steel and reinforcement chairs
- 15 23) Disposal of excess material
- 16 24) Clean-up
- 17 11. Detectable Warning Surface
- 18 a. Measurement
- 19 1) Measured by Each of Detectable Warning Surface (Pavers or
- 20 Plastic/Fiberglass) installed.
- 21 b. Payment
- 22 1) The work performed, and materials furnished in accordance with this item
- 23 and measured as provided under “Measurement” will be paid for at the unit
- 24 price bid per each for “Detectable Warning Surface” installed for:
- 25 a) Type specified.
- 26 c. The price bid shall include:
- 27 1) Furnishing and installing Detectable Warning Surface as specified by the
- 28 Drawings
- 29 2) Cleaning, shaping and/or fine grading the placement area
- 30 3) Loading
- 31 4) Unloading
- 32 5) Storing
- 33 6) Hauling
- 34 7) Handling of materials
- 35 8) Materials and work needed for any corrective action
- 36 9) Supplementary cementing materials
- 37 10) Joint sealant
- 38 11) Disposal of excess material
- 39 12) Clean-up

40 1.3 REFERENCES

41 A. Abbreviations and Acronyms

- 42 1. TAS – Texas Accessibility Standards
- 43 2. TDLR – Texas Department of Licensing and Regulation

44 B. Definitions

- 45 1. Curb: concrete edging or barrier measuring 18” or less in maximum height.

46 C. Reference Standards

- 1 1. Reference standards cited in this Section refer to the current reference standard
- 2 published at the time of the latest revision date logged at the end of this Section
- 3 unless a date is specifically cited.
- 4 2. Texas Manual on Uniform Traffic Control Devices (TMUTCD).

5 **1.4 ADMINISTRATIVE REQUIREMENTS**

6 A. Pre-Paving Meeting

- 7 a. Hold a pre-paving meeting in accordance with Sections [32 12 16](#) and [32 13 13](#).

8 B. Sequencing

9 1. Sidewalk Construction

- 10 a. Where existing sidewalks are to be closed during Curb, Gutter, Sidewalk, and
- 11 Driveway activities:
 - 12 1) Utilize pedestrian/sidewalk detour route specified in the Drawings
 - 13 a) If no detour route is provided, submit a pedestrian/sidewalk detour
 - 14 route to City for review.
 - 15 2) The pedestrian/sidewalk detour route will be subsidiary to pertinent Traffic
 - 16 Control items included with the project.
- 17 b. Install all sidewalk detours and closures in accordance with the TMUTCD,
- 18 State, and local guidelines.
- 19 c. Provide any traffic control devices in accordance with Section [34 71 13](#).

20 **1.5 SUBMITTALS**

21 A. Submittals shall be in accordance with Section [01 33 00](#).

22 B. All submittals shall be approved by the City prior to delivery.

23 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

24 A. Concrete Mix Design in accordance with Section [03 00 00](#).

25 B. Asphalt Mix Design in accordance with Section [32 12 16](#).

26 C. Product Data

- 27 1. Provide the following from each manufacturer supplying the following in
- 28 accordance with Sections [03 00 00](#) and [32 12 16](#):
 - 29 a. Curing compounds
 - 30 b. Evaporation retardant
 - 31 c. Joint fillers
 - 32 d. Chemical additives
 - 33 e. Epoxy
 - 34 f. Fiber reinforcing

35 D. Equipment Submittals

- 36 1. Submit an equipment list of all major equipment in accordance with Sections [32 12](#)
- 37 [16](#) and [32 13 13](#).

38 E. Test and Evaluation Reports

- 39 1. Provide testing and evaluation reports in accordance with Sections [01 45 23](#), [03 00](#)
- 40 [00](#), [32 12 16](#), and [32 13 13](#).

41 **1.7 CLOSEOUT SUBMITTALS**

1 A. Test and Evaluation Reports

2 1. All test reports generated during testing.

3 B. TDLR Inspection

4 1. Submit TDLR Proof of Inspection. Remove and replace any portions found to be
5 failing in accordance with Article 3.7.

6 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

7 **1.9 QUALITY ASSURANCE [NOT USED]**

8 **1.10 DELIVERY, STORAGE, AND HANDLING**

9 A. Storage and Handling Requirements

10 1. Secure and maintain a location to store the material in accordance with Section [01](#)
11 [66 00](#).

12 B. Follow all delivery, storage, and handling requirements for asphalt and concrete in
13 Sections [03 00 00](#), [32 12 16](#), and [32 13 13](#).

14 **1.11 FIELD CONDITIONS**

15 A. Follow all field condition requirements for asphalt and concrete in accordance with
16 Sections [03 00 00](#), [32 12 16](#), and [32 13 13](#).

17 **1.12 WARRANTY [NOT USED]**

18 **PART 2 - PRODUCTS**

19 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

20

1 **2.2 MATERIALS**

- 2 A. Refer to City standard details and Section [33 05 05](#) for requirements for excavation and
3 backfill.
- 4 B. Concrete
- 5 1. Class
- 6 a. Curb
- 7 1) Provide Class P1 concrete in accordance with Section [03 00 00](#).
- 8 b. Sidewalk
- 9 1) For sidewalk width less than 5' provide Class A in accordance with Section
10 [03 00 00](#).
- 11 2) For sidewalk width greater than 5' and less than 10' provide Class P1 in
12 accordance with Section [03 00 00](#).
- 13 3) For sidewalk width greater than 10' provide Class P2 in accordance with
14 Section [03 00 00](#).
- 15 c. Driveway
- 16 1) Provide Class P2 concrete in accordance with Section [03 00 00](#).
- 17 2. Production Materials
- 18 a. Provide cementitious materials, admixtures, water, forms, joint filler, joint
19 sealant, and reinforcing chairs in accordance with Section [32 13 13](#).
- 20 3. Aggregate:
- 21 a. Provide aggregate in accordance with Section [03 00 00](#) and [32 05 16](#).
- 22 b. Use coarse aggregate that is no larger than 1-1/2 inch.
- 23 4. Reinforcement:
- 24 a. Curb
- 25 1) When constructing Concrete Curb, Concrete Curb and Gutter, Concrete
26 Valley Gutter, or Concrete Ribbon Curb use fiber reinforcing in accordance
27 with Section [03 00 00](#).
- 28 2) When constructing Concrete Curb (Monolithic) use reinforcing steel in
29 accordance with Section [03 00 00](#).
- 30 b. Sidewalk and Curb Ramps
- 31 1) When constructing sidewalk less than 6" in thickness use fiber
32 reinforcement in accordance with Section [03 00 00](#).
- 33 2) When constructing sidewalk 6" in thickness or greater use steel
34 reinforcement in accordance with Section [03 00 00](#).
- 35 c. Driveway and Driveway Approaches
- 36 1) Provide reinforcing steel in accordance with Section [03 00 00](#).
- 37 C. Asphalt
- 38 1. Refer to Section [32 12 16](#) for material requirements.
- 39 2. Use Type D for Asphalt Driveway surface courses.
- 40 3. Use Type B for Asphalt Driveway intermediate and/or base courses.
- 41 D. Curb Ramps
- 42 1. Provide cast-in-place fiberglass composite or brick paver detectable warning
43 surface in accordance with TAS.
- 44 a. Glue-down detectable warning surfaces are not permitted on new ramps.

1 **2.3 ACCESSORIES [NOT USED]**

2 **2.4 SOURCE QUALITY CONTROL**

- 3 A. Follow all source quality control requirements for asphalt and concrete in Sections [03](#)
4 [00 00](#), [32 12 16](#), and [32 13 13](#).

5 **PART 3 - EXECUTION**

6 **3.1 INSTALLERS [NOT USED]**

7 **3.2 EXAMINATION [NOT USED]**

8 **3.3 PREPARATION**

9 A. Surface Preparation

- 10 1. Excavate and remove materials as required for the construction of curbs, sidewalks,
11 and driveways in accordance with Sections [02 41 15](#), [31 10 00](#), and [31 23 16](#).
12 2. Shape and compact subgrade or foundation surface to the line, grade, and cross-
13 section specified in the Drawings.
14 3. If required, treat subgrade in accordance with Sections [32 11 29](#) and [32 11 33](#).
15 4. Lightly sprinkle subgrade or foundation surface immediately before final concrete
16 or asphalt placement.

17 **3.4 INSTALLATION**

18 A. General

- 19 1. Provide finished work with a well-compacted mass and a surface free from voids
20 meeting the required shape, line, and grade as specified in the Drawings.
21 2. Place concrete and asphalt in accordance with Sections [32 12 16](#) and [32 13 13](#).
22 3. All pedestrian facilities shall comply with provisions of TAS including location,
23 slope, width, shapes, texture and coloring. Pedestrian facilities installed by the
24 Contractor and not meeting TAS must be removed and replaced to meet TAS at no
25 cost to the City.

26 B. Equipment

- 27 1. Use equipment in accordance with Section [32 12 16](#) and [32 13 13](#).
28 2. Smart level:
29 a. Use approved Smart Level to verify all sidewalk, curb ramp, and driveway
30 grades.
31 b. Calibrate Smart Level with City inspector prior to performing tests.

32 C. Curbs

- 33 1. Integral
34 a. Place integral curb while the pavement is still plastic.
35 b. Spade and consolidate concrete material with pavement in order to obtain a
36 thorough bond.
37 2. Formed
38 a. Extend forms to full depth of concrete.

- 1 b. Pour concrete into forms and strike off with a template 1/4 to 3/8 in. less than
- 2 the dimensions of the finished curb.
- 3 c. When removing forms, take caution to prevent marring or spalling or concrete.
- 4 d. After initial set, plaster surface with mortar consisting of 1 part hydraulic
- 5 cement and 2 parts fine aggregate.
- 6 e. Brush exposed surfaces to a uniform texture.
- 7 3. Slip-formed
- 8 a. Hand-tamp and sprinkle subgrade material before concrete placement.
- 9 b. Provide clean surfaces for concrete placement.
- 10 c. Place the concrete with approved self-propelled equipment.
- 11 1) The forming tube of the extrusion machine or the form of the slip form
- 12 machine must easily be adjustable vertically during the forward motion of
- 13 the machine to provide variable heights required to maintain established
- 14 grade line.
- 15 d. Attach a pointer or gauge to the machine so a continual comparison can be
- 16 made between the extruded or slip form work and grade guideline.
- 17 e. Brush finish surfaces immediately after extrusion or slip forming.
- 18 4. Joints
- 19 a. Place expansion joints in the curb and gutter at 200-foot intervals and at
- 20 intersection returns and other rigid structures.
- 21 b. Place tooled joints at 15-foot intervals or matching abutting sidewalk joints and
- 22 pavement joints to a depth of 1-1/2 inches.
- 23 c. Place expansion joints at all intersections with concrete driveways, curbs,
- 24 buildings, and other curb and gutters.
- 25 d. Make expansion joints no less than 1/2 inch in thickness, extending the full
- 26 depth of the concrete.
- 27 e. Make expansion joints perpendicular and at right angles to the face of the curb.
- 28 f. Neatly trim any expansion material extending above the finished work down to
- 29 finished grade.
- 30 g. Make expansion joints in the curb and gutter coincide with concrete expansion
- 31 joints.
- 32 h. Longitudinal dowels across the expansion joints in the curb and gutter are
- 33 required.
- 34 i. Install 3 No. 4 round, smooth bars, 24 inches in length, for dowels at each
- 35 expansion joint.
- 36 j. Coat 1/2 of the dowel with a bond breaker and terminate with dowel cap.
- 37 1) Dowel cap required to provide a minimum of 1 inch free expansion.
- 38 k. Support dowels by an approved method.
- 39 D. Sidewalk
- 40 1. Sidewalks constructed in driveway approach sections shall have a minimum
- 41 thickness equal to that of driveway approach or as specified in the Drawings.
- 42 2. Terminate workday production at an expansion joint.
- 43 3. Formed
- 44 a. Provide pre-molded or board expansion joints of the thickness specified in the
- 45 Drawings for sidewalk section lengths greater than 8 feet but less than 40 feet.
- 46 4. Slip-formed

- 1 a. Provide any additional surface finishing immediately after extrusion of slip-
- 2 forming.
- 3 b. Construct joints at locations as specified in the Drawings.
- 4 5. Joints
- 5 a. Place expansion joints at 40 foot intervals.
- 6 b. Place expansion joints at sidewalks with concrete driveways, intersections with
- 7 other sidewalks, and at other adjacent old concrete work.
- 8 c. All expansion joints shall be 1/2 inch in thickness.
- 9 d. Edges of all construction and expansion joints and outer edges of all sidewalks
- 10 shall be finished to approximately a 1/2 inch radius with a suitable finishing
- 11 tool.
- 12 e. Sidewalks shall be marked at intervals equal to the width of the walk with a
- 13 marking tool.
- 14 f. When sidewalk is against the curb, expansion joints shall match those in the
- 15 curb.
- 16 E. Curb Ramps
- 17 1. Install detectable warning surface according to manufacturer's instructions.
- 18 F. Driveways
- 19 1. Provide concrete driveways and driveway approaches unless specified otherwise.
- 20 2. Provide uninterrupted access to adjacent property unless otherwise directed.
- 21 3. When curb is required, construct monolithically with the driveway pavement.

22 **3.5 REPAIR [NOT USED]**

23 **3.6 RE-INSTALLATION [NOT USED]**

24 **3.7 SITE QUALITY CONTROL**

25 A. Concrete Placement Acceptance

- 26 1. Follow all acceptance requirements in accordance with Sections [03 00 00](#) and [32 13](#)
- 27 [13](#).

28 B. Asphalt Placement Acceptance

- 29 1. Follow all acceptance requirements in accordance with Sections [03 00 00](#) and [32 12](#)
- 30 [16](#).

31 C. Non-conforming work

- 32 1. Any work found to be non-conforming to the Contract Documents will be removed
- 33 and replaced at Contractor's expense.
- 34 2. Additional testing and inspecting, at Contractor's expense, will be performed to
- 35 determine compliance of replaced or additional work with specified requirements.

36 **3.8 SYSTEM STARTUP [NOT USED]**

37 **3.9 ADJUSTING [NOT USED]**

38 **3.10 CLEANING [NOT USED]**

39 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

- 1 **3.12 PROTECTION [NOT USED]**
- 2 **3.13 MAINTENANCE [NOT USED]**
- 3 **3.14 ATTACHMENTS [NOT USED]**

4 **END OF SECTION**

5

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

6

1 **SECTION 32 17 23**
2 **PAVEMENT MARKINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Pavement Markings:
7 a. Thermoplastic, hot-applied, spray (HAS) pavement markings
8 b. Thermoplastic, hot-applied, extruded (HAE) pavement markings
9 c. Preformed retroreflective polymer pavement markings tape
10 d. Reflectorized multipolymer, spray pavement markings
11 e. Preformed heat-activated thermoplastic tape
12 f. Pavement markings, paint
13 2. Pavement Marking Legends.
14 3. Raised Pavement Markers.
15 4. Work Zone Markings.
16 5. Removal of Pavement Markings and Markers.

17 B. Deviations from this City of Denton Standard Specification:

- 18 1. None.

19 C. Related Specification Sections include but are not limited to:

- 20 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
21 Contract.
22 2. Division 1 - General Requirements.

23 **1.2 PRICE AND PAYMENT PROCEDURES**

24 A. Measurement and Payment

- 25 1. Pavement Markings
26 a. Measurement
27 1) Measured per linear foot of pavement markings installed.
28 b. Payment
29 1) The work performed and materials furnished in accordance with this item
30 and measured as provided under "Measurement" will be paid for at the unit
31 price bid per linear foot of pavement markings installed for:
32 a) Various Widths.
33 b) Various Types.
34 c) Various Materials.
35 d) Various Colors.
36 c. The price bid shall include:
37 1) Furnishing and installing pavement markings as specified by the Drawings
38 2) Glass beads, if required
39 3) Surface preparation
40 4) Clean-up

- 1 5) Testing, if required
- 2 2. Pavement Marking Legends
- 3 a. Measurement
- 4 1) Measured per each pavement marking legend installed.
- 5 b. Payment
- 6 1) The work performed and materials furnished in accordance with this item
- 7 and measured as provided under “Measurement” will be paid for at the unit
- 8 price bid per each pavement marking legend installed for:
- 9 a) Various Types.
- 10 b) Various Materials.
- 11 c) Various Applications.
- 12 c. The price bid shall include:
- 13 1) Furnishing and installing pavement marking legend as specified by the
- 14 Drawings
- 15 2) Glass beads, if required
- 16 3) Surface preparation
- 17 4) Clean-up
- 18 5) Testing, if required)
- 19 3. Raised Pavement Markers
- 20 a. Measurement
- 21 1) Measured per each raised pavement marker installed.
- 22 b. Payment
- 23 1) The work performed and materials furnished in accordance with this item
- 24 and measured as provided under “Measurement” will be paid for at the unit
- 25 price bid per each raised pavement marker installed for:
- 26 a) Various Types.
- 27 c. The price bid shall include:
- 28 1) Furnishing and installing raised pavement markers as specified by the
- 29 Drawings
- 30 2) Surface preparation
- 31 3) Clean-up
- 32 4) Testing, if required
- 33 4. Work Zone Tab Markers
- 34 a. Measurement
- 35 1) Measured per each tab marker installed.
- 36 b. Payment
- 37 1) The work performed and materials furnished in accordance with this item
- 38 and measured as provided under “Measurement” will be paid for at the unit
- 39 price bid per each tab marker installed.
- 40 c. The price bid shall include:
- 41 1) Furnishing and installing tab markers as specified by the Drawings
- 42 2) Surface preparation
- 43 3) Clean-up
- 44 5. Pavement Marking Removal
- 45 a. Measurement
- 46 1) Measured per linear foot of pavement markings removed.
- 47 b. Payment

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot of pavement markings removed for:
 - a) Various Widths.
 - b) Various Types.
 - c) Various Materials.
 - d) Various Colors.
- c. The price bid shall include:
 - 1) Removing pavement markings as specified by the Drawings
 - 2) Hauling
 - 3) Disposal of excess materials
 - 4) Clean-up
6. Pavement Marking Legend Removal
 - a. Measurement
 - 1) Measured per each pavement marking legend removed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each pavement marking legend removed for:
 - a) Various Types.
 - c. The price bid shall include:
 - 1) Removing pavement marking legend as specified by the Drawings
 - 2) Hauling
 - 3) Disposal of excess materials
 - 4) Clean-up
7. Raised Pavement Markers Removal
 - a. Measurement
 - 1) Measured per each raised pavement marker removed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each raised pavement markers removed for:
 - a) Various Widths.
 - b) Various Types.
 - c) Various Materials.
 - d) Various Colors.
 - c. The price bid shall include:
 - 1) Removing and disposing raised pavement markers as specified by the Drawings
 - 2) Hauling
 - 3) Disposal of excess materials
 - 4) Clean-up
8. Pavement Marking, Legend, and Raised Pavement Markers Removal for Utility Trenching
 - a. Measurement
 - 1) This item is considered subsidiary to the installation of water, wastewater, or stormwater piping.
 - b. Payment

- 1) The work performed and materials in accordance with this item are subsidiary to the unit price bid per linear foot of water, wastewater, or stormwater piping installed.
9. Pavement Marking, Legend, and Raised Pavement Markers Replacement for Utility Trenching
 - a. Measurement
 - 1) Measurement for this item shall be by lump sum.
 - b. Payment
 - 1) The work performed and materials in accordance with this item shall be paid for at the lump sum price bid for “Pavement Marking, Legend, and Raised Pavement Markers Replacement for Utility Trenching”.
 - c. The price bid shall include:
 - 1) Furnishing and installing pavement markings, legends, and raised pavement markers to match pre-construction conditions
 - 2) Hauling
 - 3) Disposal of excess materials
 - 4) Clean-up

1.3 REFERENCES

A. Reference Standards

1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
2. Texas Manual on Uniform Traffic Control Devices (TMUTCD), 2011 Edition:
 - a. Part 3, Markings.
3. Federal Highway Administration (FHWA):
 - a. 23 CFR Part 655, FHWA Docket No. FHWA-2009-0139.
4. Texas Department of Transportation (TxDOT) Departmental Material Specifications (DMS):
 - a. 4200, Pavement Markers (Reflectorized).
 - b. 4300, Traffic Buttons.
 - c. 8200, Traffic Paint.
 - d. 8220, Hot Applied Thermoplastic.
 - e. 8240, Permanent Prefabricated Pavement Markings.
 - f. 8241, Removable Prefabricated Pavement Markings.
 - g. 8242, Temporary Flexible-Reflective Road Marker Tabs.
 - h. 8290, Glass Traffic Beads.
5. Texas Department of Transportation (TxDOT) Pavement Marking Handbook:
 - a. Special Specification 1513 – Reflectorized Multipolymer Pavement Markings-Houston District.

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.

1 B. All submittals shall be approved by the City prior to delivery and /or fabrication for
2 special.

3 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

4 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

5 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

6 **1.9 QUALITY ASSURANCE [NOT USED]**

7 **1.10 DELIVERY, STORAGE, AND HANDLING**

8 A. Storage and Handling Requirements

9 1. Secure and maintain a location to store the material in accordance with Section 01
10 66 00.

11 **1.11 FIELD CONDITIONS [NOT USED]**

12 **1.12 WARRANTY [NOT USED]**

13 **PART 2 - PRODUCTS**

14 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

15 **2.2 MATERIALS**

16 A. Manufacturers

17 1. Pavement Markings

18 a. Preformed Retroreflective Polymer Pavement Markings Tape

19 1) SWARCO Director 60

20 2) 3M Stamark High Performance Tape Series 3801 ES

21 2. Substitution requests for manufacturers or models not indicated above shall be
22 processed in accordance with Section 01 25 00.

23 B. Materials

24 1. Pavement Markings

25 a. Thermoplastic, hot applied, spray

26 1) Width of longitudinal lines as specified in Drawings.

27 2) Supply products especially compounded for traffic markings.

28 3) When placed on driving surfaces, markings shall not be slippery when wet,
29 lift from pavement under normal weather conditions, nor exhibit a tacky
30 exposed surface.

31 4) Cold ductility of the material shall permit normal road surface expansion
32 and contraction without chipping or cracking.

33 5) Retain original color, dimensions, and placement under normal traffic
34 conditions at road surface temperatures of 158 degrees Fahrenheit and
35 below.

36 6) Uniform cross-section, clean edges, square ends, and no evidence of
37 tracking.

- 1 7) Density, quality, and thickness of the material shall be uniform throughout
- 2 the length and width of the markings.
- 3 8) 95 percent free of holes and voids, and free of blisters for a minimum of 60
- 4 days after application.
- 5 9) Material shall not deteriorate by contact with sodium chloride, calcium
- 6 chloride or other chemicals used to prevent roadway ice, because of the oil
- 7 content of pavement markings, from oil droppings, or other effects of
- 8 traffic.
- 9 10) Material shall not prohibit adhesion of other thermoplastic markings if, at
- 10 some future time, new markings are placed over existing material.
- 11 a) New material shall bond itself to the old marking in such a manner that
- 12 no splitting or separation takes place.
- 13 11) Markings placed on driving surfaces shall be completely retroreflective
- 14 both internally and externally with traffic beads and shall exhibit uniform
- 15 retro-directive reflectance.
- 16 b. Thermoplastic, hot applied, extruded
- 17 1) Supply products especially compounded for traffic markings
- 18 2) When placed on driving surfaces, markings shall not be slippery when wet,
- 19 lift from pavement under normal weather conditions nor exhibit a tacky
- 20 exposed surface.
- 21 3) Cold ductility of the material shall permit normal road surface expansion
- 22 and contraction without chipping or cracking.
- 23 4) Markings shall retain their original color, dimensions, and placement under
- 24 normal traffic conditions at road surface temperatures of 158 degrees
- 25 Fahrenheit and below.
- 26 5) Markings shall have uniform cross-section, clean edges, square ends, and
- 27 no evidence of tracking.
- 28 6) Density, quality, and thickness of the material shall be uniform throughout
- 29 the length and width of the markings.
- 30 7) 95 percent free of holes and voids, and free of blisters for a minimum of 60
- 31 days after application
- 32 8) Minimum thickness of the marking, as measured above the plane formed
- 33 by the pavement surface, shall not be less than 1/8 inch in the center of the
- 34 marking and 3/32 inch at a distance of 1/2 inch from the edge.
- 35 9) Maximum thickness shall be 3/16 inch.
- 36 10) Material shall not deteriorate by contact with sodium chloride, calcium
- 37 chloride, or other chemicals used to prevent roadway ice or because of the
- 38 oil content of pavement markings or from oil droppings or other effects of
- 39 traffic.
- 40 11) Material shall not prohibit adhesion of other thermoplastic markings if, at
- 41 some future time, new markings are placed over existing material.
- 42 a) New material shall bond itself to the old marking in such a manner that
- 43 no splitting or separation takes place.
- 44 12) Markings placed on the roadway shall be completely retroreflective both
- 45 internally and externally with traffic beads and shall exhibit uniform retro-
- 46 directive reflectance.
- 47 c. Glass traffic beads
- 48 1) Manufactured from glass
- 49 2) Spherical in shape

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- 3) Essentially free of sharp angular particles
 - 4) Essentially free of particles showing cloudiness, surface scoring or surface scratching
 - 5) Water white in color
 - 6) Applied at a uniform rate
 - 7) In accordance with requirements of DMS-8290
- d. Reflectorized Multipolymer, spray Pavement Markings Tape
- 1) Material in accordance with TxDOT Special Specification 1513.

- 1 e. Preformed Heat-Activated Thermoplastic Tape
- 2 1) HotTape preformed thermoplastic
- 3 a) 0.125 mil thickness
- 4 f. Pavement Markings, Paint
- 5 1) In accordance with DMS-8200.
- 6 2. Raised Pavement Markers
- 7 a. In accordance with the requirements of the TMUTCD.
- 8 b. Non-reflective markers:
- 9 1) Round Ceramic Marker Types
- 10 a) Type Y (yellow body)
- 11 b) Type W (white body)
- 12 2) In accordance with DMS-4300
- 13 c. Reflective markers:
- 14 1) Manufactured of plastic
- 15 2) In accordance with DMS-4200
- 16 3) Marker Types:
- 17 a) Type I-C, white body, 1 face reflects white
- 18 b) Type II-A-A, yellow body, 2 faces reflect amber
- 19 c) Type II-C-R, white body, 1 face reflects white, the other red
- 20 3. Work Zone Markings
- 21 a. Temporary Flexible-Reflective Roadway Marker Tabs
- 22 1) In accordance with DMS-8242
- 23 2) Do not use to simulate edge lines.
- 24 3) No segment of roadway open to traffic shall remain without permanent
- 25 pavement markings for a period greater than 14 calendar days.
- 26 b. Raised Pavement Markers
- 27 1) In accordance with DMS-4200
- 28 c. Striping
- 29 1) In accordance with DMS-8200

30 **2.3 ACCESSORIES [NOT USED]**

31 **2.4 SOURCE QUALITY CONTROL**

32 **A. Performance**

- 33 1. Maintain minimum retroreflectivity level for longitudinal markings as detailed
- 34 below for a minimum of 30 calendar days.
- 35

1

	Posted Speed (mph)		
	≤ 30	35 – 50	≥ 55
2-lane roads with centerline markings only ⁽¹⁾	n/a	100	250
All other roads ⁽²⁾	n/a	50	100

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⁽¹⁾ Measured at standard 30-m geometry in units of mcd/m²/lux.

⁽²⁾ Exceptions:

- A. When raised reflective pavement markings (RRPMs) supplement or substitute for a longitudinal line, minimum pavement marking retroreflectivity levels are not applicable as long as the RRPMs are maintained so that at least 3 are visible from any position along that line during nighttime conditions.
- B. When continuous roadway lighting assures that the markings are visible, minimum pavement marking retroreflectivity levels are not applicable.

10 **PART 3 - EXECUTION**

11 **3.1 INSTALLERS [NOT USED]**

12 **3.2 EXAMINATION [NOT USED]**

13 **3.3 PREPARATION**

14 A. Surface Preparation

- 15 1. Remove dirt, grease, loose and/or flaking existing markings, and other forms of
- 16 contamination from existing roadway surface.
- 17 2. Remove curing membrane from new concrete surfaces.
- 18 3. Apply material after pavement surface is completely dry.
- 19 a. The pavement is considered dry if there is no condensation after 15 minutes of
- 20 observation on the underside of 1 square foot piece of clear plastic placed on
- 21 pavement surface and weighted on the edges on a sunny day.
- 22 4. Equipment and methods used for surface preparation shall not damage existing
- 23 pavement or create a hazard to motorists or pedestrians.

24 **3.4 INSTALLATION**

25 A. General

- 26 1. Apply materials in accordance with the manufacturer's recommendations.
- 27 2. Apply markings and markers on clean, dry pavement with a surface temperature
- 28 above 50 degrees Fahrenheit and/or within temperature limits recommended by the
- 29 material manufacturer.
- 30 3. Ensure proper safety precautions and traffic control when markings are applied on
- 31 roadways open to traffic. Provide traffic control in accordance with TMUTCD.
- 32 4. Protect freshly applied markings from traffic damage and disfigurement.
- 33 5. Temperature of the material must be equal to the temperature of the road surface
- 34 prior to restoring traffic.

35

1 B. Pavement Markings

- 2 1. Thermoplastic, hot applied, spray
- 3 a. For installation and replacement of long lines – centerlines, lane lines, edge
- 4 lines, turn lanes, and dots.
- 5 b. Application Thickness:
- 6 1) 100 mils
- 7 a) For applications over existing markings, install 90 mils.
- 8 c. Use sealer on concrete or asphalt pavement older than three (3) years.
- 9 d. Provide a typical setting time between 4 minutes and 10 minutes depending
- 10 upon the roadway surface temperature and the humidity factor.
- 11 e. Supplement roadway centerlines, lane lines, and turn lanes with retroreflective
- 12 raised pavement markers. Place markers as specified in the Drawings.
- 13 2. Thermoplastic, hot applied, extruded
- 14 a. For installation and replacement of crosswalks and stop-lines.
- 15 b. Apply markings at a 125 mil thickness.
- 16 3. Preformed Polymer Tape
- 17 a. For installation and replacement of crosswalks, stop-lines, and legends.
- 18 b. Apply markings to adhere to the pavement surface with no slippage or lifting
- 19 and have square ends, straight lines, and clean edges.
- 20 4. Preformed Heat-Activated Thermoplastic Tape
- 21 a. For installation and replacement of crosswalks, stop-lines, and legends.
- 22 b. Apply marking to adhere to the pavement surface with no slippage or lifting
- 23 and have square ends, straight lines, and clean edges.

24 C. Raised Pavement Markers

- 25 1. Install on concrete roadways with epoxy adhesive.
- 26 a. Bituminous adhesive is not permitted.
- 27 2. Install on new asphalt roadways with epoxy or bituminous adhesive.
- 28 3. Ensure proper alignment of individual marker using a chalk line, chain, or
- 29 equivalent. Place markers uniformly along the line to achieve a smooth continuous
- 30 appearance.

31 D. Work Zone Markings

- 32 1. Minimize disruption to traffic.
- 33 2. Install longitudinal markings on pavement surfaces before opening to traffic.
- 34 3. Maintain lane alignment traffic control devices and operations until markings are
- 35 installed.
- 36 4. Install markings in proper alignment in accordance with the TMUTCD and as
- 37 specified in the Drawings.
- 38 5. Place standard longitudinal lines no sooner than 3 calendar days after the placement
- 39 of a surface treatment, unless otherwise specified in the Drawings.
- 40 6. Place in proper alignment with the location of the final pavement markings.
- 41 7. Do not use raised pavement markers for words, symbols, shapes, or diagonal or
- 42 transverse lines.

- 1 8. Marking visibility is required for at least a distance of 300 feet in daylight
2 conditions and 160 feet in nighttime conditions on a low-beam automobile
3 headlight illumination.
- 4 9. The daytime and nighttime reflected color of the markings must be distinctly white
5 or yellow.
- 6 10. The markings must exhibit uniform retroreflective characteristics.
- 7 11. Epoxy adhesives are not permitted for work zone markings

8 E. Removals

- 9 1. Pavement Marking and Pavement Marker Removal
- 10 a. Use best practices to remove existing pavement markings and markers.
- 11 b. If the roadway is damaged during marker removal, coordinate with the City
12 prior to continuing removal operations.
- 13 c. Minimize color and texture contrast of the pavement surface as a result of
14 removals.
- 15 d. Repair damages greater than ¼ inch in depth resulting from the removal of
16 pavement markings and markers from asphaltic surfaces.
 - 17 1) Driveway patch asphalt emulsion may be broom applied to reseal damage
18 to asphaltic surfaces.
- 19 e. Dispose of markers in accordance with Federal, State, and local regulations.
- 20 f. Use any of the following methods unless otherwise specified in the Drawings.
 - 21 1) Surface Treatment Method
 - 22 a) Apply surface treatment at rates specified in the Drawings.
 - 23 b) Place a surface treatment a minimum of 2 feet wide to cover the
24 existing marking.
 - 25 c) Place a surface treatment, thin overlay, or microsurfacing a minimum
26 of 1 lane in width in areas where directional changes of traffic are
27 involved or in other areas as directed by the City.
 - 28 2) Burn Method
 - 29 a) Use burning method approved by City.
 - 30 b) For thermoplastic pavement markings or prefabricated pavement
31 markings, heat may be applied to remove the bulk of the marking
32 material prior to blast cleaning.
 - 33 c) When using heat, avoid spalling pavement surfaces.
 - 34 d) Sweeping or light blast cleaning may be used to remove minor residue.
 - 35 3) Blasting Method
 - 36 a) Use a blasting method such as water blasting, abrasive blasting, water
37 abrasive blasting, shot blasting, slurry blasting, water-injected abrasive
38 blasting, or brush blasting as approved by City.
 - 39 b) Remove pavement markings on concrete surfaces by blasting method
40 only.
 - 41 4) Mechanical Method
 - 42 a) Use any mechanical method except grinding.
 - 43 b) Flail milling is acceptable in the removal of markings on asphalt and
44 concrete surfaces.
- 45 2. No additional compensation will be allowed for removing markings and markers at
46 the location to be paved over or where pavement is to be removed.
- 47

1 **3.5 REPAIR [NOT USED]**
2

1 **3.6 RE-INSTALLATION**

- 2 A. Remove and replace markings placed by faulty application methods or in the wrong
3 position or alignment by the Contractor at the Contractor's expense.
- 4 B. Replace or remedy faulty markings on the same day of notification if markings create
5 motorist confusion or hazard, as determined by City. Replace and remedy all other
6 faulty markings within 5 days of notification.

7 **3.7 FIELD QUALITY CONTROL**

- 8 A. Maintain uniform cross-section with clean edge and square ends for all markings.
- 9 B. Maintain uniform density and quality of markings throughout its thickness.
- 10 C. More than 5 percent, by area, of holes or voids on the applied markings is not
11 acceptable. Applied markings shall be free of blisters.

12 **3.8 SYSTEM STARTUP [NOT USED]**

13 **3.9 ADJUSTING [NOT USED]**

14 **3.10 CLEANING [NOT USED]**

15 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

16 **3.12 PROTECTION [NOT USED]**

17 **3.13 MAINTENANCE [NOT USED]**

18 **3.14 ATTACHMENTS [NOT USED]**

19 **END OF SECTION**

20

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

21

1 **SECTION 32 31 00**
2 **FENCES AND GATES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Furnishing and installing, removing, or replacing wooden, metal, chain link, or wire
7 fences and gates.

8 B. Deviations from this City of Denton Standard Specification:

- 9 1. None.

10 C. Related Specification Sections include but are not limited to:

- 11 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
12 Contract.
13 2. Division 1 - General Requirements.
14 3. Section 02 41 13 – Selective Site Demolition.
15 4. Section 03 00 00 – Concrete and Concrete Reinforcing

16 **1.2 PRICE AND PAYMENT PROCEDURES**

17 A. Measurement and Payment

18 1. Fence

19 a. Measurement

- 20 1) Measured per linear foot of Fence installed.

21 b. Payment

- 22 1) The work performed and materials furnished in accordance with this item
23 and measured as provided under “Measurement” will be paid for at the unit
24 price bid per linear foot for “Fence” installed for:
25 a) Various Types.
26 b) Various Heights.

27 c. The price bid shall include:

- 28 1) Furnishing and installing Fence as specified by the Drawings
29 2) Posts, fencing material, and all accessories
30 3) Excavation and embankment
31 4) Loading
32 5) Unloading
33 6) Hauling
34 7) Storing
35 8) Mow strip, if required

36 2. Gate

37 a. Measurement

- 38 1) Measured per each Gate installed.
39

- 1 b. Payment
- 2 1) The work performed and materials furnished in accordance with this item
- 3 and measured as provided under “Measurement” will be paid for at the unit
- 4 price bid per each “Gate” installed for:
- 5 a) Various Types.
- 6 b) Various Heights.
- 7 c) Various Widths.
- 8 c. The price bid shall include:
- 9 1) Furnishing and installing Gates as specified by the Drawings
- 10 2) Posts, fencing material, and all accessories
- 11 3) Excavation and embankment
- 12 4) Loading
- 13 5) Unloading
- 14 6) Hauling
- 15 7) Storing
- 16 8) Mow strip, if required.
- 17 3. Cattle Guard
- 18 a. Measurement
- 19 1) Measured per each Cattle Guard installed.
- 20 b. Payment
- 21 1) The work performed and materials furnished in accordance with this item
- 22 and measured as provided under “Measurement” will be paid for at the unit
- 23 price bid per each “Cattle Guard” installed for:
- 24 a) Various Widths.
- 25 c. The price bid shall include:
- 26 1) Furnishing and installing Cattle Guards as specified by the Drawings
- 27 2) Excavation and embankment
- 28 3) Loading
- 29 4) Unloading
- 30 5) Hauling
- 31 6) Storing

32 **1.3 REFERENCES**

- 33 A. Reference Standards
- 34 1. Reference standards cited in this Section refer to the current reference standard
- 35 published at the time of the latest revision date logged at the end of this Section
- 36 unless a date is specifically cited.
- 37 2. ASTM International (ASTM):
- 38 a. A116, Standard Specification for Metallic-Coated, Steel-Woven Wire Fence
- 39 Fabric
- 40 b. A121, Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
- 41 c. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
- 42 d. A491, Standard Specification for Aluminum-Coated Steel Chain-Link Fence
- 43 Fabric
- 44 e. A702, Standard Specification for Steel Fence Posts, Hot Wrought
- 45 f. F626, Standard Specification for Fence Fittings
- 46 g. F668, Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and
- 47 Other Polymer-Coated Steel Chain Link Fence Fabric

- 1 h. F934, Standard Specification for Standard Colors for Polymer-Coated Chain
- 2 Link Fence Materials
- 3 i. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated
- 4 (Galvanized) Welded, for Fence Structures
- 5 3. American Wood-Preservers' Association (APWA).

6 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

7 **1.5 SUBMITTALS**

- 8 A. Submittals shall be in accordance with Section 01 33 00.
- 9 B. All submittals shall be approved by the City prior to delivery.

10 **1.6 ACTION SUBMITTALS**

11 A. Product Data

- 12 1. Provide product data from each manufacturer that is supplying fence, gate, or cattle
- 13 guard materials and accessories.
- 14 2. Product data sheets for all products to include:
- 15 a. Manufacturer name
- 16 b. Date
- 17 c. Material description
- 18 d. Data and test results as required in this Section
- 19 e. Manufacturer Recommended Storing Data, if applicable
- 20 f. Installation Recommendations, if applicable

21 B. Shop Drawings

- 22 1. Provide shop drawings for all fence, gates, and cattle guards showing:
- 23 a. Installation layout with details and dimensions
- 24 b. Material type
- 25 c. Material finish

26 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

27 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

28 **1.9 QUALITY ASSURANCE [NOT USED]**

29 **1.10 DELIVERY, STORAGE, AND HANDLING**

30 A. Storage and Handling Requirements

- 31 1. Secure and maintain a location to store the material in accordance with Section 01
- 32 66 00.

1 **1.11 SITE CONDITIONS [NOT USED]**

2 **1.12 WARRANTY [NOT USED]**

3 **PART 2 - PRODUCTS**

4 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

5 **2.2 MATERIALS**

6 A. General

- 7 1. Provide only new materials of the size, weight, and material specified in the
8 Drawings.
9 2. Provide materials of good commercial quality and design.

10 B. Posts

11 1. Metal

- 12 a. Do not use rerolled or open-seam material.
13 b. Provide steel pipe in accordance with ASTM F1083.
14 c. Provide T-posts in accordance with ASTM A702.
15 d. Paint all non-galvanized posts with an anti-corrosive paint approved by the
16 City.

17 2. Wood

- 18 a. Provide posts free of all decay, shakes, splits, or other defects that would
19 weaken or otherwise make the posts unsuitable for the purposes intended.
20 b. Ensure all knots are sound, tight, trimmed flush, and not exceeding 1/3 the
21 small dimension of the post.
22 c. Ensure posts are straight, such that a line drawn between the center of each end
23 does not fall outside the center of the post at any point by more than 2 inches.
24 d. For untreated posts use cedar, redwood, cypress, or live oak.
25 e. For treated posts use pine, spruce, or fir preservative treated in accordance with
26 all applicable AWWA standards.

27 3. Concrete

- 28 a. Provide concrete with a minimum 28 day compressive strength of 3,000 psi in
29 accordance with Section 03 00 00.
30 b. Bagged concrete is allowed.

31 C. Chain Link Fabric

- 32 1. Provide chain link fabric made of at least 9 gauge steel wire in accordance with
33 ASTM A392 or ASTM A491.
34 2. Provide knuckled selvages at the top and bottom edge of fabric.
35 3. Provide 7 gauge steel tension wire with a minimum breaking strength of 1,950
36 pounds for the bottom edge, and top edge when railing is not used, of all chain link
37 fence.
38 4. When directed provide PVC vinyl coated fabric in accordance with ASTM F668
39 and colored in accordance with ASTM F934.
40

- 1 D. Wire Mesh Fabric
- 2 1. Provide wire mesh fabric made of at least 10 gauge wire for the top and bottom
- 3 wires and at least 12-1/2 gauge wire for the intermediate wire and vertical stays in
- 4 accordance with ASTM A116.
- 5 E. Barbed Wire
- 6 1. Provide barbed wire made of 2 strands 12-1/2 gauge wire, twisted with 2-point 14
- 7 gauge barbs spaced no more than 5 inches apart in accordance with ASTM A121,
- 8 Class 1.
- 9 F. Wood Slats
- 10 1. Provide redwood or cedar slats free from all decay, shakes, splits, or other defects
- 11 that would weaken or otherwise make the slats unsuitable for the purposes intended.
- 12 G. Gates
- 13 1. Provide gates of the same material used in the adjacent fence, unless otherwise
- 14 specified in the Drawings.
- 15 2. Provide all gate materials in accordance with the Section.
- 16 H. Cattle Guards
- 17 1. Provide cattle guards of the dimensions and materials specified in the Drawings.

18 **2.3 ACCESSORIES**

- 19 A. Miscellaneous
- 20 1. Provide galvanized bolts, nuts, washers, staples, screws, braces, straps, and other
- 21 suitable devices needed to erect fence.
- 22 2. For metal posts, provide fittings from pressed or rolled steel, forged steel, malleable
- 23 iron, or wrought iron.
- 24 3. Paint all non-galvanized metal accessories with anti-corrosive paint approved by
- 25 the City.
- 26 B. Post Caps
- 27 1. Provide malleable iron post caps designed to exclude all moisture.
- 28 C. Chain Link Accessories
- 29 1. Provide fittings and other appurtenances in accordance with ASTM F626.

30 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

31 **PART 3 - EXECUTION**

32 **3.1 INSTALLERS [NOT USED]**

33 **3.2 EXAMINATION [NOT USED]**

34

1 **3.3 PREPARATION**

2 A. Clearing

- 3 1. Remove all stumps, brush, rocks, trees, or other obstructions that would interfere
- 4 with construction of the fence to a minimum width of 2 feet on each side of the
- 5 centerline of the fence.
- 6 2. Grub or excavate any stumps in fence clearing area.
- 7 3. Remove any existing fence in a position to interfere with the new fence location in
- 8 accordance with Section 02 41 13.
- 9 4. Backfill and compact all holes remaining after post and stump removal with
- 10 suitable soil.

11 **3.4 INSTALLATION**

12 A. General

- 13 1. Stake the locations for corner, pull, gate, and end posts as specified in the
- 14 Drawings, for City approval.
- 15 2. Follow the finished ground elevations for fencing panels between corner, pull, gate,
- 16 and end posts.
- 17 3. Level off minor ground elevation irregularities in the path of the fencing.

18 B. Post Installation

- 19 1. Space fence posts as specified in the Drawings, to match existing, or to meet the
- 20 minimum requirements below.

21

Post Type	Required Spacing or Placement
Line posts	Max 8 feet on centers
Pull posts	Max 500 feet on centers; Each horizontal change between 15° and 30°; Each vertical change greater than 20°
Corner posts	Each horizontal change greater than 30°

22
23 2. Post Holes

- 24 a. T-posts for wire fence may be hand driven. For all other posts, drill holes for
- 25 concrete footings.
- 26 b. Set posts at a minimum depth of 2 feet for line posts, and 4 feet or 1/3 the
- 27 length of the post, whichever is greater, for corner and pull posts under tension.
- 28 c. Drill holes to provide a minimum 3 inches of space between the post and drilled
- 29 hole on all sides, including the bottom.
- 30 d. Place concrete to fill all voids around post in a continuous pour. Maintain
- 31 plumbness and post position as concrete is poured.
- 32 e. Trowel finish around post sloping to direct water away from post.
- 33 f. Allow concrete footing to cure for 3 days prior to hanging gates or tensioning
- 34 cables.
- 35 g. If bagged concrete is used pull emptied bags from post holes before curing.
- 36 3. Plumb and permanently position posts with anchorages firmly set.

- 1 4. Brace corner and pull posts in two directions.
- 2 5. Brace end and gate posts in one direction.
- 3 6. Set end, corner, pull, and gate posts prior to stretching wire or wire mesh fabric
- 4 between posts.
- 5 7. Gate Posts
- 6 a. Set gate posts such that the line between both tops is level, regardless of the
- 7 grade at the groundline.
- 8 b. When the grade at the groundline is not level, set posts such that the minimum
- 9 height requirement is met for the downgrade post.
- 10 C. Chain Link Fence
- 11 1. Fasten fabric to corner, pull, end, and gate posts using steel stretcher bars.
- 12 2. Fasten one end of fabric and apply tension to the other end to remove all slack
- 13 before making attachments.
- 14 3. Place bottom of fabric approximately 2 inches above the finished grade.
- 15 4. Grade uneven areas so the maximum distance between the bottom of the fabric and
- 16 ground is 6 inches.
- 17 5. Fasten fabric to the tension wires, top rail, and intermediate line posts at 16-inch
- 18 intervals using 9 gauge galvanized steel ties.
- 19 6. Connect existing fence to new fence at existing or newly installed corner post.
- 20 D. Wire Mesh Fabric and Wire Fence
- 21 1. Fasten wire mesh fabric or wire fence to posts using galvanized ties or staples while
- 22 drawing the fencing taut.
- 23 2. Guy Wire
- 24 a. Secure fencing with guy wire at the critical point of grade depressions where
- 25 tension tends to pull posts out of the ground with a double 9 gauge galvanized
- 26 wire.
- 27 b. Connect the guy wire to the top and bottom wire of wire mesh fabric or each
- 28 strand of wire fence and to a deadman weighing at least 100 pounds, buried in
- 29 the ground.
- 30 c. Stretch the wire fence prior to guying.
- 31 3. Connect existing cross fences to new fences and corner posts at junction with
- 32 existing fences.
- 33 E. Wood Fence
- 34 1. Place wood fence slats approximately 2 inch above the finished grade and on a
- 35 straight grade between posts.
- 36 2. Grade uneven areas so the maximum distance between the bottom of the slats and
- 37 ground is 6 inches.
- 38 3. Attach slats to rails using galvanized screws.
- 39 F. Gates
- 40 1. Install horizontal stiffeners on gates 7 feet or taller, and vertical stiffeners on
- 41 maximum 8-foot centers.
- 42 2. Install swing gates to open 180 degrees from the closed position.

- 1 **3.5 REPAIR [NOT USED]**
- 2 **3.6 RE-INSTALLATION [NOT USED]**
- 3 **3.7 SITE QUALITY CONTROL [NOT USED]**
- 4 **3.8 SYSTEM STARTUP [NOT USED]**
- 5 **3.9 ADJUSTING [NOT USED]**
- 6 **3.10 CLEANING [NOT USED]**
- 7 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 8 **3.12 PROTECTION [NOT USED]**
- 9 **3.13 MAINTENANCE [NOT USED]**
- 10 **3.14 ATTACHMENTS [NOT USED]**

11 **END OF SECTION**

12

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

13

1 **SECTION 32 32 00**
2 **RETAINING WALLS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Installation and construction of retaining walls.

7 B. Deviations from this City of Denton Standard Specification:

- 8 1. None.

9 C. Related Specification Sections include but are not limited to:

- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
11 Contract.
12 2. Division 1 - General Requirements.
13 3. Section 03 00 00 – Concrete and Concrete Reinforcing.
14 4. Section 03 30 00 – Cast-in-Place Concrete.
15 5. Section 31 24 00 – Embankments.
16 6. Section 33 46 00 – Subdrainage.
17 7. Section 34 41 24 – Drilled Shaft Foundations.

18 **1.2 PRICE AND PAYMENT PROCEDURES**

19 A. Measurement and Payment

20 1. Retaining Wall

21 a. Measurement

- 22 1) Measured per cubic yard of Retaining Wall installed.

23 b. Payment

- 24 1) The work performed and materials furnished in accordance with this item
25 and measured as provided under “Measurement” will be paid for at the unit
26 price bid per cubic yard for Retaining Wall installed for:

27 a) Various Types.

28 c. The price bid shall include:

- 29 1) Furnishing and installing Retaining Wall as specified by the Drawings
30 2) Excavation for Retaining Wall footings
31 3) Backfill
32 4) Cement stabilization
33 5) Proof rolling
34 6) Waterproofing material
35 7) Filter fabric
36 8) Loading
37 9) Unloading
38 10) Storing
39 11) Hauling
40 12) Handling of Materials

- 13) Clean up
- d. The price bid shall not include the following:
 - 1) Furnishing, placing, and compacting backfill in embankment areas
 - 2) Drilled shaft foundations
- 2. Temporary Retaining Wall
 - a. Measurement
 - 1) Measured per cubic yard of Temporary Retaining Wall installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per cubic yard for Temporary Retaining Wall installed for:
 - a) Various Types.
 - c. The price bid shall include:
 - 1) Furnishing and installing Retaining Wall as specified by the Drawings
 - 2) Excavation for Retaining Wall footings
 - 3) Furnishing, placing, and compacting backfill in excavation areas
 - 4) Leveling pads
 - 5) Copings
 - 6) Traffic rail foundations
 - 7) Fabricating wall blocks or panels
 - 8) Anchorage systems
 - 9) Loading
 - 10) Unloading
 - 11) Storing
 - 12) Hauling
 - 13) Handling of Materials
 - 14) Clean up
 - d. The price bid shall not include the following:
 - 1) Furnishing, placing, and compacting backfill in embankment areas
 - 2) Drilled shaft foundations

1.3 REFERENCES

A. Abbreviations and Acronyms

- 1. MSE – Mechanically Stabilized Earth
- 2. CIP – Cast-in-Place
- 3. RAP – Recycled Asphalt Pavement
- 4. LRA – Limestone Rock Asphalt

B. Definitions

- 1. Permanent Wall
 - a. A retaining wall with a design service life of 75 years. All walls are presumed to be permanent walls unless otherwise specified in the Drawings.
- 2. Temporary Wall
 - a. A retaining wall with a design service life of 3 years or less.
- 3. MSE Wall
 - a. A wall consisting of a volume of select backfill with tensile earth reinforcement elements distributed throughout.

- 4. Concrete Block Wall
 - a. A retaining wall that uses machine-made, precast concrete block units as facing elements.

C. Reference Standards

- 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
- 2. ASTM International (ASTM):
 - a. C90, Standard Specification for Loadbearing Concrete Masonry Units.
- 3. Texas Department of Transportation (TxDOT) Test Procedures:
 - a. Tex-128-E, Determining Soil pH.
 - b. Tex-129-E, Measuring the Resistivity of Soil Materials.
 - c. Tex-411-A, Soundness of Aggregate Using Sodium Sulfate or Magnesium Sulfate.
 - d. Tex-460-A, Determining Crushed Face Particle Count.

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Working Drawings

- 1. When proprietary wall systems are used submit casting drawings, construction drawings, and design calculations signed and sealed by a professional engineer licensed in the State of Texas.
- 2. For any retaining wall with a maximum height of 4 feet or greater provide casting drawings, construction drawings, and design calculations signed and sealed by a professional engineer licensed in the State of Texas.

B. Casting Drawings

- 1. Provide all information necessary for casting wall elements, including:
 - a. Railing and coping when prefabricated
 - b. Shape and dimensions of panels
 - c. Size, quantity, and details of the reinforcing steel
 - d. Size, quantity, type, and details of connection and lifting hardware

C. Construction Drawings

- 1. Provide a numbered panel layout showing horizontal and vertical alignment of the walls as well as the existing and proposed groundlines.
- 2. Provide all information necessary to erect walls including:
 - a. Proposed leveling pad elevations
 - b. The type and details of the soil reinforcing system
 - c. The details and manufacturer of all pads, fillers, and filter fabric
 - d. Limits, dimensions, and type of structural backfill

1 e. Details necessary to incorporate coping, railing, inlets, drainage, and electrical
2 conduit

3 **D. Design Calculations**

4 1. Provide calculations covering the range of heights and loading conditions on the
5 project.

6 2. Provide calculations for both internal and external stability as described on the
7 plans.

8 3. Provide summary of all design parameters used, including:

9 a. Material types, strength values, and assumptions

10 b. Loads and loading combinations

11 c. Factor of safety parameters

12 **1.7 CLOSEOUT SUBMITTALS**

13 **A. Record Documentation**

14 1. Upon completion of construction, submit a set of reproducible as-built drawings.

15 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

16 **1.9 QUALITY ASSURANCE [NOT USED]**

17 **1.10 DELIVERY, STORAGE, AND HANDLING**

18 **A. Storage and Handling Requirements**

19 1. Secure and maintain a location to store the material in accordance with Section 01
20 66 00.

21 2. Cement and Supplementary Cementitious Material

22 a. In accordance with Section 03 00 00.

23 3. Steel Reinforcement

24 a. In accordance with Section 03 00 00.

25 4. Chemical Admixture, Epoxy, Curing Compound, and Other Materials

26 a. Follow manufacturer's instructions regarding storage and application at
27 temperatures of material.

28 5. Epoxy

29 a. In accordance with Section 32 13 13.

30 **1.11 FIELD CONDITIONS**

31 **A. Ambient Conditions**

32 1. Surface temperature must be at least 40° F and the ambient temperature must be 45°
33 F and rising.

34 2. Do not install retaining walls during or shortly after rain events which prevent
35 proper placement of wall elements, backfill, or embankments.

36 a. Do not resume retaining wall construction until area within wall limits dries to
37 optimal density.

38 **1.12 WARRANTY [NOT USED]**

1 **PART 2 - PRODUCTS**

2 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

3 **2.2 MATERIALS**

4 A. Concrete

- 5 1. Provide concrete for retaining walls in accordance with Section 03 00 00, Section
6 03 30 00, and in accordance with the criteria below:

7

Application	Concrete
Cast-in-place	Class F, 4,000 psi
Precast	Class H, 4,000 psi

8 B. Reinforcing Steel

- 9 1. Provide reinforcing steel in accordance with Section 03 00 00.
10 2. Epoxy coat all steel used in concrete panels and coping including connectors,
11 dowels, stirrups, and reinforcing steel when the Drawings specify epoxy coating of
12 steel earth reinforcements.

13 C. Concrete Blocks

- 14 1. Provide machine-made concrete block units in accordance with ASTM C90, Class
15 1, Type II, with a minimum 28-day compressive strength of 4,000 psi and a
16 maximum moisture absorption of 7 percent.
17 2. Provide units with molded dimensions within 1/8 inch of specified dimension
18 horizontally and 1/16 inch vertically.
19 3. Provide sample block units displaying the color, texture, and finish prior to
20 delivery.

21 D. Backfill

- 22 1. General
23 a. Provide backfill free from organic or otherwise deleterious materials.
24 b. Provide backfill free from shale, caliche, or other soft, poor-durability coarse
25 aggregate particles.
26 c. RAP is not allowed.
27 d. Crushed concrete is not allowed.
28 e. Manufactured sand is allowed for temporary walls only.
29 2. Non-Select
30 a. Furnish non-select backfill in accordance with Section 31 24 00.
31 b. Use non-select backfill for walls other than temporary and permanent MSE and
32 concrete block walls as specified in the Drawings.
33 3. Select
34 a. Use select backfill for permanent and temporary MSE and concrete block walls
35 as specified in the Drawings.
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- b. Provide backfill in accordance with the gradation requirements of the table below for the type specified in the Drawings.

Type	Material	Recommended Use	Sieve Size	Percent Retained
AS	Gravel, crushed slag, crushed stone, or LRA	As directed in Drawings	3"	0
			1/2"	50-100
			#4	See Note*
			#200	95-100
BS	Crushed gravel, crushed slag, crushed stone, or LRA	Permanent Walls	3"	0
			#4	See Note*
			#40	40-100
			#200	85-100
CS	Gravel, crushed slag, or crushed stone	Temporary Walls	3"	0
			#4	See Note*
			#200	75-100
DS	Crushed gravel, crushed slag, or crushed stone	Walls subject to inundation; wall below the 100-year flood elevation	3"	0
			3/8"	85-100
			#200	95-100

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* - When the backfill gradation results in 85 percent or more material retained on the #4 sieve, the backfill will be considered rock backfill.

- c. Furnish gravel with a minimum 95 percent of aggregates with two or more mechanically induced crushed faces in accordance with Tex-460-A.
- d. All select backfill particles larger than 1/4 inch must be angular or completely crushed.
- e. Rounded rock or rounded gravel is not allowed.
- f. Natural sand in accordance with the requirements of this Section is allowed.
- g. When nonmetallic or epoxy coated earth reinforcements are used furnish rock backfill with a maximum backfill particle size of 3/4 inch.
4. Drainage Aggregate
- a. When specified in the Drawings provide drainage aggregate in accordance with the gradation limits below.

Sieve Size	Percent Retained
1"	0
3/4"	25-50
1/2"	50-100
#4	75-100

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5. Cement Stabilized Backfill
- a. Stabilize Type CS backfill with 5% hydraulic cement by dry weight of the backfill material when specified in the Drawings.
6. Electrochemical Requirements
- a. When using permanent retaining wall systems with galvanized metallic earth reinforcements provide backfill with the following additional criteria:

- 1) The pH is between 5.5 and 10.0 in accordance with Tex-128-E.
 - 2) Resistivity is more than 3,000 ohm-cm in accordance with Tex-129-E.
- E. Filter Fabric
1. Provide Type 1 filter fabric in accordance with DMS-6200.
 2. Provide UV-resistant filter fabric when used as part of the exposed facing for a temporary wall.
- F. Earth Reinforcements
1. Furnish earth reinforcements as specified in the Drawings.
 2. Galvanize or epoxy coat all steel elements for permanent walls in contact with soil.
 3. Furnish nonmetallic, galvanized, or epoxy coated connection hardware to match the earth reinforcement.
- G. Subdrainage
1. In accordance with to Section 33 46 00.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Backfill Material Quality

1. Submit material tests from each backfill source location to verify they are in accordance with this Section.
 - a. Test each source of backfill for durability and soundness in accordance with Tex-411-A.
 - b. Backfill material with a maximum 5-cycle soundness loss exceeding 25 percent will be rejected.

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION

A. General

1. Grade the foundation for the wall to a width equal or exceeding the length of the reinforcing system.
2. Proof rolling
 - a. Use equipment that will apply sufficient load to identify soft spots that rut or pump.
 - 1) Acceptable equipment includes fully loaded single-axle water truck with minimum 1,500-gallon capacity.
 - b. City must be on-site during proof rolling operations.
 - c. Make at least two passes with the proof roller, offsetting each trip by at most one tire width.
 - d. Correct areas of rutting or pumping greater than 3/4 inch and unstable or non-uniform areas in accordance with this Section.

3. Place drilled shaft foundations in accordance with Section 34 41 24.
4. Place subdrainage in accordance with Section 33 46 00.

3.4 INSTALLATION

A. General

1. Construct walls to a horizontal tolerance of 3/4 inch when measured along a 10-foot straightedge.
2. Construct walls to an overall vertical tolerance of 1/2 inch per 10 feet of wall height.
3. Prevent surface water from damaging the retaining wall during construction.
 - a. Shape the backfill form to prevent water from ponding or flowing on the backfill or against the wall face.
 - b. Remove and replace all portions of the retaining wall damaged or moved out of tolerance.

B. Cast-in-Place Concrete Walls

1. Construct cast-in-place concrete walls in accordance with Section 03 30 00.

C. Permanent MSE Walls

1. Concrete Leveling Pad
 - a. Place concrete leveling pad as specified in the Drawings.
 - b. Wait a minimum of 24 hours before beginning panel erection.
 - c. Shim the first row of panels as necessary to achieve correct alignment.
 - 1) Use plastic shims or other material that will not deteriorate.
 - 2) If the required shim height exceeds 1 inch remove and replace the leveling pad or provide grout level-up as directed.
2. Place filter fabric behind the wall along the joint between the leveling pad and the panels. Grout areas where filter fabric spans more than 6 inches at leveling pad steps.
3. Place and compact fill material over the leveling pad to an elevation even with or above the surrounding ground after backfilling the first row of panels. Do not allow water to accumulate and stand at the base of the wall.
4. Place filter fabric behind all wall joints and at the intersection of retaining walls with other structures. Cover joints at least 6 inches on each side and use adhesive to hold the fabric in place.
5. Place panels with care to prevent damage.
 - a. Stop any operation that results in chipping, spalling, or cracking of panels.
 - b. Remove and replace damaged panels.
6. Provide external bracing for the initial row of panels.
 - a. Use wooden wedges, clamps, or other means necessary to maintain position and stability of panels during placement and compaction of backfill.
 - b. Remove wooden wedges as soon as the panel or coping above the wedged element is erected and backfilled.
 - c. Remove all wedges after completing the wall.
7. Construct walls so the maximum offset at any panel joint is 3/4 inch and no joint is open to the extent the filter fabric is visible from the front of the wall.

- 1
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8. Check each row of panels for plumbness and position before placing the subsequent row. Remove and rebuild any portion of the wall out of tolerance.

- 1 9. Place backfill and embankment material in accordance with Section 31 24 00.
- 2 a. Place backfill to closely follow the erection of each row of panels.
- 3 b. Place the select and embankment backfill to the same elevation where possible
- 4 and operate the compaction equipment over the interface.
- 5 c. Do not create a continuous, distinct, vertical joint between the select and
- 6 embankment backfill.
- 7 d. When using cement stabilized backfill place and compact the backfill within 2
- 8 hours of mixing.
- 9 e. Replace any panels or earth reinforcements damaged or displaced during
- 10 backfill and embankment placement or compaction.
- 11 10. Maintain the stability of the interface area between the existing ground and the
- 12 select fill when building a wall against existing ground. Remove and recompact
- 13 any material that loosens, caves, or falls.
- 14 11. Earth Reinforcements
- 15 a. Place and compact backfill to each reinforcement level prior to placing
- 16 reinforcement.
- 17 b. Place earth reinforcements perpendicular to the face of the wall.
- 18 c. Remove slack in connections prior to placing backfill.
- 19 d. Pre-tension each layer of reinforcement to remove slack prior to placing
- 20 backfill for systems using nonmetallic earth reinforcements.
- 21 e. Do not operate tracked equipment directly on any reinforcement.
- 22 12. Place filter fabric over rock backfill any time backfill type transitions to finer
- 23 gradation within the wall volume.
- 24 a. Overlap fabric at least 18 inches at splices, and extend it past the edge of the
- 25 rock backfill at least 18 inches.
- 26 13. Complete embankment and compaction after wall is fully constructed.
- 27 D. Temporary MSE Walls
- 28 1. Provide a facing system rigid enough to maintain a smooth and straight wall face
- 29 both during and after construction.
- 30 2. Place facing elements and filter fabric with no gaps in the facing or fabric.
- 31 3. Place earth reinforcements and compact backfill in accordance with this Section.
- 32 E. Concrete Block Walls
- 33 1. Place concrete block facing units in accordance with the approved working
- 34 drawings.
- 35 2. Fill voids within the units and fill the 1-foot zone immediately behind the facing
- 36 with drainage aggregate as specified in the Drawings.
- 37 3. Place facing elements with maximum 1/4 inch gaps between block units.
- 38 4. Place earth reinforcements and compact backfill in accordance with this Section.

39 **3.5 REPAIR [NOT USED]**

40 **3.6 RE-INSTALLATION [NOT USED]**

41 **3.7 SITE QUALITY CONTROL**

42 A. Field Tests and Inspections

- 43 1. Perform testing in accordance with Sections 03 00 00, 03 30 00, and 31 24 00.

- 1 B. Non-Conforming Work
2 1. The City may at any time reject a material if it is found to not be in accordance with
3 this Section.
4 2. Any rejection of materials or source locations will be at no cost to the City.

5 **3.8 SYSTEM STARTUP [NOT USED]**

6 **3.9 ADJUSTING [NOT USED]**

7 **3.10 CLEANING [NOT USED]**

8 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

9 **3.12 PROTECTION [NOT USED]**

10 **3.13 MAINTENANCE [NOT USED]**

11 **3.14 ATTACHMENTS [NOT USED]**

12 **END OF SECTION**

13

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

14

- 1 b. Payment
- 2 1) The work performed and materials furnished in accordance with this item
- 3 and measured as provided under “Measurement” will be paid for at the unit
- 4 price bid per lump sum for Irrigation System Restoration.
- 5 c. The price bid shall include:
- 6 1) Furnishing and installing Irrigation System Restoration as specified by the
- 7 Drawings
- 8 2) Trench excavation and backfill
- 9 3) All products required to install irrigation system
- 10 4) Product and installation testing
- 11 5) Licensed irrigator
- 12 6) Equipment
- 13 7) Tools
- 14 8) Equipment
- 15 9) Labor and incidentals needed to execute work

16 **1.3 REFERENCES**

17 A. Abbreviations and Acronyms

- 18 1. CWP – Cold Working Pressure
- 19 2. GPM – Gallons per Minute
- 20 3. PSI – Pounds per Square Inch
- 21 4. PVC – Polyvinyl Chloride

22 B. Reference Standards

- 23 1. ASTM International (ASTM):
- 24 a. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC)
- 25 Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- 26 b. D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated
- 27 Pipe (SDR Series).
- 28 2. NSF International (NSF):
- 29 a. 61, Drinking Water System Components – Health Effects.
- 30 3. Uniform Plumbing Code

31 **1.4 ADMINISTRATIVE REQUIREMENTS**

32 A. Preinstallation Meetings

- 33 1. Coordinate with the current owners of any existing irrigation system 1 week prior to
- 34 holding the preinstallation meeting.
- 35 2. Hold a preinstallation meeting 1 week prior to performing any tasks included under
- 36 Irrigation Installation and Repair. Invite the City and the current owner (if other
- 37 than the City) of any existing irrigation system along with any appropriate
- 38 representatives. Prior to the preinstallation meeting, the following needs to be
- 39 prepared or conducted:
- 40 a. Irrigation Plan:
- 41 1) Provide an irrigation plan prepared, signed, and sealed by a licensed
- 42 irrigator.
- 43 2) Test the existing system prior to meeting in accordance with Quality
- 44 Assurance.

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to delivery.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Shop Drawings

6 1. Product Data

7 a. Provide electronic product data from each manufacturer supplying irrigation
8 products to be used on the project.

9 b. Product data sheets will include:

10 1) Manufacturer name

11 2) Date

12 3) Product description

13 4) Verification that the product meets the required standards stated in this
14 specification.

15 5) Produce data and test results as required in this specification

16 6) Material Safety Data Sheets, if applicable

17 7) Manufacturer Recommended Storing Data, if applicable

18 8) Usage and Installation Recommendations

19 B. Information Submittals

20 1. Trench Safety Plan

21 a. Provide a trench safety plan if required in accordance with Occupational Safety
22 and Health Administration CFR 29, Part 1926-Safety regulations, Subpart P-
23 Excavations. If required provide shop drawings in accordance with Section 33
24 05 05.

25 2. Backflow Prevention Testing

26 a. Provide backflow prevention test results performed by a Certified Backflow
27 Tester.

28 **1.7 CLOSEOUT SUBMITTALS**

29 A. Operation and Maintenance Data

30 1. Provide any manufacturer recommended operation and maintenance information to
31 the City and irrigation system owner (if other than the City) once the irrigation
32 system is installed.

33 B. Warranty Documentation

34 1. Provide any manufacturer warranty information to the City and irrigation system
35 owner (if other than the City) once the irrigation system is installed.

36 2. Transfer any manufacturer irrigation warranties to the City or irrigation owner
37 following irrigation installation if applicable.

38 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

39 **1.9 QUALITY ASSURANCE**

40 A. Qualifications

41

- 1 1. Licensed Professionals
- 2 a. Provide an irrigator licensed in the State of Texas to oversee the construction of
- 3 all Irrigation Installation and Restoration work performed.
- 4 B. Preconstruction Testing
- 5 1. Coordinate with the owners of any existing irrigation systems to schedule a
- 6 preconstruction test. Invite the irrigation system owners and the City along with
- 7 their appropriate representatives to witness the preconstruction test.
- 8 2. Perform a preconstruction test of any existing irrigation systems and provide
- 9 documentation of the working condition of any existing irrigation system. Include
- 10 the following documentation:
- 11 a. Photos, videos, and site notes that adequately document the existing condition
- 12 of each zone, controller equipment, sprinkler heads, and drip lines.
- 13 b. Provide any additional documentation that is available such as record drawings.

14 **1.10 DELIVERY, STORAGE, AND HANDLING**

15 A. Storage and Handling Requirements

- 16 1. Secure and maintain a location to store the material in accordance with Section 01
- 17 66 00.

18 **1.11 SITE CONDITIONS**

19 A. Ambient Conditions

- 20 1. In accordance with applicable specifications and manufacturer recommendations
- 21 for all water products. Applicable specifications include, but are not limited to
- 22 Section 33 14 11.

23 B. Existing Conditions

- 24 1. Prior to performing work:
- 25 a. Locate all existing utility lines in accordance with State and local requirements
- 26 b. Verify power source for existing and proposed irrigation systems
- 27 c. Document existing irrigation system in accordance with Administrative
- 28 Requirements, if applicable
- 29 d. Locate all existing irrigation structures which may include, but are not limited
- 30 to water lines, controllers, sprinkler heads, and drip lines

31 **1.12 WARRANTY [NOT USED]**

32 **PART 2 - PRODUCTS**

33 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

34 **2.2 PRODUCTS**

35 A. General

- 36 1. Provide products specified in the Drawings or approved equal.
- 37 2. Substitution requests for manufacturers or models shall be processed in accordance
- 38 with Section 01 25 00.

39 B. Manufacturers

- 1 1. Control Valves
 - 2 a. Drip Zones
 - 3 1) Rain Bird, X CZ-100-PRB-COM
 - 4 b. Master Valve, 1"
 - 5 1) Rain Bird, 100-PEB
 - 6 c. Master Valve, 1.5"
 - 7 1) Rain Bird, 150-PEB
 - 8 d. Master Valve, 2"
 - 9 1) Rain Bird, 200-PEB
 - 10 e. Flow Meter, 1"
 - 11 1) Netafilm, 1" Water Meter Cast Iron
 - 12 f. Flow Meter, 2"
 - 13 1) Netafilm, 2" Water Meter Cast Iron
 - 14 g. Isolation Valve
 - 15 1) Spears HD, CWV
 - 16 h. Quick Coupler
 - 17 1) Rain Bird, 33-DRC
- 18 2. Drip Tubing and Fitting
 - 19 a. Standard Drip
 - 20 1) Rain Bird, XFS-09-12
 - 21 b. Check Valve Drip
 - 22 1) Rain Bird, XFCV-09-12
 - 23 c. Drip Tube Fittings
 - 24 1) Rain Bird, XF™ Series 17mm Insert Fittings
 - 25 d. Tree Bubbler
 - 26 1) Hunter, PCN-50
 - 27 e. Tree Bubbler Head, 4"
 - 28 1) Hunter, 1804-SAM-PRS
 - 29 f. Operation Indicator
 - 30 1) Rain Bird, XFS OPERIND X17500
- 31 3. Controllers
 - 32 a. Motorola, IRRInet AC/DC
 - 33 b. Rain Bird, WR2-RFC Rain/Freeze Combo
 - 34 c. Others as specified by the City
- 35 4. Backflows
 - 36 a. Wilkins, RPZ 375XL 115 Lead Free
 - 37 b. Wilkins, RPZ 375XL 020 Lead Free
- 38 5. Backflow Enclosures
 - 39 a. Dekorra, 302-BG-C3
 - 40 b. Dekorra, 603GN
- 41 6. Valve Boxes
 - 42 a. Large Rectangle Box (21"x15"x13")
 - 43 1) NDS, 117BC
 - 44 b. Standard Rectangle Box (17"x12"x12")
 - 45 1) NDS, 113BC
 - 46 c. 6" Round Box
 - 47 1) NDS, 107BC
 - 48 d. 10" Round Box

- 1) NDS, 111BC
7. Flow Sensor
 - a. Arad, AC Flow Meter
 - b. Others as specified by the City
- C. Polyvinyl Chloride (PVC) Pipe
 1. Provide PVC pipe in accordance with:
 - a. ASTM D1784
 - b. ASTM D2241
 - c. NSF 61
 - d. Uniform Plumbing Code
 2. Provide PVC Class 200 SDR 21 for irrigation mainline.
 3. Provide PVC Class 200 SDR 21 for irrigation lateral line.
 4. Provide PVC Schedule 40 for pipe sleeves.
 5. Provide Detectable Warning Tape in accordance with Section 33 05 97.
- D. Polyvinyl Chloride (PVC) Fittings
 1. Provide PVC fittings in accordance with:
 - a. ASTM D1784
 - b. ASTM D2241
 - c. NSF 61
 - d. Uniform Plumbing Code
 2. Provide fittings that are solvent weld type, schedule 40, and of the type recommended by the pipe manufacturer for the size and intended use.
 3. If connecting to a metal pipe or metal accessory, use a PVC adapter with female thread. Any PVC pipe that is connected by any other means may be considered non-conforming. Obtain written approval from the City if another connection method has been approved.
- E. Irrigation Heads or Bubblers
 1. Refer to the Drawings for the nozzle sets, circle angles, and product series.
 2. Provide irrigation heads or bubblers that conform to the requirements of the manufacturer designated on the Drawings or approved equal.
- F. Wire and Wire Connectors
 1. Provide copper wiring UL approved, Type UF, PVC insulated, 14 gage, suitable for direct burial, and in accordance with the requirements for a NEC Class 2 circuit (30 volts AC or less).
 2. Provide direct burial wire connectors that have a one-piece PVC housing that when filled with silicone forms a reusable, one-piece, moisture-proof wire splice connector.
 3. Provide wire connectors that are U.L. listed, rated 60C, 500 volts, for PVC insulated wire.
 4. Do not use epoxy type wire connectors.
- G. Gate Valves
 1. Provide a gate valve rated for a minimum 150 PSI working pressure.
 2. Provide a gate valve in accordance with the size specified in the Drawings.

- 1 3. For any gate valve 2 inches in size or smaller, use Ohio bras or approved equal.
- 2 4. Install the gate valve per City Standard Details or Drawings.

3 H. Valve Boxes

- 4 1. For any electric valves, provide a plastic valve box rated for use with electric
- 5 control valves.

6 I. Electric Section Control Valves

- 7 1. Provide the size specified in the Drawings.
- 8 2. Only one electric section should operate at one time on any one controller.
- 9 3. Electric sectional control valves
 - 10 a. Globe-type diaphragm valves of normally open design
 - 11 b. 24 VAC electric solenoid control operated,
 - 12 c. Equipped with flow adjustment stems,
 - 13 d. Cold working pressure (CWP) of 150 PSI
 - 14 e. Plastic bodies and covers.

15 2.3 ACCESSORIES [NOT USED]

16 2.4 SOURCE QUALITY CONTROL

17 PART 3 - EXECUTION

18 3.1 INSTALLERS [NOT USED]

19 3.2 EXAMINATION [NOT USED]

20 3.3 PREPARATION

21 A. Demolition / Removal

- 22 1. Prior to removal or shut-off of any existing irrigation systems, notify the owner
- 23 within 48 hours.

24 3.4 INSTALLATION

25 A. Trench Excavation and Backfill

- 26 1. Trenching and backfilling are considered subsidiary to the irrigation installation bid
- 27 items.
- 28 2. Perform trench excavation and backfill in accordance with Section 33 05 05 unless
- 29 otherwise specified in the Drawings or this Section.
- 30 3. Trench Excavation
 - 31 a. Maintain a minimum distance of 6 inches between parallel lines.
 - 32 b. Excavate to a depth that provides the following cover from finished grade:
 - 33 1) 30 inches minimum under vehicle traffic area
 - 34 2) Non-vehicle traffic areas:
 - 35 a) 18 inches minimum for lateral lines
 - 36 b) 24 inches minimum for main lines
- 37 4. Backfill

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- a. Backfill the trench after the irrigation system is operational and required testing and inspection has been performed by the City and a licensed irrigator.
 - b. Embedment material is not required unless otherwise specified in the Drawings.

- 1 c. Backfill Material:
 - 2 1) Initial Backfill
 - 3 a) Remove any rocks or stones larger than 1 inch from the backfill
 - 4 material for 6 inches above the top of pipe.
 - 5 b) Place marker tape on top of the initial trench backfill in accordance
 - 6 with Section 33 05 97.
 - 7 2) Final Backfill
 - 8 a) Remove any rocks or stones larger than 3 inches in diameter.
 - 9 3) All in-situ materials are considered acceptable unless otherwise specified in
 - 10 the Drawings.
 - 11 d. Compact in accordance with Section 33 05 05.
 - 12 e. For trenches that will have plantings installed at finished grade, flood the
 - 13 backfill prior to installing plantings using a jetting process.
 - 14 B. Pipe Laying
 - 15 1. Lay pipe at a minimum 1 foot from the back of curb, sidewalks, buildings, walls,
 - 16 and other objects, or as directed by the City.
 - 17 2. Install all PVC pipe connections and fittings in accordance with the manufacturer's
 - 18 recommendations and Section 33 14 11.
 - 19 C. Pipe Joints
 - 20 1. Install joints in accordance with the manufacturer's recommendations and Section
 - 21 33 14 11.
 - 22 2. Allow adequate time for joint solvent to form a chemical bond before disturbing the
 - 23 joint. Refer to manufacturer's recommendations. If no recommendation is given, do
 - 24 not disturb the joint for 15 minutes after joint is installed on pipe.
 - 25 D. Closing and Flushing of PVC Pipe
 - 26 1. Cap or plug pipes after installation to prevent entry of foreign materials that would
 - 27 obstruct the flow of water.
 - 28 2. Leave caps or plugs in place until it is time for final completion.
 - 29 3. At final completion, remove the caps, thoroughly flush all water lines, and perform
 - 30 any final testing necessary for final completion.
 - 31 E. Sprinkler Heads and Drip Tubing
 - 32 1. Install sprinkler heads and drip tubing in accordance with the manufacturer's
 - 33 recommendations at locations specified in the Drawings or as directed by the City.
 - 34 F. Wiring
 - 35 1. Install wire in trenches below the pipe or in a minimum 1-inch PVC pipe with at
 - 36 least 12 inches of cover of its entire run.
 - 37 2. Install wire in continuous lengths.
 - 38 3. Splice wire, if required, in valve boxes using waterproof materials.
 - 39 G. Valve and Valve Box Placement
 - 40 1. Install valves and valve boxes at a minimum 2 foot from the back of curb,
 - 41 sidewalks, buildings, walls, and other objects, or as directed by the City.
 - 42 2. Place valves and valve boxes in accordance with City Standard Details, applicable
 - 43 specifications, and the Drawings.

- 1 3. Valves
- 2 a. Install all gate, check, and control valves with a valve box to the same depth as
- 3 the irrigation pipe.
- 4 b. Provide a minimum of 12 inches of clearance from the top of the valve to the
- 5 surface of the valve box.
- 6 c. After valves are installed, fully open and fully close valves to ensure that all
- 7 parts are in working condition.
- 8 4. Valve Boxes
- 9 a. Set valve boxes plumb vertically and concentric with the valve stem.
- 10 b. If a valve box is relocated due to incorrect installation location, relocate at no
- 11 cost to the City.
- 12 c. Coil any excess wires inside the valve box.
- 13 d. When valve is located in pavement, install concrete collar around valve box in
- 14 accordance with City Standard Details.
- 15 e. Adjust valve box height to be flush with finished grade.
- 16 H. Controller
- 17 1. Install controllers in accordance with manufacturer's recommendations at locations
- 18 shown on the Drawings.
- 19 I. Backflow Prevention
- 20 1. Install backflow prevention in accordance with the manufacturer's
- 21 recommendations at locations shown on the Drawings or as directed.
- 22 2. Install the double check valve in a concrete meter box per City Standard Details or
- 23 the Drawings.
- 24 J. Sleeves & Encasement
- 25 1. Coordinate with the paving contractor to install sleeves as shown on the Drawings.
- 26 2. Install wiring and irrigation piping in separate encasements when under pavement.
- 27 3. For encasement pipes, provide a minimum of 12 inches of cover over the pipe.
- 28 a. For areas with surface improvements, cover is measured from the top of the
- 29 pipe to the bottom of subgrade or to the bottom of the sidewalk slab.
- 30 K. Boring
- 31 1. Boring is only allowed when specified in the Drawings. Coordinate with the City
- 32 for approval of boring locations and requirements.

33 **3.5 REPAIR AND RESTORATION**

- 34 A. Restore all existing surfaces and repair any existing structures or pipes that have been
- 35 damaged due to irrigation installation at no cost to the City.
- 36 B. If any existing irrigation systems have been damaged as a result of any construction
- 37 activities, repair and restore the existing irrigation system to the original condition.
- 38 1. Obtain approval from the irrigation system owner and provide approval to the City.

39 **3.6 RE-INSTALLATION [NOT USED]**

40 **3.7 SITE QUALITY CONTROL**

- 41 A. General

- 1 1. Provide a licensed irrigator to perform all required Site Quality Control testing.
- 2 2. Perform inspections throughout the duration of installation.
- 3 **B. Sprinkler/Dripline Layout and Spacing Inspection**
- 4 1. Verify the irrigation design is accurately installed in the field.
- 5 2. If spacing is not within 5 percent of the design spacing, adjust the layout at no cost
- 6 to the City.
- 7 3. If design cannot be met due to site constraints, obtain written approval from the
- 8 City and the licensed irrigator before modifying the layout.
- 9 **C. Pipe Installation Depth Inspection**
- 10 1. Verify the irrigation pipes were installed to the minimum depths in accordance with
- 11 this Section.
- 12 2. Verify all joints were installed correctly and there are no loose or non-compliant
- 13 joints.
- 14 **D. Hydrostatic Tests**
- 15 1. Provide a licensed irrigator during hydrostatic testing and notify the City in writing
- 16 48 hours in advance of testing.
- 17 2. Center load piping with initial backfill to prevent arching or slipping under
- 18 pressure.
- 19 3. After all welded joints have cured for at least 24 hours, test the mainlines from the
- 20 meter to the valves, with all valves closed, for at least 2 consecutive hours by
- 21 applying a continuous and static minimum 80 PSI water pressure. Repair leaks if
- 22 necessary and retest.
- 23 4. Maintain all mainline and lateral lines under static pressure for 24 hours without
- 24 leaks before final approval.
- 25 5. If the Hydrostatic Test indicates any leaks, repair at no cost to the City.

26 **3.8 SYSTEM STARTUP [NOT USED]**

27 **3.9 ADJUSTING [NOT USED]**

28 **3.10 CLEANING [NOT USED]**

29 **3.11 CLOSEOUT ACTIVITIES**

30 **A. Demonstration**

- 31 1. After installation is complete, hold a demonstration meeting and invite the licensed
- 32 irrigator who prepared the irrigation plans, the City, and the current owner (if other
- 33 than the City) of any existing irrigation systems along with any appropriate
- 34 representatives. At this meeting, perform the following tasks:
- 35 a. If there is an existing system:
- 36 1) Test the irrigation system and compare the functionality with the
- 37 documented conditions of any existing irrigation system.
- 38 b. If there is not an existing system:
- 39 1) Test the irrigation system to verify all zones, controllers, sprinkler heads,
- 40 and drip lines function as designed.

- 1 c. Obtain in writing the City and the irrigation owner (if other than the City) have
2 agreed the irrigation system functions as designed after the demonstration
3 meeting is held.
4 d. The meeting is required to be performed prior to final acceptance.

5 **B. Record of Installation**

- 6 1. Provide a Record of Installation set of Drawings to any existing irrigation system
7 owners with any warranties and product information at the completion of irrigation
8 system installation.
9 2. If the City is the owner of the irrigation system, provide the record drawings to the
10 prime contractor to be included with the overall record drawing set at the end of the
11 project.

12 **3.12 PROTECTION [NOT USED]**

13 **3.13 MAINTENANCE [NOT USED]**

14 **3.14 ATTACHMENTS [NOT USED]**

15 **END OF SECTION**

16

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

17

1 **SECTION 32 93 00**
2 **PLANTINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Material, installation, and maintenance requirements for:
7 a. Plantings (Tree, Shrub, Ground Cover, and Miscellaneous Plantings)
8 b. Topsoil, Seeding, and Sodding (Grass and Wildflowers)
9 c. Landscape Edging
10 d. Landscape Restoration
11 e. General Site Landscaping
12 f. Subsidiary Planting Items (Fertilizer, Mulch, Plant Supports, Mulch Tacking,
13 and Water)

14 B. Deviations from this City of Denton Standard Specification:

- 15 1. None.

16 C. Related Specification Sections include but are not limited to:

- 17 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
18 Contract.
19 2. Division 1 - General Requirements.
20 3. Section 03 00 00 – Concrete and Concrete Reinforcement.
21 4. Section 03 30 00 – Cast-in-Place Concrete.
22 5. Section 31 25 14 – Erosion and Sediment Control.
23 6. Section 32 13 13 – Concrete Paving.
24 7. Section 32 13 16 – Decorative Concrete Paving.

25 **1.2 PRICE AND PAYMENT PROCEDURES**

26 A. Measurement and Payment

- 27 1. Tree
28 a. Measurement
29 1) Measured per each Tree planted.
30 b. Payment
31 1) The work performed and materials furnished in accordance with this item
32 and measured as provided under “Measurement” will be paid for at the unit
33 price bid per each for Tree planted for:
34 2) Various caliper inches.
35 c. The price bid shall include:
36 1) Furnishing and installing Tree as specified by the Drawings
37 2) Preparing excavation pit
38 3) Topsoil, fertilizer, mulch, and planting mix
39 4) Plant supports
40 5) Loading

- 1 6) Unloading
- 2 7) Storing
- 3 8) Hauling
- 4 9) Handling all materials
- 5 10) Placing
- 6 11) All maintenance activities
- 7 2. Shrub
- 8 a. Measurement
- 9 1) Measured per each Shrub planted.
- 10 b. Payment
- 11 1) The work performed and materials furnished in accordance with this item
- 12 and measured as provided under “Measurement” will be paid for at the unit
- 13 price bid per each of Shrub planted for:
- 14 a) Various sizes.
- 15 c. The price bid shall include:
- 16 1) Furnishing and installing Shrub as specified by the Drawings
- 17 2) Preparing excavation pit
- 18 3) Topsoil, fertilizer, mulch, and planting mix
- 19 4) Plant supports
- 20 5) Loading
- 21 6) Unloading
- 22 7) Storing
- 23 8) Hauling
- 24 9) Handling all materials
- 25 10) Placing
- 26 11) All maintenance activities
- 27 3. Ground Cover
- 28 a. Measurement
- 29 1) Measured per square foot of Ground Cover planted.
- 30 b. Payment
- 31 1) The work performed and materials furnished in accordance with this item
- 32 and measured as provided under “Measurement” will be paid for at the unit
- 33 price bid per square foot for Ground Cover planted.
- 34 c. The price bid shall include:
- 35 1) Furnishing and installing Ground Cover as specified by the Drawings
- 36 2) Preparing excavation pit
- 37 3) Topsoil, fertilizer, mulch, and planting mix
- 38 4) Plant supports
- 39 5) Loading
- 40 6) Unloading
- 41 7) Storing
- 42 8) Hauling
- 43 9) Handling all materials
- 44 10) Placing
- 45 11) All maintenance activities
- 46 4. Miscellaneous Planting
- 47 a. Measurement
- 48 1) Measured per square foot of Miscellaneous Planting planted.

- 1 b. Payment
- 2 1) The work performed and materials furnished in accordance with this item
- 3 and measured as provided under “Measurement” will be paid for at the unit
- 4 price bid per square foot for Miscellaneous Planting installed.
- 5 c. The price bid shall include:
- 6 1) Furnishing and installing Miscellaneous Planting as specified by the
- 7 Drawings
- 8 2) Preparing excavation pit
- 9 3) Topsoil, fertilizer, mulch, and planting mix
- 10 4) Plant supports
- 11 5) Loading
- 12 6) Unloading
- 13 7) Storing
- 14 8) Hauling
- 15 9) Handling all materials
- 16 10) Placing
- 17 11) Tools
- 18 12) Equipment
- 19 13) All maintenance activities
- 20 5. Landscape Edging
- 21 a. Measurement
- 22 1) Measured per linear foot of Landscape Edging installed.
- 23 b. Payment
- 24 1) The work performed and materials furnished in accordance with this item
- 25 and measured as provided under “Measurement” will be paid for at the unit
- 26 price bid per linear foot for Landscape Edging installed for:
- 27 a) Concrete Landscape Edging, various widths and depths
- 28 (1) 6” wide, 12” depth, 6”x12”
- 29 (2) 12” wide, 12” depth, 12”x12”
- 30 (3) 12” wide, 24” depth, 12”x24”
- 31 b) Decorative Concrete Landscape Edging, 12”x12”
- 32 c) Plastic Landscape Edging
- 33 d) Metal Landscape Edging
- 34 c. The price bid shall include:
- 35 1) Furnishing and installing Landscape Edging as specified by the Drawings
- 36 2) Loading
- 37 3) Unloading
- 38 4) Storing
- 39 5) Hauling
- 40 6) Handling all materials
- 41 7) Placing
- 42 8) All maintenance activities
- 43 6. Topsoil
- 44 a. Measurement
- 45 1) Measured per cubic yards of Topsoil installed.
- 46 b. Payment

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- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per cubic yard for Topsoil installed.

- 1 c. The price bid shall include:
 - 2 1) Furnishing and installing Topsoil as specified by the Drawings
 - 3 2) Salvaging existing topsoil
 - 4 3) Loading
 - 5 4) Unloading
 - 6 5) Storing
 - 7 6) Hauling
 - 8 7) Handling all materials
 - 9 8) Placing
 - 10 9) All maintenance activities
- 11 7. Seeding
 - 12 a. Measurement
 - 13 1) Measured per square yard of Seed installed.
 - 14 b. Payment
 - 15 1) The work performed and materials furnished in accordance with this item
 - 16 and measured as provided under "Measurement" will be paid for at the unit
 - 17 price bid per square yard of Seeding installed for:
 - 18 a) Grass Seeding.
 - 19 b) Wildflower Seeding.
 - 20 c. The price bid shall include:
 - 21 1) Furnishing and installing Seeding as specified by the Drawings
 - 22 2) Rolling and tamping
 - 23 3) Loading
 - 24 4) Unloading
 - 25 5) Storing
 - 26 6) Hauling
 - 27 7) Handling all materials
 - 28 8) Placing
 - 29 9) Mulching and tacking, if required
 - 30 10) Fertilizer, if required
 - 31 11) Watering, until established
 - 32 12) All maintenance activities
- 33 8. Sodding
 - 34 a. Measurement
 - 35 1) Measured per square yard of Sodding installed.
 - 36 b. Payment
 - 37 1) The work performed and materials furnished in accordance with this item
 - 38 and measured as provided under "Measurement" will be paid for at the unit
 - 39 price bid per square yard of Sodding installed.
 - 40 c. The price bid shall include:
 - 41 1) Furnishing and installing Sodding as specified by the Drawings
 - 42 2) Rolling and tamping
 - 43 3) Loading
 - 44 4) Unloading
 - 45 5) Storing
 - 46 6) Hauling
 - 47 7) Handling all materials
 - 48 8) Placing

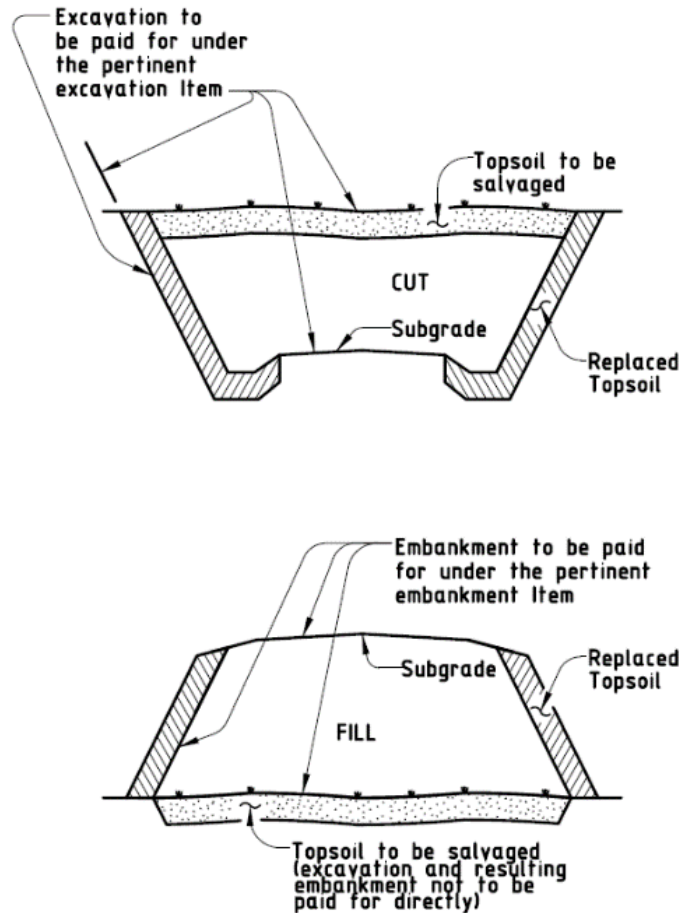
- 1 9) Mulching and tacking, if required
- 2 10) Fertilizer, if required
- 3 11) Watering, until established
- 4 12) All maintenance activities
- 5 9. Landscape Restoration
- 6 a. Measurement
- 7 1) Measured lump sum of Landscape Restoration installed
- 8 b. Payment
- 9 1) The work performed and materials furnished in accordance with this item
- 10 and measured as provided under “Measurement” will be paid for at the unit
- 11 price bid per lump sum for Landscape Restoration.
- 12 c. The price bid shall include:
- 13 1) Furnishing and installing Landscape Restoration as specified by the
- 14 Drawings
- 15 2) Preparing excavation pit
- 16 3) Topsoil, fertilizer, mulch, and planting mix
- 17 4) Plant supports
- 18 5) Loading
- 19 6) Unloading
- 20 7) Storing
- 21 8) Hauling
- 22 9) Handling all materials
- 23 10) Placing
- 24 11) All maintenance activities
- 25 10. General Site Landscaping
- 26 a. Measurement
- 27 1) Measured lump sum of General Site Landscaping installed
- 28 b. Payment
- 29 1) The work performed and materials furnished in accordance with this item
- 30 and measured as provided under “Measurement” will be paid for at the unit
- 31 price bid per lump sum for General Site Landscaping installed.
- 32 c. The price bid shall include:
- 33 1) Furnishing and installing General Site Landscaping as specified by the
- 34 Drawings
- 35 2) Preparing excavation pit
- 36 3) Topsoil, fertilizer, mulch, and planting mix
- 37 4) Plant supports
- 38 5) Loading
- 39 6) Unloading
- 40 7) Storing
- 41 8) Hauling
- 42 9) Handling all materials
- 43 10) Placing
- 44 11) All maintenance activities

45 1.3 REFERENCES

- 46 A. Abbreviations and Acronyms
- 47 1. PSF – Pounds per Square Foot

- 1 2. PSI – Pounds per Square Inch
- 2 3. B&B – Balled and Burlapped
- 3 B. Definitions

4 **Figure 1**
5 **Limits of excavation, embankment, salvaged topsoil and replaced topsoil**
6



- 7
- 8 C. Reference Standards
- 9 1. Reference standards cited in this Section refer to the current reference standard
- 10 published at the time of the latest revision date logged at the end of this Section
- 11 unless a date is specifically cited.
- 12 2. American Joint Committee on Horticultural Nomenclature
- 13 a. Standardized Plant Names
- 14 3. American National Standard Institute ANSI:
- 15 a. ANSI Z60.1 – American Standard for Nursery Stock
- 16

- 1 4. Texas Department of Agriculture Standards:
 - 2 a. Texas Seed Law
 - 3 b. Texas Fertilizer Law
- 4 5. Texas Department of Transportation, Standard Specifications for Construction and
5 Maintenance of Highways, Streets, and Bridges (TxDOT):
 - 6 a. Item 7, Article 7, “Preservation of Cultural and Natural Resources and the
7 Environment”
- 8 6. TxDOT Test Procedures:
 - 9 a. Tex-128-E, Determining Soil pH.

10 **1.4 ADMINISTRATIVE REQUIREMENTS**

11 **A. Coordination**

- 12 1. Coordinate with irrigation installation to ensure plantings receive required amount
13 of water. The Contractor is responsible for all watering required in accordance with
14 this Section.

15 **B. Pre-Planting Meetings**

- 16 1. Coordinate with the current owners of any existing landscape areas 1 week prior to
17 holding the pre-planting meeting.
- 18 2. Hold a pre-planting meeting 1 week prior to performing any tasks included under
19 Plantings. A second pre-planting meeting may be required if seeding/sodding
20 activities are performed more than 3 weeks apart from planting activities. Invite the
21 City and the current owner (if other than the City) of any existing landscape areas
22 along with any appropriate representatives. Prior to the pre-planting meeting, the
23 following needs to be prepared or conducted:
 - 24 a. Landscape Plan:
 - 25 1) Provide a landscape plan prepared, signed, and sealed by a licensed
26 landscape architect.
 - 27 2) Document existing landscape areas during the growing and blooming
28 season. Documentation to include at a minimum quantity, location, and
29 condition of all existing landscape areas.

30 **1.5 SUBMITTALS [NOT USED]**

31 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

32 **A.** Submittals shall be in accordance with Section 01 33 00.

33 **B.** All submittals shall be approved by the City prior to delivery.

34 **C. Shop Drawings**

- 35 1. Product Data
 - 36 a. Provide product data for the following products to be used during Planting
37 activities.
 - 38 1) Tacking Agents
 - 39 2) Fertilizer
 - 40 3) Tree Trunk Protection
 - 41 4) Landscape Edging
 - 42 5) Insect, Disease, and Animal Treatment
 - 43 a. Product data sheets will include:

- 1) Manufacturer name or source location
 - 2) Date
 - 3) Product description
 - 4) Verification that the product meets the required standards stated in this specification.
 - 5) Produce data and test results as required in this specification
 - 6) Material Safety Data Sheets, if applicable
 - 7) Manufacturer Recommended Storing Data, if applicable
 - 8) Usage and Installation Recommendations
 - 9) Maintenance recommendations, if applicable
2. Plantings
- a. Provide the following information for any plantings:
 - 1) Nursery Name and Location
 - 2) Date
 - 3) Plant description
 - 4) Certification that the plants meet the specification requirements
 - 5) Produce data and test results as required in this specification
 - 6) Planting recommendations
 - 7) Maintenance recommendations
 3. Plastic and Metal Landscape Edging
 - a. Provide a shop drawing of the product data for the plastic and/or metal landscape edging material being used. .
 4. Topsoil
 - a. Provide any offsite source location for topsoil and soil testing results.
 5. Sod
 - a. Provide source location and proposed grass type for all sod used on project site.
 6. Seed
 - a. Provide source location for seeding and seed type for all grass and wildflower seeding.
 7. Mulch
 - a. Provide no float cypress mulch or approved equal for use in landscape areas.
 - b. For all other types of mulch, provide source location, type of mulch, and composition for all mulch used on site.
 8. Concrete
 - a. Provide concrete mix design, integral color, stamp pattern, and sealant for all concrete and decorative concrete landscape edging in accordance with Sections 03 00 00, 32 13 13, and 32 13 16.
- D. Informational Submittals
1. Licensed Landscaper
 - a. Provide information and applicable certifications for the licensed landscape architect or a landscaper of sufficient experience in project specific plantings.
 2. Equipment Submittals:
 - a. Submittal for all major equipment to include:
 - 1) Equipment name and description
 - 2) Size
 - 3) Intended use

1 **1.7 CLOSEOUT SUBMITTALS**

2 A. Maintenance Recommendations

- 3 1. Provide any nursery or supplier recommendations for care and maintenance of
4 plants and plant materials to the City.

5 B. Warranty Documentation

- 6 1. Provide any nursery or supplier warranty information to the City.
7 2. Transfer any nursery or supplier warranties to the City if applicable.

8 **1.8 MAINTENANCE MATERIAL SUBMITTALS**

- 9 A. Maintain all plantings for 1 year. No separate pay will be provided for maintenance
10 period.

11 **1.9 QUALITY ASSURANCE**

12 A. Qualifications

13 1. Licensed Professionals

- 14 a. Provide a landscape architect or qualified landscaper during planting.

15 2. Planting Substitutions

- 16 a. No substitutions will be allowed without written approval by the City. The
17 following is required when requesting a plant substitution:
18 1) Submit proof of non-availability together with proposal for use of
19 equivalent material.
20 2) Substitutions of larger size or better grade than specified will be allowed
21 upon approval by the City. No additional payment or increase in unit price
22 will be given.

23 **1.10 DELIVERY, STORAGE, AND HANDLING**

24 A. Delivery and Acceptance Requirements

25 1. Plants

26 a. General:

- 27 1) Notify City at least 48 hours prior to delivering plants to the site.
28 2) Coordinate with the City for inspection and approval of materials upon
29 delivery.
30 3) Remove rejected plants from the workplace and replace as directed.

31 b. When planting is delayed more than 6 hours after delivery

- 32 1) Set plants in the shade
33 2) Protect from weather and mechanical damage
34 3) Keep roots moist by covering with mulch, burlap, or other acceptable
35 means of retaining moisture. Water as needed.

36 2. Trees

- 37 a. Ship trees with Certificates of Inspection as required by governing authorities.
38 b. Label each tree and shrub with securely attached waterproof tag bearing legible
39 designation of botanical and common name.
40 c. Use protective covering during delivery.
41 d. Deliver packaged materials in fully labeled original containers showing weight,
42 analysis, and name of nursery.
43

1 B. Storage and Handling Requirements

- 2 1. Secure and maintain a location to store the material in accordance with Section 01
3 66 00.
- 4 2. Trees
- 5 a. Protect trees from deterioration during delivery and while being stored on-site.
- 6 b. Do not prune prior to planting.
- 7 c. Do not bend or bind-tie trees or shrubs in a way that will damage the bark,
8 break branches, or alter the natural shape.

9 C. Stockpiling

- 10 1. Topsoil
- 11 a. Stockpile topsoil, when necessary, in a windrow in approved locations within
12 the right of way or easements.
- 13 b. Keep source and stockpile areas drained.
- 14 c. Once topsoil has been removed from stockpiled location, restore stockpile site
15 to existing conditions or better.
- 16 2. Seed
- 17 a. If using native grass or wildflower seed, provide seed harvested within 100
18 miles of the site.
- 19 b. Provide each seed species in separate containers labeled with seed variety.
- 20 3. Sod
- 21 a. Protect sod from exposure to wind, sun, and freezing.
- 22 b. Keep stacked sod moist.
- 23 4. Fertilizer
- 24 a. Provide fertilizer in acceptable distribution condition and in containers labeled
25 with the analysis.

26 **1.11 SITE CONDITIONS**

27 A. Ambient Conditions

- 28 1. Follow all nursery and/or supplier recommendations for optimal weather conditions
29 for installation.
- 30 2. Comply with all requirements of this specification for planting, seeding, and
31 sodding timeframes.

32 B. Existing Conditions

- 33 1. Prior to performing work:
- 34 a. Locate all existing utility lines in accordance with Federal, State, and local
35 requirements.
- 36 b. Verify power source for existing and proposed irrigation systems.
- 37 c. Document existing irrigation system in accordance with Administrative
38 Requirements, if applicable.
- 39 d. Locate all existing irrigation structures which may include, but are not limited
40 to water lines, controllers, sprinkler heads, and drip lines.

41 **1.12 WARRANTY [NOT USED]**

1 **PART 2 - PRODUCTS**

2 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

3 **2.2 MATERIALS**

4 A. Plants

5 1. General:

- 6 a. Planting bid items are generic based on plant types. Refer to Drawings for
7 planting schedule and locations.
8 b. Provide nursery-grown plants unless otherwise specified in the Drawings.
9 c. Provide plants with the following characteristics:
10 1) vigorous, healthy, well-rooted plants
11 2) with well-formed crowns
12 3) true to sizes and of typical shape and characteristic of the species
13 d. Refer to Source Quality Control for non-conforming plants.

14 2. Plant Supports:

- 15 a. Provide a minimum 8-foot long steel T-stakes and 1-inch wide plastic tree
16 chains with protecting chain cover to interface with tree trunk or ArborTie or
17 similar product.
18 b. Deadman Anchoring System:
19 1) Where applicable for anchoring trees, obtain written approval for products
20 and installation method prior to planting trees.
21 c. Provide an ArborGard tree truck protector or similar product.

22 3. Trees

- 23 a. Tree characteristics:
24 1) True to species and variety specified
25 2) Straight and symmetrical
26 3) Grown under climatic conditions similar to those in the locality of the
27 project for at least 2 years
28 4) Freshly dug during the most recent favorable harvest season
29 5) Grown and harvested in accordance with the American Standard for
30 Nursery Stock
31 6) From a nursery within 200 miles of the project unless otherwise approved
32 7) Compatible with the cold hardiness zone of the project location
33 b. Mark the tree's north orientation in the nursery for all deciduous trees grown in
34 the field with a 1-inch diameter spot of white paint on the tree trunk within the
35 bottom twelve inches of the trunk.
36 c. Provide a tree with a crown in good overall proportion to entire height of the
37 tree with branching configuration as recommended by ANSI Z60.1 for the tree
38 specified.
39 d. Balled and Burlapped Trees
40 1) Provide trees balled and burlapped or in the container that the tree was
41 grown in.
42 2) Dig a size and shape conforming to the American Standard for Nursery
43 Stock.
44 3) Ensure the balls contain soil with as many fibrous roots as possible.
45 4) Wrap balls firmly with non-synthetic, rottable burlap and secure the burlap
46 using nails and heavy non-synthetic rottable twine.

- 1 5) Ensure the root collar is apparent (first lateral root visible) at the surface of
- 2 the ball after wrapping.
- 3 6) Trees with loose, broken, processed, or manufactured root balls will not be
- 4 accepted.
- 5 e. Caliper Measuring:
- 6 1) For trunks up to 4 inches or less in diameter: Measure the caliper 6 inches
- 7 above the top of root ball.
- 8 2) For trunks that are more than 4 inches in diameter: Measure the caliper 12
- 9 inches above the top of root ball.
- 10 3) Caliper Measurements:
- 11 a) By diameter tape measure
- 12 b) Indicated calipers on Drawings are minimum
- 13 c) Averaging of plant caliper is not permitted.
- 14 4. Backfill and Plant Soil Mix:
- 15 a. Use soil excavated from the plant pits or beds or provide a loose, friable soil
- 16 mix as specified in the Drawings.
- 17 b. Provide a mix free of:
- 18 1) reproductive parts of weeds and grasses
- 19 2) harmful substances and detrimental amounts of foreign matter
- 20 c. Use fertilizer when specified in the Drawings.
- 21 B. Landscape Edging
- 22 1. Concrete
- 23 a. Concrete Class: Class A
- 24 2. Decorative Concrete
- 25 a. Concrete Class: Class A
- 26 b. Provide the amount of color to be added to the concrete during production with
- 27 the concrete mix design.
- 28 c. Provide color in accordance with the requirements of the Drawings and Section
- 29 32 13 16.
- 30 3. Plastic and Metal
- 31 a. Plastic and metal landscape edging are not permitted unless otherwise specified
- 32 in the Drawings or approved in writing by the City.
- 33 b. Plastic and metal landscape edging will be permitted only in locations where
- 34 the proposed landscape edging is matching existing.
- 35 c. Provide the City with a shop drawing to review prior to purchasing the
- 36 landscape edging.
- 37 C. Topsoil
- 38 1. Approved Topsoil Sources:
- 39 a. Within the Right of Way:
- 40 1) Obtain topsoil from the right of way at sites of proposed excavation or
- 41 embankment when specified in the Drawings, or as directed by the City.
- 42 b. Outside the Right of Way:
- 43 1) Obtain topsoil from approved sources in accordance with Article 7.7
- 44 "Preservation of Cultural and Natural Resources and the Environment".
- 45 2. Topsoil characteristics:
- 46 a. Easily cultivated and fertile

- b. Free of objectionable material including subsoil, weeds, clay lumps, non-soil materials, roots, stumps, or stones larger than 1 inch in diameter
- c. Resists erosion
- d. Able to support plant growth
- e. When tested:
 - 1) pH: 5.5 to 8.5 per Tex-128-E
 - 2) Liquid Limit: 50 or less
 - 3) Plasticity Index: 20 or less
 - 4) Gradation: Maximum of 10 percent passing the No. 200 sieve

D. Seeding

1. General

- a. Provide seed from the previous season's crop in accordance with Texas Seed Law including the testing and labeling for pure live seed (PLS=Purity x Germination).
- b. Furnish Seed of the designated species in unopened and labeled bags or containers.
- c. Use within 12 months from the date of the analysis.
- d. When Buffalograss is specified, use seed treated with potassium nitrate (KNO₃).

2. Availability of Seed

- a. The City may permit the use of an alternative seed variety if the specified seed is not available.
- b. Receive approval in writing before using an alternative seed variety.

3. Unacceptable Seed Varieties

- a. Johnson Grass
- b. Nut Grass
- c. Use a seed product that does not contain more than 10 percent by weight of the total of pure live seed of weed seed.

4. Approved Seed Varieties

- a. Do not plant wildflower seed mixes:
 - 1) within 10 feet of a road or parking lot
 - 2) within 3 feet of a sidewalk, trail, or other walkway
- b. Ditch, Channel, and Rural Area Seeding:
 - 1) Plant between February 1 and May 15

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**Table 1
 Ditch, Channel, and Rural Area Seed Mix**

Clay Soils		Sandy Soils	
Species and Rates (pound PLS per acre)		Species and Rates (pound PLS per acre)	
Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
Shortspike Windmillgrass (Welder)	0.2	Slender Grama (Dilley)	1.0
Little Bluestem (OK Select)	0.8	Sand Lovegrass (Mason)	0.2
		Sand Dropseed (Borden County)	0.2
		Little Bluestem (OK Select)	0.8
Wildflower Seed Mixes			
Purple Prairie Clover (Cuero)	0.6	Partridge Pea (Comanche)	0.6
Englemann Daisy (Eldorado)	0.75	Englemann Daisy (Eldorado)	0.75
Illinois Bundleflower	1.3	Purple Prairie Clover	0.3
Awnless Bushsunflower (Plateau)	0.2		

- c. Urban Area Seeding
 1) Plant between February 1 and May 15

**Table 2
 Urban Area Seed Mix**

Clay Soils		Sandy Soils	
Species and Rates (pound PLS per acre)		Species and Rates (pound PLS per acre)	
Green Sprangletop	0.3	Green Sprangletop (Van Horn)	0.3
Sideoats Grama (El Reno)	3.6	Buffalograss (Texoka)	1.6
Buffalograss (Texoka)	1.6	Bermudagrass	3.6
Bermudagrass	2.4	Sand Dropseed (Borden County)	0.4

- d. Cool Weather Seeding
 1) Plant between September 1 and November 30

**Table 3
 Cool Weather Seed Mix**

Species and Rates (pound PLS per acre)	
Tall Fescue	4.5
Western Wheatgrass	5.6
Wheat (Red, Winter)	34

- e. Warm Weather Seeding
 1) Plant between May 1 and August 31

**Table 4
 Warm Weather Seed Mix**

Species and Rates (pound PLS per acre)

Foxtail Millet	34
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- 1 E. Sodding
- 2 1. Do not use sod from areas where the grass is thinned out.
- 3 2. Approved Sod Varieties
- 4 a. St. Augustine grass
- 5 b. Common Bermudagrass
- 6 c. Buffalograss
- 7 d. Approved varieties of Bermudagrass and Zoysia Grass
- 8 e. Match existing grass varieties where possible.
- 9 3. Acceptable Growing Bed Properties:
- 10 a. St. Augustine:
- 11 1) Clay or Clay Loam topsoil
- 12 b. Bermudagrass and Zoysia Grass:
- 13 1) Sandy or Sandy Loam soils
- 14 4. Sod characteristics:
- 15 a. Block, rolled, or solid
- 16 b. Free from insects, noxious weeds, Johnson grass, other grasses, stones, or any
- 17 matter deleterious to the growth and subsistence of the sod
- 18 c. Alive and growing grass and is of the type specified in the Drawings
- 19 d. Contains stolons, leaf blades, rhizomes, and dense matted roots throughout the
- 20 soil of the sod for a minimum of 1 inch
- 21 5. Acceptable Sod Dimensions
- 22 a. Machine cut to uniform soil thickness.
- 23 b. Has a uniform width and can be easily lifted, handled, and rolled without
- 24 breaking.
- 25 c. Minimum Sod Thickness: 3/4 inch
- 26 d. Maximum Grass Height: 2 inches
- 27 6. Keep sod material moist from the time it is dug until it is planted. Grass sod with
- 28 dried roots will be considered non-conforming. Any grass installed with dried roots
- 29 will be removed and replaced at no cost to the City.
- 30 7. Mulch sod is not approved for use.
- 31 8. Any broken or torn sod or sod with uneven ends will be considered non-conforming
- 32 and will be rejected. Remove any non-conforming sod at no cost to the City.
- 33 F. Landscape Restoration
- 34 1. Inventory all existing plantings prior to any construction activity.
- 35 2. Contractor to replace any existing plantings that have been damaged due to
- 36 construction activities and restore the landscape site to the existing condition or
- 37 better.
- 38 G. Water
- 39 1. Provide clean water free of industrial wastes and other substances harmful to the
- 40 growth of vegetation.
- 41 H. Fertilizer

1. Provide fertilizer in accordance with the requirements of the Texas Fertilizer Law and passes testing by the Texas A&M Feed and Fertilizer Control Service.
2. Acceptable Nitrogen, Phosphorus, and Potassium Composition
 - a. 16 percent Nitrogen, 20 percent Phosphorus, and 0 percent Potassium
 - b. 16 percent Nitrogen, 8 percent Phosphorus, and 8 percent Potassium
 - c. Ensure that 50 percent of the nitrogen component is a slow-release sulfur-coated urea.

I. Mulch

1. For Use on Seeding:
 - a. Straw Mulch:
 - 1) Oat, wheat, or rice straw
 - b. Hay Mulch:
 - 1) Hay mulch of either Bermudagrass or prairie grasses.
 - c. Characteristics:
 - 1) Free of Johnson grass and other noxious and foreign materials.
 - 2) Dry and free from molded or rotted material.
2. For Use on Landscape Areas:
 - a. Provide no float cypress mulch or approved equal.
 - b. Mulch characteristics:
 - 1) is free from growth or germination inhibiting qualities; and
 - 2) contains no more than 10 percent moisture.

J. Tacking Materials

1. Use a tacking agent applied in accordance with manufacturer's recommendations or a crimping method on all straw or hay mulch operations.
2. Use tacking agents as approved or as specified in the Drawings.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections

B. Non-Conforming Work

1. Rejection of Plants
 - a. Plants with any of the following characteristics are subject to rejection:
 - 1) Disease or insect infestation, including eggs and larvae
 - 2) Dried or damaged root system or crown
 - 3) Excessive abrasion of the bark
 - 4) Prematurely opened or damaged buds
 - 5) Disfiguring knots
 - 6) Evidence of heat, freeze, windburn, mold, sub scale, or similar conditions
 - 7) Damaged, pruned, crooked, or multiple leaders, unless multiple leaders are specified or are normal for the species
 - 8) Cut limbs over 3/4 inch in diameter that have not completely callused
 - 9) Dry, soggy, loose, cracked, broken, misshapen, or undersized root balls
 - 10) Processed balled roots (bench balled)
 - 11) Root balls encased in impervious material
 - 12) Overgrown or root-bound plants

- 1 13) Undersized or unsound containers
- 2 14) Containers with less than $\frac{3}{4}$ planting medium depth
- 3 15) An abnormal balance between height and spread for the species
- 4 16) Missing or broken serialized locking tags, when specified
- 5 17) Any condition not in accordance with the Drawings or nursery stock
- 6 standards
- 7 18) Conditions that would prevent thriving growth or cause an unacceptable
- 8 appearance
- 9 C. Manufacturer Services
- 10 D. Coordination of Other Tests and Inspections

11 **PART 3 - EXECUTION**

12 **3.1 INSTALLERS [NOT USED]**

13 **3.2 EXAMINATION [NOT USED]**

14 **3.3 PREPARATION**

15 A. Surface Preparation

16 1. Plants

17 a. Mark Plant Locations and Bed Outlines

- 18 1) Provide and install markings such as wooden stakes to mark the locations,
- 19 types of plants, and the outline of planting beds.
- 20 2) Obtain approval from the City and any applicable landscape bed owners of
- 21 the plant and bed locations before any planting activities begin.

22 2. Plant Bed Preparation

- 23 a. Prepare the bed and install the planting soil mix, vegetation barrier, and other
- 24 materials as specified in the Drawings.

25 3. Plant Soil Preparation

- 26 a. Clean topsoil of roots, plants, sod, stones, clay lumps, and other foreign
- 27 materials.
- 28 b. Mix fertilizer in with topsoil within 48 hours of planting.

29 4. Erosion Control Blanket

- 30 a. Prepare the site in accordance with the manufacturer's recommendations and
- 31 Section 31 25 14.

32 **3.4 INSTALLATION**

33 A. Finishing of Parkways

- 34 1. Finishing of parkways is considered subsidiary to pertinent items and will not be
- 35 paid for separately.
- 36 2. Smoothly shape parkways, shoulders, slopes, and ditches.
- 37 3. Grade parkways to finished slopes and elevations prior to the placement of any
- 38 Plantings within the site.
- 39 4. Standard Parkway Slopes
- 40 a. Minimum: 1 percent

- 1
 - 2
 - 3
 - 4
- b. Maximum: 4:1
 - c. Use standard parkway slopes unless otherwise specified in the Drawings or directed by the City.

- d. Where sidewalk is present, maintain the minimum parkway slope in accordance with the following criteria before transitioning to a steeper slope:
 - 1) from the back of curb to the face of sidewalk edge
 - 2) 2 feet from the back of sidewalk
- e. If no sidewalk is present, maintain minimum parkway slope 2 feet from the back of curb before transitioning to a steeper slope.

B. Plants

1. Plant Pit Excavation

- a. Excavate the receiving pits for mechanically transplanted plants with the same type and size equipment used to dig the plants.
- b. Depth:
 - 1) Excavate pits for container and balled and burlapped stock to the depth specified in the Drawings or at least the depth of the root ball.
 - 2) Excavate pits for bare root plants to the depth of the root system.
 - 3) Excavate pits on slopes using measurements specified in the Drawings or at least the depth of the root ball based on the uphill side of the pit.
- c. Horizontal Dimensions:
 - 1) Provide a minimum horizontal dimension of 12 inches between the root ball and pit walls for the following, unless otherwise specified in the Drawings:
 - a) 15 gallon or larger pots
 - b) 14 inch or larger boxes
 - c) Larger than 14-inch root balls of balled and burlapped plants
 - 2) Provide a minimum horizontal dimension of 2 times the root ball diameter across the pit for the following, unless otherwise specified in the Drawings:
 - a) Less than 15-gallon pots
 - b) 14 inch or smaller root balls of balled and burlapped plants.
 - 3) Provide a minimum pit diameter for bare root plants in accordance with the supplier's recommendations and allows the roots to spread without crowding or curving around the walls of the pit.

2. Plant Installation

- a. General Plant Installation:
 - 1) Install plants within 24 hours of excavating plant pits. Cover or barricade any planting pit to remain open overnight.
 - 2) Scarify the walls of pits as plant installation begins.
 - 3) Lift plants only from the bottom of the root balls or with belts or lifting harnesses that are wide enough to not damage the root balls.
 - 4) Center all plants in a pit, except those mechanically collected, and back fill in lifts using topsoil, fertilized topsoil, or planting mix as directed.
 - 5) Backfill in lifts where each lift is 1/3 of the depth of the root ball.
 - 6) Fill the pit with water after each lift to remove air pockets.
- b. Containerized Plants:
 - 1) Remove plastic, paper, or fibrous pots from the containerized plant material before planting.
 - 2) Pull roots out of the root mat and cut circling roots with a knife.
 - 3) Loosen the potting soil and shake away from the root mat.
 - 4) Install the plant immediately after removing the container, install the plant.

- 1 c. Balled and Burlapped (B&B) Plants
- 2 1) Cut and remove ropes or strings from the top of root balls and trees after
- 3 plant has been set.
- 4 2) Remove burlap or cloth wrapping and any wire baskets.
- 5 a) If site conditions do not allow complete removal, remove a minimum
- 6 of the top two-thirds of balls.
- 7 3) Do not turn under and bury portions of burlap at top of ball.
- 8 d. For mechanically collected plants:
- 9 1) Prune protruding roots from the root ball to a point even with the cutting
- 10 blades.
- 11 2) Place the plant in the pit and work sand between the pit walls and the root
- 12 ball with water until the sand fills all the cavities.
- 13 e. Apply fertilizer where specified in the Drawings.
- 14 f. Ensure top of the root ball remains at the grade specified in the Drawings after
- 15 settlement.
- 16 3. Pruning:
- 17 a. Perform in accordance with Section 31 10 00. Provide all required submittals
- 18 and testing required in accordance with Section 31 10 00.
- 19 b. Limit pruning to removal of dead and broken branches and as needed to
- 20 improve the appearance and health of the plants.
- 21 c. Remove and dispose of pruning debris.
- 22 4. Plant Supports:
- 23 a. Install plant supports such as staking, guying, anchoring, and bracing as
- 24 specified in the Drawings.
- 25 b. Support and keep plants in a vertical position or as directed.
- 26 5. Trunk Protection:
- 27 a. Perform in accordance with Section 31 10 00. Provide all required submittals
- 28 and testing required in accordance with Section 31 10 00.
- 29 6. Landscape Edging Installation
- 30 a. Concrete Landscape Edging (Concrete Mow Strips)
- 31 1) Concrete Class: Class A, 12 inches wide, 6 inches thick
- 32 2) Finish: Trowel
- 33 3) Sawing: 1.5" deep sawcut spaced at 6' on center
- 34 4) Jointing: If mow strip is adjacent to the back of curb or other pavement
- 35 structure, provide a doweled expansion joint between mow strip and
- 36 pavement.
- 37 b. Plastic or Metal Edging
- 38 1) Install landscape edging in accordance with the Drawings and
- 39 manufacturer's recommendations.
- 40 7. Mulching
- 41 a. Mulch plant beds to a depth of 2 inches unless otherwise specified in the
- 42 Drawings.
- 43 C. Landscape Edging
- 44 1. Concrete and Decorative Concrete
- 45 a. Install in accordance with Sections 03 30 00, 32 13 13, and 32 13 16.
- 46 2. Plastic and Metal
- 47 a. Install in accordance with manufacturer's recommendations.

1 D. Topsoil

- 2 1. Remove and dispose of objectionable material from the topsoil source before
3 starting work.
- 4 2. Cultivate the area to a depth of 4 inches before placing topsoil unless sodding is
5 installed. Refer to this Section for topsoil depth requirements.
- 6 3. Spread 4 inches of topsoil to a uniform loose cover unless another depth is specified
7 in the Drawings.
- 8 4. Place and shape the topsoil as directed.
- 9 5. Water and roll the topsoil with a light roller or other suitable equipment.

10 E. Seeding

- 11 1. General:
 - 12 a. In Areas Without Existing Grass:
 - 13 1) Cultivate the area to a depth of 4 inches before placing the seed.
 - 14 2) Smoothly distribute topsoil to a depth of 4 inches.
 - 15 b. In Areas with Existing Grass:
 - 16 1) Mow the area before placement of the permanent seed.
- 17 2. Broadcast Seeding:
 - 18 a. Broadcast seed in 2 directions at right angles to each other.
 - 19 b. After placing seeds, perform the following:
 - 20 1) In large seeding areas along ditches, channels, or rural areas:
 - 21 a) Roll the planted area with a light roller or other suitable equipment.
 - 22 2) In urban seeding areas:
 - 23 a) Harrow or lightly rake the area to cover the seed.
 - 24 3) Avoid covering the seed with more soil than twice the seed's diameter.
 - 25 c. Wildflower Seeding:
 - 26 1) Scalp any existing grass to 1 inch and remove all grass clippings before
27 spreading wildflower seeds.
 - 28 3. Mechanically Seeding (Drilling):
 - 29 a. Uniformly distribute seed over the areas specified in the Drawings.
 - 30 b. All varieties of seed and fertilizer may be distributed at the same time provided
31 that each component is uniformly applied at the specified rate.
 - 32 c. Drill seed at a depth of 1/4 inch to 1/3 inch utilizing a pasture or rangeland type
33 drill.
 - 34 d. Plant seeds along the contour of slopes.
 - 35 e. After planting:
 - 36 1) Roll with a roller that is integral to the seed drill, or use a corrugated roller
37 referred to as a "Cultipacker."
 - 38 2) Roll sloped areas on the contour.
 - 39 4. Hydromulching is not allowed.
 - 40 5. Fertilize uniformly at the required rate over seeded area.
 - 41 6. Watering and Finishing
 - 42 a. Water soil to a minimum depth of 4 inches within 48 hours of seeding.
 - 43 b. Water twice daily for 14 days after seeding. Take care to prevent washing of the
44 slopes or dislodgement of the seed.
 - 45 1) If seed is washed away due to watering or rainfall, re-seed bare areas until
46 grass meets the required length for final acceptance at no cost to the City.

- 1 c. Continue watering until after final acceptance.
- 2 7. Final Turf Requirements
- 3 a. Continue seeding activities until seeded areas are free of bare areas.
- 4 b. Established Turf:
- 5 1) 100 percent growth to a height of 3 inches.
- 6 2) A minimum of 1 mow cycle has been completed.
- 7 c. Final acceptance won't be given until turf has been established.
- 8 F. Sodding
- 9 1. General:
- 10 a. Plant the sod specified and mulch, if required, after the area has been completed
- 11 to lines and grades as specified in the Drawings.
- 12 b. Use grass sod of the same grass type as the adjacent grass or existing lawn
- 13 unless otherwise specified in the Drawings or by the City.
- 14 c. Plant between the average date of the last freeze in the Spring and 6 weeks
- 15 before the average date for the first freeze in the Fall according to the Texas
- 16 Almanac for the project area.
- 17 d. Use care to retain native soil on the roots of the sod during the process of
- 18 excavating, hauling, and planting.
- 19 e. Keep sod material moist from the time it is dug until planted.
- 20 2. Installation:
- 21 a. Cultivate the area to a depth of 6 inches before placing the sod.
- 22 b. Place 4 inches of topsoil in accordance with the type of sod grass being
- 23 installed.
- 24 c. Apply fertilizer uniformly over the entire area and water, if required in
- 25 accordance with the Drawings.
- 26 d. Place sod so the entire area designated for sodding is covered.
- 27 e. Fill voids left in the sodding with additional sod and tamp.
- 28 f. Roll and tamp sod so sod is in complete contact with topsoil at a uniform slope.
- 29 g. Peg sod with either wooden pegs or wire staples driven through the sod block to
- 30 the firm earth in areas that may slide.
- 31 h. Remove portions of dead sod as necessary to provide a uniform established turf
- 32 before final acceptance. Removal and replacement of dead sod will be done at
- 33 no cost to the City.
- 34 i. Ensure top of sod is 1-inch below the top of curb, sidewalk, concrete edging, or
- 35 any other adjacent structure.
- 36 3. Watering and Finishing
- 37 a. Coordinate irrigation installation with planting to ensure plants and grass are
- 38 receiving adequate water. Contractor is responsible for watering all plantings
- 39 during construction until final acceptance.
- 40 b. Thoroughly water sod immediately after planting.
- 41 c. Continue watering until after final acceptance.
- 42 d. Established Turf:
- 43 1) 100 percent growth to a height of 3 inches.
- 44 2) A minimum of 1 mow cycle has been completed.
- 45 3) Roots have started to peg down
- 46 4) There are no dead blocks of sod.
- 47 e. Final acceptance won't be given until turf has been established.
- 48

1 G. Erosion Control Blanket

- 2 1. Install erosion control blanket in accordance with manufacturer's recommendations
3 and Section 31 25 14.
4 2. Install the erosion control blanket within 24 hours after seeding or sodding has
5 occurred unless otherwise directed.

6 H. Mulching

- 7 a. Ensure top of sod is 1-inch below the top of curb, sidewalk, concrete edging, or
8 any other adjacent structure.

9 2. For Use on Grass Sod:

- 10 a. Apply straw or hay mulch uniformly in areas as specified in the Drawings.
11 b. Use an approved tacking method over the mulched area.
12 c. Application Rate:
13 1) Straw Mulch:
14 a) Apply at 2 to 2.5 tons per acre
15 2) Hay Mulch:
16 a) Apply at 1.5 to 2 tons per acre

17 I. Fertilizer

- 18 1. Apply uniformly at the specified rate over required areas.
19 2. Apply fertilizer as a dry material and do not mix with water to form a slurry.
20 3. Fertilizer Rate:
21 a. Seeding:
22 1) Incorporate during seedbed preparation.
23 2) Not required for wildflower seeding.
24 3) Grass Seeding:
25 a) Newly Established – 100 pounds of nitrogen per acre
26 b) Established Seeding Areas – 150 pounds of nitrogen per acre
27 b. Sod:
28 1) Only required when directed by the City or specified in the Drawings.

29 **3.5 REPAIR [NOT USED]**

30 **3.6 RE-INSTALLATION [NOT USED]**

31 **3.7 SITE QUALITY CONTROL [NOT USED]**

32 **3.8 SYSTEM STARTUP [NOT USED]**

33 **3.9 ADJUSTING [NOT USED]**

34 **3.10 CLEANING [NOT USED]**

35 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

36 **3.12 PROTECTION [NOT USED]**

37 **3.13 MAINTENANCE**

38 A. Maintenance

- 39 1. Perform maintenance on all plantings until final acceptance of the project.

- 1 2. Maintenance is considered subsidiary to applicable planting items and will not be
- 2 paid for separately.
- 3 3. Mowing, Trimming, and Edging
- 4 a. Mow, trim, and edge all planting areas within the project limits.
- 5 b. Mow, trim, and edge at a minimum every 15 days during the growing season
- 6 unless otherwise directed.
- 7 c. Mow to a height of 3 to 4 inches in height.
- 8 d. Keep cord trimmers at least 1 foot from plants to prevent damage.
- 9 e. Remove and replace all plants damaged during maintenance work.
- 10 4. Plant Bed and Site Maintenance
- 11 a. Chemically control weeds and unwanted grasses in plant beds, along structures,
- 12 and around existing plants within the project side every 15 days unless
- 13 otherwise directed.
- 14 b. Reshape plant beds every 30 days as necessary.
- 15 c. Maintain mulch in plant beds as needed.
- 16 d. Ensure that herbicides and pesticides do not damage any proposed or existing
- 17 desirable plants.
- 18 e. Follow the manufacturer's recommendations for herbicides and pesticides.
- 19 5. Plant Supports
- 20 a. Replace, repair, and adjust supports as needed to meet the requirements of the
- 21 Drawings.
- 22 b. Adjust staking and guying to prevent girdling of plant trunks.
- 23 c. Remove or dispose of support material as directed.
- 24 6. Insect, Disease, and Animal Treatment
- 25 a. Inspect plants and planting areas every 15 days.
- 26 b. Notify the City of concerns, problems, and recommended corrective measures
- 27 in writing for approval.
- 28 c. Treat the plants and planting areas in accordance with TDA or TSPCB laws and
- 29 regulations.
- 30 d. Follow the manufacturer's instructions for handling and applying pesticides.
- 31 7. Plant Replacement
- 32 a. Remove and dispose of dead and damaged plants from the site as directed.
- 33 b. Replace plants as originally specified within 10 days of notification.
- 34 c. Plant replacement must be completed and approved prior to final acceptance.

35 **3.14 ATTACHMENTS [NOT USED]**

36 **END OF SECTION**

37

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

38

SECTION 33 01 10

CLEANING AND ACCEPTANCE TESTING OF WATER AND SEWER FORCE MAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleaning, disinfecting, and testing of water mains, valves, and appurtenances prior to making permanent connections to the distribution system to meet the standards established by the Water Utilities Department and the requirements of Chapter 290 of the Texas Administrative Code (TAC) established by the Texas Commission on Environmental Quality (TCEQ).
2. Hydrostatic testing of sewer force mains and appurtenances to meet the standards established by the Water Utilities Department and the requirements of Chapter 217 of the Texas Administrative Code (TAC) established by the Texas Commission on Environmental Quality (TCEQ).

B. Deviations from this City of Denton Standard Specification:

1. None.

C. Related Specification Sections include but are not limited to:

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 - General Requirements.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Measurement
 - a. This item is considered subsidiary to the water or sewer force main being cleaned and tested.
2. Payment
 - a. The work performed and the materials furnished in accordance with this item are subsidiary to the unit price bid per linear foot of water main complete in place.

1.3 REFERENCES

A. Reference Standards

1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
2. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C651, Disinfecting Water Mains.
 - b. C655, Field De-Chlorination.
3. Texas Administration Code:

- 1 a. Chapter 290, (30 TAC §290), Public Drinking Water.
- 2 b. Chapter 217, (30 TAC §217), Design Criteria for Sewerage System.

3 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

4 **1.5 SUBMITTALS**

- 5 A. Submittals shall be in accordance with Section 01 33 00.
- 6 B. All submittals shall be approved by the City prior to delivery.
 - 7 1. Cleaning and Disinfection plans are required to be reviewed and accepted by the
 - 8 City of Denton Water Department prior to implementation.

9 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 10 A. Water mains
 - 11 1. Cleaning Plan – Prior to the start of construction, submit a water main cleaning plan
 - 12 detailing the methods and schedule, including:
 - 13 a. A detailed description of cleaning procedures
 - 14 b. Pigging entry and exit ports for mains 16-inch and larger
 - 15 c. Flushing procedures
 - 16 d. Plans and hydraulic calculations to demonstrate adequate flushing velocities, or
 - 17 demonstrate conformance with the conditions outlined in AWWA C651 Table
 - 18 3
 - 19 e. Control of water
 - 20 f. Disposal
 - 21 2. Disinfection Plan – prior to the start of construction submit a disinfection plan,
 - 22 including:
 - 23 a. Method of mixing and introducing chlorine
 - 24 b. Flushing
 - 25 c. Bacteriological sampling
 - 26 d. De-chlorination in accordance with AWWA C655
 - 27 e. Disposal of chlorinated water
 - 28 f. Completed City of Denton Standard Testing Disinfection and De-Chlorination
 - 29 Plan Form.
 - 30 1) Blank form will be provided by City Water Department upon request.

31 **1.7 CLOSEOUT SUBMITTALS**

- 32 A. Test and Evaluation Reports
 - 33 1. All test reports generated during testing.

1 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

2 **1.9 QUALITY ASSURANCE [NOT USED]**

3 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

4 **1.11 FIELD [NOT USED]**

5 **1.12 WARRANTY [NOT USED]**

6 **PART 2 - PRODUCTS**

7 **2.1 CITY-FURNISHED [OR] CITY-SUPPLIED PRODUCTS [NOT USED]**

8 **2.2 MATERIALS**

9 A. Pigs

- 10 1. Open cell polyurethane foam body
- 11 2. Densities between 2 pounds per cubic foot up to 8 pounds per cubic foot
- 12 3. May be wrapped with polyurethane spiral bands
- 13 4. Abrasives are not permitted, unless expressly approved by the City in writing for
- 14 the particular application.
- 15 5. Must pass through a reduction up to 65 percent of the cross-sectional area of the
- 16 nominal pipe diameter.
- 17 6. Able to traverse standard piping arrangements such as 90-degree bends, tees,
- 18 crosses, wyes, and gate valves.

19 **2.3 ACCESSORIES [NOT USED]**

20 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

21 **PART 3 - EXECUTION**

22 **3.1 INSTALLERS [NOT USED]**

23 **3.2 EXAMINATION [NOT USED]**

24 **3.3 PREPARATION [NOT USED]**

25 **3.4 ERECTION / INSTALLATION / APPLICATION [NOT USED]**

26 **3.5 REPAIR / RESTORATION [NOT USED]**

27 **3.6 RE-INSTALLATION [NOT USED]**

28 **3.7 FIELD QUALITY CONTROL**

29 A. Hydrostatic Testing

- 30 1. Hydrostatically test all water mains and force mains intended to be pressurized to
- 31 meet the following criteria:
- 32 a. Furnish and install corporations for proper testing of the main.

- 1) Furnish adequate and satisfactory equipment and supplies necessary to make such hydrostatic tests.
- b. The City will furnish water required for the testing at its nearest City water main.
- c. Gradually fill the section of main to be tested with water, carefully expelling the air and apply the specified pressure.
- d. Test Pressure
 - 1) PVC, Ductile Iron, and HDPE water mains
 - a) Not less than 1.25 (187 psi minimum) times the stated working pressure of the water main measured at the highest elevation along the test section
 - b) Not less than 1.5 (225 psi minimum) times the stated working pressure at the lowest elevation of the test section.
 - 2) Bar-Wrapped Steel Cylinder Type and Buried Steel water mains
 - a) Not less than 1.25 (250 psi minimum) times the stated working pressure of the water main measured at the highest elevation along the test section.
 - b) Not less than 1.5 (300 psi minimum) times the stated working pressure at the lowest elevation of the test section.
 - 3) Sewer Force Mains
 - a) Not less than 50 psi above the normal working pressure and in accordance with 30 TAC §217.
- e. Test Conditions
 - 1) Install main and backfill prior to hydrostatic testing.
 - 2) Test Duration
 - a) Water mains: 2 hours
 - b) Sewer force mains: 4 hours
 - c) Special Considerations for HDPE mains: Under no circumstances should the total time for initial pressurization and time at test pressure exceed 8-hours at 1.5 times the system pressure rating.
 - 3) Add water as necessary to sustain the required test pressure.
 - 4) Fire Hydrants: Test fire hydrants to the fire hydrant valve.
 - a) Leave the isolation valve on the fire hydrant lead line open during the hydrostatic testing.
 - 5) Service Lines: Test service lines to curb stop
 - a) Leave the corporation stop on the service line open during the hydrostatic testing.
 - 6) Close isolation valves for air release valves.
 - 7) Makeup water must come from a fixed 55-gallon container that does not have a water source.
- f. Measure all water used in the pressure test through an approved meter, or measure the difference in volume within a 55-gallon container.
 - 1) Do not test against existing water distribution valves unless expressly provided for in the Drawings or approved by the City.
 - 2) If the City denies approval to test against existing water distribution system valve, then plug and test the pipe at no additional cost.
- g. Hydrostatic Test Failures
 - 1) For any main that fails to pass hydrostatic test:
 - a) Identify the cause.

- 1 b) Repair the leak.
- 2 c) Restore the trench and surface.
- 3 d) Retest.
- 4 (1) For HDPE, allow pipe to relax for a period of 8-hours before
- 5 beginning next test.
- 6 2) All costs associated with repairing the main to pass the hydrostatic test is
- 7 the sole responsibility of the Contractor and included in the price per linear
- 8 foot of pipe.
- 9 3) If the City determines that an existing system valve is the cause for the
- 10 failed hydrostatic test, the Contractor shall make provisions to test the main
- 11 without the use of the system valve.
- 12 a) No additional payment will be made to the Contractor if the existing
- 13 valve is unable to sustain the hydrostatic test. All work required to
- 14 facilitate suitable test conditions shall be included in the price per linear
- 15 foot of pipe.

16 2. Allowable Leakage

17 a. Water Mains

- 18 1) No pipe installation should be accepted if the amount of makeup water is
- 19 greater than that determined using the following formula:

20 In inch-pound units,

$$21 \qquad\qquad\qquad L = \frac{SD \sqrt{P}}{148,000}$$

22 Where:

- 23 L = testing allowance (make up water), gallons per hour
- 24 S = length of pipe tested, ft.
- 25 D = nominal diameter of pipe, in.
- 26 P = average test pressure during the hydrostatic test, psi
- 27
- 28
- 29

30 b. Sewer Force Mains

- 31 1) Do not exceed more than 10.0 gallons per inch of diameter per mile of pipe
- 32 per day.
- 33 2) No greater leakage rate in gallons per hour per 1,000 feet of pipe than that
- 34 determined using the following formula:

35 In inch-pound units,

$$36 \qquad\qquad\qquad L = \frac{SD \sqrt{P}}{155,400}$$

37 Where:

- 38 L = testing allowance (make up water), gallons per hour
- 39 S = length of pipe tested, ft.
- 40 D = nominal diameter of pipe, in.
- 41 P = average test pressure during the hydrostatic test, psi
- 42
- 43

1 **3.8 SYSTEM STARTUP [NOT USED]**

2 **3.9 ADJUSTING [NOT USED]**

3 **3.10 CLEANING**

4 A. General

- 5 1. Clean water mains prior to bacteriological testing.
- 6 a. Pig all 16-inch to 36-inch water mains.
- 7 b. Pigging may be required for water mains smaller than 16-inch upon repeated
- 8 failed bacteriological tests.
- 9 c. Pig or manually sweep 42-inch and larger mains.
- 10 d. Flushing in lieu of pigging is only permitted when specifically designated in the
- 11 Drawings or if pigging is deemed impractical with approval from the City.

12 B. Pigging Method

- 13 1. Prepare main for installation and removal of pig, including:
- 14 a. Furnish all equipment, material and labor to satisfactorily expose cleaning wye,
- 15 remove cleaning wye covers, etc.
- 16 b. Where expulsion of the pig is required through a dead-ended conduit:
- 17 1) Prevent backflow of purged water into the main after passage of the pig.
- 18 2) Install a mechanical joint to provide a riser out of the trench on 12-inch and
- 19 smaller mains to prevent backwater re-entry into the main.
- 20 3) Additional excavation of the trench may be performed on mains over 12-
- 21 inches to prevent backwater re-entry into the main.
- 22 4) Flush any backflow water that inadvertently enters the main in accordance
- 23 with flushing method approved by City.
- 24 c. Flush short dead-end pipe sections not swabbed by a pig in accordance with
- 25 flushing method approved by City.
- 26 d. Once pigging is complete:
- 27 1) Pigging wyes shall remain in place unless otherwise specified in the
- 28 Contract Documents.
- 29 2) Install blind flanges or mechanical joint plugs on cleaning wye.
- 30 3) Plug and place blocking at other openings.
- 31 4) Backfill.
- 32 5) Complete all appurtenant work necessary to secure the system and proceed
- 33 with disinfection.

34 C. Flushing Method

- 35 1. Prepare the main by installing temporary blow-offs at appropriate locations, of
- 36 sufficient sizes and numbers, and with adequate flushing to achieve a minimum
- 37 velocity in the main of 3.0 feet per second.
- 38 a. Minimum blow-off sizes for various main sizes are as follows:
- 39 1) 4-inch through 8-inch main – 3/4-inch blow-off
- 40 2) 10-inch through 12-inch main – 1-inch blow-off
- 41 3) 16-inch and greater main – 2-inch blow-off
- 42 b. Flushing shall be subject to the following limitations:
- 43 1) Limit the volume of water for flushing to 3 times the volume of the water
- 44 main.
- 45 2) Do not unlawfully discharge chlorinated water.

- 1 3) Do not damage private property.
- 2 4) Do not create a traffic hazard.
- 3 c. Once Flushing is complete:
- 4 1) Plug all corporation stops used for flushing.
- 5 D. Daily Main Cleaning
- 6 1. Wipe joints and then inspect for proper installation.
- 7 2. Sweep each joint and maintain cleanliness during construction.
- 8 3. Install a temporary, water-tight plug on all exposed mains at the end of each
- 9 working day or at the end of an extended period of work stoppage.
- 10 4. Follow procedures of AWWA C651 for preventing contamination during
- 11 installation of new water main.
- 12 E. Disinfection
- 13 1. General
- 14 a. Disinfection of the main shall be accomplished by the “continuous feed”
- 15 method or the “slug” method as determined by the Contractor.
- 16 b. The free chlorine amounts shown are minimums. The Contractor may require
- 17 higher rates.
- 18 1) Use calcium hypochlorite granules as the source of chlorine.
- 19 c. Continuous Feed Method
- 20 1) Apply water at a constant rate in the newly laid main.
- 21 a) Use the existing distribution system or other approved water source.
- 22 2) At a point not more than 10 feet downstream from the beginning of the
- 23 main, dose the water entering the new main with chlorine.
- 24 a) Free chlorine concentration: 25 mg/L minimum, or as required by
- 25 AWWA C651, whichever is greater.
- 26 b) Do not cease chlorine applications until the entire main is filled with
- 27 heavily chlorinated water.
- 28 3) Retain chlorinated water in the main for at least 24 hours.
- 29 a) During this time, operate valves and hydrants in the treated section to
- 30 disinfect the appurtenances.
- 31 b) Prevent the flow of chlorinated water back into active mains.
- 32 c) Residual at the end of the 24-hour period: 10 mg /L free chlorine,
- 33 minimum, for the treated water in all portions of the main.
- 34 4) Test the chlorine residual prior to flushing operations.
- 35 a) If the chlorine residual exceeds 4 mg/L, the water shall remain in the
- 36 main until the chlorine residual is less the 4 mg/L.
- 37 b) The Contractor may choose to evacuate the water into water trucks or
- 38 another approved storage facility.
- 39 (1) Treat any evacuated water with Sodium Bisulfate, another de-
- 40 chlorination chemical, or method appropriate for potable water and
- 41 approved by the City until the chlorine residual is reduced to 4
- 42 mg/L or less.
- 43 c) After the specified chlorine residual is obtained, the water may be
- 44 discharged into the drainage system or utilized by the Contractor.
- 45 5) Flush the heavily chlorinated water from the main and dispose of in a
- 46 manner and at a location accepted by the City in accordance with AWWA
- 47 C651.

1 d. Slug Method

- 2 1) Water from the existing distribution system, or other approved water
3 supply, shall flow at a constant rate in the main.
4 2) At a point not more than 10 feet downstream from the beginning of the
5 main, dose the water entering the new main with chlorine.
6 a) Free chlorine concentration: 100 mg/L minimum, AWWA C651
7 whichever is greater.
8 b) Apply chlorine continuously and for a sufficient amount of time to
9 develop a solid column or “slug” of chlorinated water. Ensure exposure
10 of all interior surfaces to “slug” for a minimum of 3 hours.
11 3) Operate the fittings and valves as the chlorinated water flows past to
12 disinfect the appurtenances.
13 4) Prevent the flow of chlorinated water back into active mains.
14 5) Flush the heavily chlorinated water from the main and dispose of in a
15 manner and at a location accepted by the City.
16 6) Upon completion, test the chlorine residual remaining in the main.
17 a) Maintain chlorine levels of 4 mg/l or less.

18 2. Contractor Requirements

- 19 a. Furnish all equipment, material and labor to satisfactorily prepare the main for
20 the disinfection method approved by the City, including adequate provisions for
21 sampling.
22 b. Make all necessary taps into the main to accomplish chlorination of a new line,
23 unless otherwise specified in the Contract Documents.
24 c. After satisfactory completion of the disinfection operation, as determined by
25 the City, remove surplus pipe at the chlorination and sampling points, plug the
26 remaining pipe, backfill and complete all appurtenant work necessary to secure
27 the main.

28 F. Dechlorination

- 29 1. General. All chlorinated water shall be de-chlorinated before discharge into the
30 environment. Use chemical amounts, as listed in ANSI/AWWA C651:
31 “Disinfecting Water Mains”, to neutralize the residual chlorine concentrations using
32 de-chlorination procedures listed in ANSI/AWWA C655: “Field De-Chlorination”.
33 Continue de-chlorination until chlorine residual is non-detectable.
34 2. Testing. Continuously test for the chlorine residual level immediately downstream
35 of the de-chlorination process during the entire discharge of the chlorinated water.
36 Periodically conduct chlorine residual testing and check for possible fish kills at
37 locations where discharged water enters the existing watershed.
38 3. Fish Kill Coordination: In the event a fish kill occurs associated with the discharge
39 of water from the distribution system or any other construction activities:
40 a. Immediately alter activities to prevent further fish kills.
41 b. Immediately notify City inspector.
42 c. Coordinate with City to properly notify TCEQ.
43 d. Any fines assessed by TCEQ (or local, state or federal agencies) for fish kills
44 will be the responsibility of the Contractor.

45 G. Bacteriological Testing (Water Sampling)

- 46 1. General
47 a. Notify the City when the main is suitable for sampling.

- 1 b. The City will obtain water samples from a suitable tap for analysis by the City’s
- 2 laboratory, unless otherwise specified in the Contract Documents.
- 3 1) No hose or fire hydrant shall be used in the collection of samples.
- 4 2. Water Sampling
- 5 a. Complete microbiological sampling prior to connecting the new main into the
- 6 existing distribution system in accordance with AWWA C651.
- 7 b. Collect samples for bacteriological analysis in sterile bottles treated with
- 8 sodium thiosulfate.
- 9 c. Collect 2 consecutive sets of acceptable samples, taken at least 24 hours apart,
- 10 from the new main.
- 11 d. Collect at least 1 set of samples from every 1,000 linear feet of the new main
- 12 (or at the next available sampling point beyond 1,000 linear feet as designated
- 13 by the City), plus 1 set from the end of the main and at least 1 set from each
- 14 branch.
- 15 e. If trench water has entered the new main during construction or, if in the
- 16 opinion of the City, excessive quantities of dirt or debris have entered the new
- 17 main, obtain bacteriological samples at intervals of approximately 200 linear
- 18 feet.
- 19 f. Obtain samples from water that has remained in the main for at least 16 hours
- 20 after formal flushing.
- 21 3. Repetition of Sampling
- 22 a. Unsatisfactory test results require a repeat of the disinfection process and re-
- 23 sampling as required above until a satisfactory sample is obtained.

24 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

25 **3.12 PROTECTION [NOT USED]**

26 **3.13 MAINTENANCE [NOT USED]**

27 **3.14 ATTACHMENTS [NOT USED]**

28 **END OF SECTION**

29

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

30

1 **SECTION 33 01 30**
2 **POST CONSTRUCTION CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Requirements and procedures for Closed Circuit Television (CCTV) Inspection of
7 all new sanitary sewer mains and services or storm sewer mains prior to:
8 a. Final Acceptance
9 b. At the end of the warranty period
10 2. If the Contractor elects to perform any pre-construction CCTV Inspection for their
11 own reference, inspection and payment will be the sole responsibility of the
12 Contractor.

13 B. Deviations from this City of Denton Standard Specification:

- 14 1. None.

15 C. Related Specification Sections include but are not limited to:

- 16 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
17 Contract.
18 2. Division 1 - General Requirements.
19 3. Section 33 01 32 – Cleaning of Sewer Mains.

20 **1.2 PRICE AND PAYMENT PROCEDURES**

21 A. Measurement and Payment

22 1. Measurement

- 23 a. Measurement for this item will be by the linear foot of line televised for CCTV
24 Inspection performed following repair or installation determined from the
25 distance recorded on the video log.

26 2. Payment

- 27 a. The work performed and materials furnished in accordance with this item and
28 measured as provided under “Measurement” will be paid for at the unit price
29 bid per linear foot for “Post-CCTV Inspection”.
30 1) Contractor will not be paid for unaccepted video.

31 3. The price bid shall include:

- 32 a. Mobilization
33 b. Cleaning
34 c. Digital file

35 **1.3 REFERENCES**

36 A. Reference Standards

- 37 1. Reference standards cited in this Section refer to the current reference standard
38 published at the time of the latest revision date logged at the end of this Section
39 unless a date is specifically cited.

- 1 2. Pipeline Assessment and Certification Program (PACP)
- 2 3. National Association of Sewer Service Companies (NASSCO)

3 **1.4 ADMINISTRATIVE REQUIREMENTS**

- 4 A. Coordination – Coordinate with Inspector 48 hours in advance of work.
- 5 B. Scheduling:
 - 6 1. CCTV cannot be performed until final surface repair and manhole adjustments are
 - 7 completed.
 - 8 2. CCTV cannot be performed until all items listed in Paragraph 3.3 A have been
 - 9 completed.

10 **1.5 SUBMITTALS**

- 11 A. Submittals shall be in accordance with Section 01 33 00.
- 12 B. All submittals shall be approved by the City prior to delivery.
- 13 C. Log sheet report must utilize PACP reporting standards.
- 14 D. Video submittal shall be a digital mpeg file unless otherwise directed by the City and
- 15 must be compatible with the City’s equipment.
- 16 E. All information gathered must be legible, easily read or viewed, and of high definition
- 17 color in accordance with NASSCO.
- 18 F. Inspection Report shall include:
 - 19 1. Asset
 - 20 a. Date and Time
 - 21 b. City
 - 22 c. Address and/or Project Name
 - 23 d. Main Number – GIS ID (If Available) or Station
 - 24 e. Upstream Manhole GIS ID (If Available) or Station
 - 25 f. Downstream Manhole GIS ID (If Available) or Station
 - 26 g. Pipe Diameter
 - 27 h. Material
 - 28 i. Pipe Length
 - 29 2. Inspection
 - 30 a. Inspection Number (i.e. 1st,2nd, etc...)
 - 31 b. Crew Number
 - 32 c. Operator Name
 - 33 d. Operator Comments
 - 34 e. Reason for Inspection
 - 35 f. Equipment Number
 - 36 g. Camera Travel Direction (Upstream/Downstream)
 - 37 h. Inspected Length (feet)
 - 38 i. City Contract Name and Number
 - 39 j. Contractor Company Name
 - 40 k. Contractor Contact Name
 - 41 l. Contractor Contact Phone Number

42 **1.6 INFORMATIONAL SUBMITTALS [NOT USED]**

1 **1.7 CLOSEOUT SUBMITTALS**

2 A. Post-CCTV submittals

- 3 1. Provide PDF copies of CCTV video and Inspection Reports on 2 USB drives.
4 2. Provide 2 hard copies of CCTV Inspection Report.
5 3. Submit to the City for review prior to scheduling a project final walk through.
6 4. The City maintains the right to reject CCTV submittals if the submittals fail to
7 conform to the quality or administrative requirements as specified in this Section
8 (e.g., obstructions on lens, foggy lens, insufficient data, etc.).
9 a. Any additional CCTV inspections performed by the Contractor due to a
10 rejected submittal will be the responsibility of the Contractor.

11 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

12 **1.9 QUALITY ASSURANCE [NOT USED]**

13 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

14 **1.11 FIELD CONDITIONS [NOT USED]**

15 **1.12 WARRANTY**

- 16 A. A second television inspection by the Contractor shall be started no sooner than
17 630 calendar days after date of Final Acceptance and finished no later than 690 calendar
18 days after the date of Final Acceptance.
- 19 B. Should the Contractor fail to provide a second original television inspection video with
20 proper documentation to the City by the 690th calendar day, written notice to perform a
21 second television inspection shall be given by the City to the Contractor and the Surety.
- 22 C. If the Contractor or Surety fail to perform a second televised inspection within 10
23 calendar days of notification, City shall have the right to perform a second television
24 inspection or cause the same to be done, either by contract or otherwise, and to pay for
25 the cost of the second television inspection.
- 26 1. If such cost of repairs, so made, shall not be paid by the Contractor or Surety upon
27 receipt of notice of the amount thereof:
- 28 a. City shall have the right of action on the Performance Bond; or
29 b. In case the second television inspection shall not actually be made by City after
30 such failure on the part of the Contractor or Surety:
- 31 1) City shall have the right to ascertain and determine the cost of such repairs
32 and to maintain an action against the Contractor or Surety; or both under
33 said bond, to recover the amount so determined in any court of competent
34 jurisdiction, and the amount so determined shall be conclusive upon the
35 Contractor and Surety in any action upon said bond.

36 **PART 2 - PRODUCTS**

37 **2.1 EQUIPMENT**

38

1 A. Closed Circuit Television Camera

- 2 1. One specifically designed and constructed for sewer inspection
- 3 2. Be operative in 100 percent humidity/submerged conditions
- 4 3. Capable of tilting at right angles along the axis of the pipe while panning the
- 5 camera lens through a full circle about the circumference of the pipe.
- 6 4. Solid state color and have remote control of the rotational lens.
- 7 5. Capable of viewing the complete circumference of the pipe and manhole structure,
- 8 including the cone-section or corbel.
- 9 6. Lens shall be an auto-iris type with remote controlled manual override.
- 10 7. Equipment will provide a view of the pipe ahead of the equipment and of features
- 11 to the side of the equipment through turning and rotation of the lens.
- 12 8. Lighting for camera shall be suitable to allow a clear picture of the entire periphery
- 13 of the pipe.
- 14 a. Lights shall be capable of panning 90-degrees to the axis of the pipe.

15 B. Video Capture System

- 16 1. The video and audio recordings of the CCTV inspections shall be made using
- 17 digital video equipment. A video enhancer may be used in conjunction with, but
- 18 not in lieu of, the required equipment. The digital recording equipment shall
- 19 capture CCTV inspection on USB drive, with each segment (from upstream
- 20 manhole to downstream manhole) inspection recorded as an individual file in
- 21 .MPEG format.
- 22 2. Capable of printing pipeline inspection reports with captured images of defects or
- 23 other related significant visual information on a standard color printer.
- 24 3. Store digitized color picture images and be saved in digital format on a USB drive.
- 25 4. Able to produce data reports to include, at a minimum, all observation points and
- 26 pertinent data.
- 27 5. Camera footage, date, main number, and manhole numbers shall be maintained in
- 28 real time and shall be displayed on the video monitor as well as the video character
- 29 generators illuminated footage display at the control console.

30 **2.2 EQUIPMENT, PRODUCT TYPES, MATERIALS [NOT USED]**

31 **2.3 ACCESSORIES [NOT USED]**

32 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

33 **PART 3 - EXECUTION**

34 **3.1 INSTALLERS [NOT USED]**

35 **3.2 EXAMINATION [NOT USED]**

36 **3.3 PREPARATION**

37 A. General

- 1 1. Prior to inspection obtain pipe and manhole asset identification numbers from the
2 plans or City to be used during inspections, if available.
 - 3 a. If identification numbers are not available at the time of inspection:
 - 4 1) Use pipe and manhole stations corresponding with the design plans.
 - 5 2) Pipe and manhole identification numbers are to be included at the time of
6 the warranty inspection.
- 7 2. Inspection shall not commence until the sewer section to be televised has been
8 completely cleaned in accordance with Section 33 01 32.
 - 9 a. Sewer system should be connected to existing sewer system and should be
10 active; or
 - 11 b. Sewer may be flooded with clean water, not jetted, in lieu of active sewer.
- 12 3. Inspection of newly installed sewers not yet in service shall not begin prior to
13 completion of the following:
 - 14 a. Pipe testing
 - 15 b. Completion of all manhole work
 - 16 c. Installation of all lateral services
 - 17 d. Vacuum test of manholes
 - 18 e. Final surface repair
- 19 4. Temporary Bypass Pumping in accordance with Section 33 32 11, if required.

20 **3.4 INSPECTION (CCTV)**

21 **A. General**

- 22 1. Begin inspection immediately after cleaning of the main.
- 23 2. Move camera through line in either direction at a moderate rate, stopping when
24 necessary to permit proper documentation of the main's condition.
- 25 3. Do not move camera at a speed greater than 30 feet per minute.
- 26 4. Use manual winches, power winches, TV cable, and power rewinds that do not
27 obstruct camera view, allowing for proper evaluation.
- 28 5. During investigation, stop camera at each defect along the main.
 - 29 a. Record the nature, location, and orientation of the defect or infiltration location.
- 30 6. Pan and tilt the camera to provide additional detail at:
 - 31 a. Manholes
 - 32 1) Pan camera around to see condition of manhole including installation of
33 epoxy liner, if applicable.
 - 34 a) Visual confirmation does not relieve the Contractor from performing
35 Quality Control on epoxy liners in accordance with Section 33 01 40.
 - 36 b. Service connections
 - 37 1) Pan camera to get a complete overview of service connection including
38 zooming into service connection, include location (i.e. 3 o'clock, 9 o'clock,
39 etc.)
 - 40 c. Joints
 - 41 1) Include comment on condition, signs of damage, etc.
 - 42 d. Visible pipe defects
 - 43 1) Including but not limited to cracks, broken or deformed pipe, holes, offset
44 joints, obstructions or debris (show as % of pipe diameter).
 - 45 a) If debris has been found in the pipe during the post-CCTV inspection,
46 additional cleaning is required and pipe shall be re-televised.

- 1 e. Infiltration/Inflow locations
- 2 f. Pipe material transitions
- 3 g. Other locations that do not appear to be typical for normal pipe conditions
- 4 h. Note locations where camera is underwater and level as a % of pipe diameter.
- 5 7. Provide accurate distance measurement.
- 6 a. The meter device is to be accurate to the nearest 1/10 foot.
- 7 8. CCTV inspections are to be continuous.
- 8 a. Do not provide a single segment of main on more than 1 USB drive.
- 9 b. A single segment is defined from manhole to manhole.

10 **3.5 REPAIR**

- 11 A. Make repairs or clean the line if the City notes problems, including but not limited to
- 12 the following:
 - 13 1. Pulled or slipped joints.
 - 14 2. Rolled gaskets.
 - 15 3. Water infiltration.
 - 16 4. Cracked or damaged pipe.
 - 17 5. Sagging or deformed pipe.
 - 18 6. In pipes with gradients less than 0.7 percent, a maximum one-half inch of standing
 - 19 water will be allowed in 6" through 24" diameter pipes.
 - 20 7. In pipes with gradients 0.7 percent or greater, no standing water is allowed.
 - 21 a. The depths of standing water allowable for mains that are greater than 24" in
 - 22 diameter will be evaluated by the City.
 - 23 8. Structural damage to the pipe.
 - 24 9. Services coming into the main at an angle other than according to the Drawings.
 - 25 10. Services not installed on lots indicated by plans.
 - 26 11. Pipe or manhole invert has debris, soil or residue.
 - 27 12. Failed manhole liners.
- 28 B. After any repairs, another televised inspection is to be run at no additional cost is
- 29 required.

30 **3.6 RE-INSTALLATION [NOT USED]**

31 **3.7 FIELD QUALITY CONTROL [NOT USED]**

32 **3.8 SYSTEM STARTUP [NOT USED]**

33 **3.9 ADJUSTING [NOT USED]**

34 **3.10 CLEANING**

- 35 A. Cleaning of sewer mains:
 - 36 1. Clean the mains in accordance with Section 33 01 32.

37 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

38 **3.12 PROTECTION [NOT USED]**

1 **3.13 MAINTENANCE [NOT USED]**
2

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

SECTION 33 01 31
SEWER AND MANHOLE TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Testing for sanitary sewer pipe and manholes prior to placing in service
 - a. Low Pressure Air Test and Deflection (Mandrel) Test for 36-inch and smaller sanitary sewer mains
 - 1) Excludes pipe with flow.
 - 2) Hydrostatic Testing is not allowed.
 - b. Individual Joint Test for greater than 36-inch sanitary sewer mains
 - 1) Excludes pipe with flow.
 - 2) Hydrostatic Testing is not allowed.
 - c. Vacuum Testing for sanitary sewer manholes
 - 1) Non-standard manholes or manholes installed over an existing sewer main may not require vacuum testing.
2. All newly constructed sanitary sewer pipe and manholes shall be cleaned and tested prior being placed into service.

B. Deviations from this City of Denton Standard Specification:

1. None.

C. Related Specification Sections include but are not limited to:

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 - General Requirements.
3. Section 03 80 00 – Modifications to Existing Concrete Structures.
4. Section 33 01 32 – Cleaning of Sewer Mains.
5. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Pipe Testing
 - a. Measurement
 - 1) This item is considered subsidiary to the sanitary sewer main (pipe) completed in place.
 - b. Payment
 - 1) The work performed and the materials furnishing in accordance with this item are subsidiary to the unit price bid per linear foot of sanitary sewer main (pipe) complete in place, and no other compensation will be allowed.
2. Manhole Testing
 - a. Measurement
 - 1) This item is considered subsidiary to the manhole completed in place.

1

- 1 b. Payment
2 1) The work performed and the materials furnished in accordance with this
3 item are subsidiary to the unit price bid per each manhole complete in
4 place, and no other compensation will be allowed.

5 **1.3 REFERENCES [NOT USED]**

6 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

7 **1.5 SUBMITTALS**

8 A. Submittals shall be in accordance with Section 01 33 00.

9 B. All submittals shall be approved by the City prior to delivery.

10 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

11 **1.7 CLOSEOUT SUBMITTALS**

12 A. Test and Evaluation Reports

13 1. All test reports generated during testing (pass and fail)

14 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

15 **1.9 QUALITY ASSURANCE**

16 A. Certifications

17 1. Mandrel Equipment

18 a. If requested by City, provide Quality Assurance certification verifying the
19 equipment used has been designed and manufactured in accordance to the
20 required specifications.

21 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

22 **1.11 FIELD CONDITIONS [NOT USED]**

23 **1.12 WARRANTY [NOT USED]**

24 **PART 2 - PRODUCTS**

25 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

26 **2.2 MATERIALS**

27 A. Materials

28 1. Mandrel used for deflection test

29 a. Use of an uncertified mandrel or a mandrel altered or modified after certification
30 will invalidate the deflection test.

31 b. Mandrel requirements

32 1) Odd number of legs with minimum of 9 legs

33 2) Effective length not less than its nominal diameter

34 3) Fabricated of rigid and nonadjustable steel

35 4) Fitted with pulling rings at each end

- 1 5) Stamped or engraved on some segment other than a runner indicating the
2 following:
3 a) Pipe material specification
4 b) Nominal size
5 c) Mandrel outside diameter (OD)
6 6) Mandrel diameter must be 95 percent of inside diameter (ID) of pipe.

7 **2.3 ACCESSORIES [NOT USED]**

8 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

9 **PART 3 - EXECUTION**

10 **3.1 INSTALLERS [NOT USED]**

11 **3.2 EXAMINATION [NOT USED]**

12 **3.3 PREPARATION**

- 13 A. Low Pressure Air Test (Pipe)
14 1. Clean the sewer main before testing, in accordance with Section 33 01 32.
15 2. Plug ends of all branches, laterals, tees, wyes, and stubs to be included in test.
16 B. Deflection (mandrel) test (Pipe)
17 1. Perform as last work item before final inspection.
18 2. Clean the sewer main and inspect for offset and obstruction prior to testing.
19 C. Individual Joint test (Pipe)
20 1. Perform as pipe installation progresses.
21 2. Clean the sewer main and inspect for offset and obstruction prior to testing.
22 D. Vacuum test (Manhole)
23 1. Plug lifting holes and exterior joints.
24 2. Plug pipes and stub-outs entering the manhole.
25 3. Secure stub-outs, manhole boots, and pipe plugs to prevent movement while
26 vacuum is drawn.
27 4. Plug pipes with drop connections beyond drop.
28 5. Place test head inside the frame at the top of the manhole.

29 **3.4 INSTALLATION**

- 30 A. Low pressure air test (Pipe)
31 1. Install plug with inlet tap.
32 2. Connect air hose to inlet tap and a portable air control source.
33 3. Start the stop watch after the stabilization period (3.5 psig minimum pressure).
34

- 1 4. Determine the time in seconds required for the internal air pressure to reach 2.5
2 psig. Minimum permissible pressure holding time per diameter per length of pipe
3 is computed from the following equation:

$$T = \frac{(0.0850 * D * K)}{Q}$$

7 Where:

- 8 T = shortest time, seconds, allowed for air pressure to drop to 1.0 psig
9 K = 0.000419 * D * L, but not less than 1.0
10 D = nominal pipe diameter, inches
11 L = length of pipe being tested (by pipe size), feet
12 Q = 0.0015, cubic feet per minute per square foot of internal surface

- 13 5. UNI-B-6, Table 1 provides required time for given lengths of pipe for sizes 4-inch
14 through 60-inch based on the equation above.
15 6. Stop test if no pressure loss has occurred during the first 25 percent of the
16 calculated testing time.

17 B. Deflection (mandrel) test (Pipe)

- 18 1. The mandrel is pulled through the pipe by hand to ensure maximum allowable
19 deflection is not exceeded.
20 2. Maximum percent deflection by pipe size is as follows:

Nominal Pipe Size Inches	Percent Deflection Allowed
12 and smaller	5.0
15 through 30	4.0
Greater than 30	3.0

22 C. Individual Joint test (Pipe)

- 23 1. Follow procedures in Section 3.4.A, but each individual joint to be 100% tested.
24 The time allowed for the pressure drop from 3.5 psig to 2.5 psig is 10-seconds.
25 2. No joint shall be air tested until the pipe has been backfilled. Perform air testing as
26 pipe installation progresses. Pipe installation shall not exceed 100-feet from the
27 last joint tested.
28 3. Perform visual inspection of each joint immediately after testing.
29 4. If the joint fails to pass the joint air test, necessary repairs as recommended by the
30 pipe manufacturer may be made if approved by City, and the joint retested.
31 a. Failure to pass the air test after repairs have been made may be cause for
32 rejection.

33 D. Vacuum test (Manhole) (prior to backfill)

- 34 1. Draw a vacuum of 10 inches of mercury and turn off the pump.
35 2. With the valve closed, read the level vacuum level after the required test time.
36

3. Minimum time required for vacuum drop of 1 inch of mercury is as follows:

Depth of Manhole, feet	4-foot Dia Seconds	5-foot Dia Seconds	6-foot Dia Seconds
8	20	26	33
10	25	33	41
12	30	39	49
14	35	45	57
16	40	52	67
18	40	59	73
**	T=5	T=6.5	T=8

** - For manholes over 18-feet deep, add "T" seconds as shown for each respective diameter for each 2 feet of additional depth of manhole to the time shown for 18-foot depth. (Example: A 30-foot deep, 4-foot diameter. Total test time would be 70 seconds. $40+6(5) = 70$ seconds)

4. Manhole vacuum levels observed to drop greater than 1 inch of mercury, fail the test.

3.5 REPAIR

A. Non-Conforming Work

1. Low pressure air test
 - a. Should the air test fail, find and repair leak(s) and retest.
2. Deflection (mandrel) test (Pipe)
 - a. Should the mandrel fail to pass, the pipe is considered over-deflected.
 - b. Uncover over-deflected pipe and allow pipe to recover. Reinstall and compact backfill and embedment in accordance with Section 33 05 05 if pipe is not permanently deformed or otherwise damaged.
 - c. If damaged, remove and replace.
3. Vacuum test (Manhole)
 - a. Should the vacuum test fail, repair suspect area and retest.
 - 1) External repairs required for leaks at pipe connection to manhole.
 - a) Shall be in accordance with Section 03 80 00.
 - 2) Leaks within the manhole structure may be repaired internally or externally.

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING

A. Cleaning of sewer mains:

1. Clean the mains in accordance with Section 33 01 32.

1 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

2 **3.12 PROTECTION [NOT USED]**

3 **3.13 MAINTENANCE [NOT USED]**

4 **3.14 ATTACHMENTS [NOT USED]**

5 **END OF SECTION**

6

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

7

1 **SECTION 33 01 32**
2 **CLEANING OF SEWER MAINS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Procedures for cleaning sanitary sewer mains to remove all debris, solids, sand,
7 grease, grit, etc. from the pipelines and manholes prior to television inspection.

8 B. Related Specification Sections include but are not limited to:

- 9 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
10 Contract.
11 2. Division 1 - General Requirements.

12 **1.2 PRICE AND PAYMENT PROCEDURES**

13 A. Measurement and Payment

14 1. Measurement

- 15 a. This item is considered subsidiary to the sanitary sewer main being cleaned.

16 2. Payment

- 17 a. The work performed and the materials furnished in accordance with this item
18 are subsidiary to the unit price bid per linear foot of sewer pipe complete in
19 place, and no other compensation will be allowed.

20 **1.3 REFERENCES [NOT USED]**

21 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

22 **1.5 SUBMITTALS [NOT USED]**

23 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

24 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

25 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

26 **1.9 QUALITY ASSURANCE [NOT USED]**

27 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

28 **1.11 FIELD CONDITIONS [NOT USED]**

29 **1.12 WARRANTY [NOT USED]**

30 **PART 2 - PRODUCTS**

31 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**
32

1 **2.2 MATERIALS**

2 A. Materials

- 3 1. Use only the type of cleaning material which will not create hazards to health or
4 property or affect treatment plant processes.

5 **2.3 ACCESSORIES [NOT USED]**

6 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

7 **PART 3 - EXECUTION**

8 **3.1 INSTALLERS [NOT USED]**

9 **3.2 EXAMINATION [NOT USED]**

10 **3.3 PREPARATION [NOT USED]**

11 **3.4 INSTALLATION [NOT USED]**

12 **3.5 REPAIR [NOT USED]**

13 **3.6 RE-INSTALLATION [NOT USED]**

14 **3.7 FIELD QUALITY CONTROL [NOT USED]**

15 **3.8 SYSTEM STARTUP [NOT USED]**

16 **3.9 ADJUSTING [NOT USED]**

17 **3.10 CLEANING**

18 A. General

- 19 1. All materials, equipment, and personnel necessary to complete the cleaning of the
20 sanitary sewer main and manholes must be present on the jobsite prior to isolating
21 the sewer manhole or line segment and beginning the cleaning process.
- 22 2. Maintain clean work and surrounding premises within the work limits so as to
23 comply with Federal, State, and local environmental and anti-pollution laws,
24 ordinances, codes, and regulations when cleaning and disposing of waste materials,
25 debris, and rubbish.
- 26 3. Keep the work and surrounding premises within work limits free of accumulations
27 of dirt, dust, waste materials, debris, and rubbish.
- 28 4. Suitable containers for storage of waste materials, debris, and rubbish shall be
29 provided until time of disposal.
- 30 a. It is the sole responsibility of the Contractor to secure a licensed legal dump site
31 for the disposal of this material.
- 32 b. Under no circumstances shall sewage or solids removed from the main or
33 manhole be dumped onto streets or into ditches, catch basins, storm drains, or
34 sanitary sewers.
- 35 5. The cleaning process shall remove all grease, sand, silts, solids, rags, debris, etc.
36 from each sewer segment, including the manhole(s).

- 1 6. Selection of cleaning equipment and the method for cleaning shall be based on the
2 condition of the sanitary sewer mains at the time work commences and will be
3 subject to approval by the City.
- 4 7. All cleaning equipment and devices shall be operated by experienced personnel.
- 5 8. Satisfactory precautions shall be taken to protect the sanitary sewer mains and
6 manholes from damage that might be inflicted by the improper use of the cleaning
7 process or equipment.
- 8 9. Any damages done to a sewer main and/or structure by the Contractor shall be
9 repaired by the Contractor at no additional cost and to the satisfaction of the City.
- 10 10. Cleaning shall also include washing the manhole wall by high pressure water jet.
- 11 11. The Contractor may be required to demonstrate the performance capabilities of the
12 cleaning equipment proposed for use on the project.
 - 13 a. If the results obtained by the proposed sanitary sewer cleaning equipment are
14 not satisfactory, the Contractor shall use different equipment and/or
15 attachments, as required, to meet City satisfaction.
 - 16 b. More than 1 type of equipment/attachments may be required at a location.
- 17 12. When high velocity cleaning equipment is used, a suitable sand trap, weir, dam, or
18 suction shall be constructed in the downstream manhole to trap all solids and debris
19 for removal.
- 20 13. Any damage of property, as a result of flooding, shall be the liability and
21 responsibility of the Contractor.
- 22 14. The flow of wastewater present in the sanitary sewer main shall be utilized to
23 provide necessary fluid for hydraulic cleaning devices whenever possible.
- 24 15. When additional quantities of water from fire hydrants are necessary to avoid delay
25 in normal working procedures, the water shall be conserved and not used
26 unnecessarily.
 - 27 a. No fire hydrant shall be obstructed or used when there is a fire in the area.
 - 28 b. It is the responsibility of the Contractor to obtain a fire hydrant water meter and
29 establish responsibility for all related charges for the set-up, including the water
30 usage bills from respective water purveyor agency.
 - 31 c. All expenses shall be considered incidental to the cleaning of the existing
32 sanitary sewer mains.

33 B. Methods

- 34 1. High-Velocity Cleaning
 - 35 a. Cleaning equipment that uses a high velocity water jet for removing debris shall
36 be capable of producing a minimum volume of 50 gpm, with a pressure of
37 1,500 psi, for the sanitary sewer line and 3,500 psi for the (manhole) structure
38 at the pump.
 - 39 1) Any variations to this pumping rate must be approved in advance by the
40 City.
 - 41 2) To prevent damage to older sewer mains and property, a pressure less than
42 1,500 psi can be used with City approval.
 - 43 3) A working pressure gauge shall be used on the discharge of all high
44 pressure water pumps.

- 4) For sewers 18 inches and larger in diameter, in addition to conventional nozzles, use a nozzle which directs the cleaning force to the bottom of the pipe.
- 5) Operate the equipment so the pressurized nozzle continues to move at all times.
- 6) The pressurized nozzle shall be turned off or reduced anytime the hose is on hold or delayed in order to prevent damage to the line.

2. Mechanical Cleaning

- a. Mechanical cleaning, in addition to normal cleaning when required, shall be with equipment and accessories typically used for this application driven by power winching devices.
- b. Submit the equipment manufacturer's operational manual and guidelines to the City, which shall be followed strictly unless modified by the City.
- c. All equipment and devices shall be operated by experienced operators to ensure no damage to the pipe occurs in the process of cleaning.
- d. Buckets, scrapers, scooters, porcupines, kites, heavy duty brushes, and other debris-removing equipment/accessories shall be used as appropriate and necessary in the field, in conjunction with the approved power machines.
- e. The use of cleaning devices such as rods, metal pigs, porcupines, root saws, snakes, scooters, sewer balls, kites, and other approved equipment, in conjunction with hand winching device, and/or gas, electric rod propelled devices, shall be considered normal cleaning equipment.

3. Hydraulic Cleaning (pipe flooding) is not allowed.

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

1 **SECTION 33 01 33**
2 **SANITARY SEWER PIPE BURSTING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Requirements to rehabilitate existing sanitary sewers by the pipe enlargement
7 system, herein called Pipe Bursting (Pipe Bursting/Crushing).
8 a. Sizes range from 6-inch through 20-inch for the new pipe.
9 1) Pipe larger than 20-inch will require City approval.
10 b. The system includes splitting or bursting the existing pipe to install a new high-
11 density polyethylene (HDPE) pipe and reconnecting existing sewer service
12 connections.

13 B. Deviations from this City of Denton Standard Specification:

- 14 1. None.

15 C. Related Specification Sections include but are not limited to:

- 16 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
17 Contract.
18 2. Division 1 - General Requirements.
19 3. Section 33 01 30 – Closed Circuit Television (CCTV) Inspection.
20 4. Section 33 05 62 – Cast-in-Place Concrete Manholes.
21 5. Section 33 14 14 – High Density Polyethylene (HDPE) Pipe.
22 6. Section 33 31 16 – Sanitary Sewer Service Connections and Service Line.
23 7. Section 33 32 11 – Bypass Pumping of Existing Sewer Systems.

24 **1.2 PRICE AND PAYMENT PROCEDURES**

25 A. Measurement and Payment

- 26 1. Pipe Installation by Pipe Bursting
27 a. Measurement
28 1) Measured horizontally along the ground surface from center line to center
29 line of the manhole or appurtenance of HDPE Pipe installed by Pipe
30 Bursting.
31 b. Payment
32 1) The work performed and materials furnished in accordance with this item
33 and measured as provided under “Measurement” will be paid for at the unit
34 price bid per linear foot for “Pipe Bursting” installed for:
35 a) Various sizes.
36 c. The price bid shall include:
37 1) Furnishing and installing pipe as specified by the Drawings
38 2) Pre-CCTV
39 3) Pavement removal
40 4) Excavation

- 1 5) Hauling
- 2 6) Launching pit
- 3 7) Receiving pit
- 4 8) Obstruction removal and disposal
- 5 9) Bypass Pumping for pipes 12-inch and smaller
- 6 10) Disposal of excess material
- 7 11) Furnishing, placement, and compaction of embedment
- 8 12) Furnishing, placement, and compaction of backfill
- 9 13) Fittings or couplings if necessary
- 10 14) Reinstatement of benches/inverts
- 11 15) Anchoring new pipe and sealing manholes
- 12 16) Clean-up
- 13 17) Cleaning
- 14 18) Testing
- 15 2. Point Repair
- 16 a. Measurement
- 17 1) Measured horizontally along the ground surface following the pipe
- 18 centerline for the length identified during the Pre-CCTV inspection and
- 19 directed by the City.
- 20 b. Payment
- 21 1) The work performed and materials furnished in accordance with this item
- 22 and measured as provided under “Measurement” will be paid for at the unit
- 23 price bid per linear foot for “Sewer Pipe, Point Repair” installed for:
- 24 a) Various sizes.
- 25 c. The price bid shall include:
- 26 1) Furnishing and installing pipe as specified by the Drawings
- 27 2) Pre-CCTV
- 28 3) Repair clamps or couplings
- 29 4) Pavement removal
- 30 5) Excavation
- 31 6) Hauling
- 32 7) Bypass Pumping for pipes 12-inch and smaller
- 33 8) Disposal of excess material
- 34 9) Furnishing, placement, and compaction of embedment
- 35 10) Furnishing, placement, and compaction of backfill
- 36 11) Clean-up
- 37 12) Cleaning
- 38 13) Testing
- 39 3. Service Reinstatement, Pipe Bursting
- 40 a. Measurement
- 41 1) Measured per each service to be reinstated.
- 42 b. Payment
- 43 1) The work performed and materials furnished in accordance with this Item
- 44 and measured as provided under “Measurement” shall be paid for at the
- 45 unit price bid per each “Service Reinstatement, Pipe Bursting.”
- 46 c. The price bid shall include:
- 47 1) Furnishing and installing pipe as specified by the Drawings
- 48 2) Repair clamps or couplings

- 1 3) Pre-CCTV
- 2 4) Pavement removal
- 3 5) Excavation
- 4 6) Hauling
- 5 7) Launching pit, if necessary
- 6 8) Receiving pit, if necessary
- 7 9) Bypass Pumping for pipes 12-inch and smaller
- 8 10) Disposal of excess material
- 9 11) Furnishing, placement, and compaction of embedment
- 10 12) Furnishing, placement, and compaction of backfill
- 11 13) Clean-up
- 12 14) Cleaning
- 13 15) Testing

14 **1.3 REFERENCES**

15 A. Abbreviations and Acronyms

- 16 1. HDPE – High Density Polyethylene
- 17 2. CCTV – Closed Circuit Television

18 B. Definitions

- 19 1. Pipe Bursting/Crushing/Enlargement
 - 20 a. The reconstruction of gravity sewer pipe by installing an approved pipe
 - 21 material by use of a static, hydraulic or pneumatic hammer “moling” device,
 - 22 suitably sized to break out the old pipe or by using a modified boring “knife”
 - 23 with a flared plug that implodes and crushes the existing sewer pipe.
 - 24 b. Forward progress of the "mole" or the "knife" may be aided by the use of
 - 25 hydraulic equipment or other apparatus.
 - 26 c. The replacement pipe is either pulled or pushed into the bore.
 - 27 d. The method allows for replacement of pipe sizes from 6-inches through 20-
 - 28 inches and/or upsizing in varying increments up to 20-inches.
 - 29 e. No other Pipe Enlargement system, other than those listed in this Section, is
 - 30 acceptable.

31 **1.4 ADMINISTRATIVE REQUIREMENTS**

32 A. Coordination

- 33 1. Coordinate with City, franchise utilities, etc. as specified in the Drawings.
- 34 2. Provide advanced notice prior to commencing actual pipe enlargement activities, as
- 35 specified in the Drawings, in order to allow the City to provide appropriate
- 36 advanced notice to affected residents.
- 37 3. Review the location and number of insertion or access pits with the City Inspector
- 38 prior to excavation.

39 B. Sequencing

- 40 1. Provide a bypass pumping plan, for existing 15-inch and larger sewer lines,
- 41 detailing collection and discharge locations and method of bypass pumping in
- 42 accordance with Section 33 32 11, prior to the start of construction.
- 43 2. Provide a phasing plan with the sequence of construction prior to the start of
- 44 construction.

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to delivery.

4 **1.6 ACTION SUBMITTALS**

5 A. Special Procedure Submittals

6 1. Provide a bypass pumping plan for existing 15-inch and larger sewer lines, in
7 accordance with Section 33 32 11.

8 2. Provide a phasing plan with the sequence of construction prior to the start of
9 construction.

10 B. Submit Contractor and personnel experience records in accordance with this Section

11 **1.7 CLOSOUT SUBMITTALS**

12 A. Record Documentation

13 1. Provide Post-Construction CCTV inspection reports in accordance with Section 33
14 01 30.

15 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

16 **1.9 QUALITY ASSURANCE**

17 A. Qualifications

18 1. The Contractor shall be certified by the particular Pipe Enlargement system
19 manufacturer that such firm is a licensed installer of their system.

20 2. The Contractor shall be able to show that the personnel directly involved with Pipe
21 Enlargement have adequate experience with similar work and shall have performed
22 a minimum of 50,000 feet of successful installation in the United States.

23 B. Pre-construction and Post-Construction Testing

24 1. Inspection and payment for any Pre-Construction CCTV Inspection will be the sole
25 responsibility of the Contractor.

26 2. Provide Post-Construction CCTV Inspection of the pipeline to be replaced and/or
27 enlarged in accordance with Section 33 01 30.

28 **1.10 DELIVERY, STORAGE, AND HANDLING**

29 A. Storage and Handling Requirements

30 1. Secure and maintain a location to store the material in accordance with Section 01
31 66 00.

32 **1.11 SITE CONDITIONS [NOT USED]**

33 **1.12 WARRANTY [NOT USED]**

34 **PART 2 - PRODUCTS**

35 **2.1 CITY-FURNISHED [NOT USED]**

1 **2.2 MATERIALS**

- 2 A. HDPE Pipe in accordance with Section 33 14 14.
3 B. Service Saddles/lateral connections in accordance with Section 33 31 16.
4 C. Repair Clamps in accordance with Section 33 14 14.
5 D. Manhole Inverts and Benches requiring replacement in accordance with Section 33 05
6 62.

7 **2.3 ACCESSORIES [NOT USED]**

8 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

9 **PART 3 - EXECUTION**

10 **3.1 INSTALLERS [NOT USED]**

11 **3.2 EXAMINATION**

- 12 A. Verification of Conditions
13 1. Perform Pre-Construction CCTV Inspection of the pipeline to be replaced/enlarged.
14 a. Inspection of the pipelines shall be performed by experienced personnel trained
15 in locating breaks, obstacles, and service connections by Closed Circuit Color
16 Television.
17 B. Evaluation and Assessment
18 1. Identify, by location, the presence of line obstructions in the existing sewer (heavy
19 solids, dropped joints, protruding service taps, or collapsed pipe) which will prevent
20 completion of the pipe bursting/crushing process and which cannot be removed by
21 conventional sewer cleaning equipment.
22 2. Identify, by location, the presence of sags in the sewer line(s) by the following
23 procedure:
24 a. Perform CCTV inspection.
25 b. Provide CCTV inspection results to the City.
26 c. The City Inspector will review the Pre-CCTV to determine if any excessive
27 sags exist and will inform the Contractor which segments of pipe are to be
28 replaced by point repair.

29 **3.3 PREPARATION**

- 30 A. Bypassing Sewage
31 1. Bypass pump sewage in accordance with Section 33 32 11.
32 B. Line Obstructions
33 1. If identified in the CCTV inspection, remove line obstruction.
34 a. Removal of obstruction is considered subsidiary to pipe bursting.
35 C. Point Repairs
36 1. Perform point repair as specified in the Drawings and at the discretion of the City
37 including:

- 1) Pipe replacement
- 2) Digging a sag elimination pit and bringing the bottom of the pipe trench to a uniform grade in line with the existing pipe invert

3.4 INSTALLATION

A. Site Organization

1. Locate insertion or access pits to minimize the total number required and to maximize the length of replacement pipe installed in a single pull.
 - a. Use existing manholes wherever practical.
 - 1) Manhole inverts and bottoms may be removed to permit access for installation equipment.
2. Locate equipment used to perform the Work away from buildings so as to minimize noise impact.
 - a. Provide silencers or other devices to reduce machine noise as needed in accordance with City noise ordinance.
3. Insertion pits shall be of sufficient length to allow the bursting head and new HDPE pipe to enter the host pipe at an angle that will maintain the grade of the existing sanitary sewer.

B. Schedule

1. Do not begin pipe bursting/enlargement operations if segment cannot be completed before the end of the same work day.

C. Finished Pipe

1. The installed replacement pipe shall be continuous over the entire length of each pipe segment from manhole to manhole and free from visual defects such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, pipe separation, and other deformities.
2. Carefully cut out the replacement pipe passing through or terminating in a manhole in manner approved by the City.
3. Streamline and improve the manhole invert and benches to ensure smooth flow.
4. The installed pipe shall meet the leakage requirements of the pressure test specified herein.

D. Pipe Jointing

1. Assemble and join sections of HDPE replacement pipe on the job site above ground.
2. Use the heating and butt-fusion system for jointing in strict accordance with the manufacturer's printed instructions and in accordance to Section 33 14 14.
3. Ensure butt-fusion joints have a smooth, uniform, double rolled back bead made while applying the proper melt, pressure, and alignment.
4. Make all joints available for inspection by City prior to insertion.
5. Join the replacement pipe on site in appropriate working lengths near the insertion pit.
 - a. Limit the maximum length of continuous replacement pipe assembled above ground and pulled on the job site at any one time to 500 linear feet.

- 1 6. For situations where the replacement pipe is not pulled all the way to the manhole,
2 utilize a repair clamp to connect segments of the HDPE pipe, as approved by the
3 City.

4 E. New Pipe Installation

- 5 1. Install new pipe in accordance with the manufacturer’s recommendations.

6 F. Anchoring New Pipe and Sealing Manholes

- 7 1. After the new pipe has been installed in the entire length of the sewer section,
8 anchor the pipe at manholes.
9 a. The new pipe shall protrude in the manholes for enough distance to allow
10 sealing and trimming, but not less than 4 inches.
11 2. Wait a minimum of 10 hours after installation before sealing the new pipe at
12 manholes.
13 3. Provide a flexible gasket connector in the manhole wall at the end of the new pipe,
14 centered in the existing manhole wall.
15 4. Grout flexible connector in the manhole, filling all voids the full thickness of the
16 manhole wall.
17 5. Restore manhole bottom and invert if required, in accordance with Section 33 05
18 62.

19 G. Sewer Service Connections

- 20 1. Install service connections in accordance with Section 33 31 16.

21 H. Rescue

- 22 1. The cost for rescue of static, hydraulic, or pneumatic hammer “moling” devices or
23 modified boring “knives” that become stuck or excessively buried and require
24 additional excavation to retrieve shall be the sole responsibility of the Contractor.

25 I. Surface Restoration

- 26 1. Any damage caused to paving structures or any surface fracture resulting from the
27 pipe enlargement shall be repaired or replaced to the same condition, or better, at
28 the expense of the Contractor.

29 **3.5 REPAIR [NOT USED]**

30 **3.6 RE-INSTALLATION [NOT USED]**

31 **3.7 SITE QUALITY CONTROL**

32 A. Post-Construction Closed Circuit Television (CCTV) Inspection

- 33 1. Video Inspection
34 a. Conduct a Post-Construction CCTV Inspection in accordance with Section 33
35 01 30.

36 **3.8 SYSTEM STARTUP [NOT USED]**

37 **3.9 ADJUSTING [NOT USED]**

38 **3.10 CLEANING [NOT USED]**

39 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

- 1 **3.12 PROTECTION [NOT USED]**
- 2 **3.13 MAINTENANCE [NOT USED]**
- 3

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

SECTION 33 01 40
LINERS FOR SANITARY SEWER STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Application of a lining system to concrete utility structures such as manholes, lift station wet wells, junction boxes, or other concrete facilities that may require protection from corrosive materials.
 - a. This covers rehabilitation of existing sanitary sewer structures and newly installed sanitary sewer structures.
 - 2. Structures to be lined include all force main discharge manholes, pre-cast manholes, junction structures, lift station wet wells, the manhole preceding a wet well, and any other manhole or structure as specified in the Drawings.
- B. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 33 01 31 – Sewer and Manhole Testing.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Manholes
 - a. Measurement
 - 1) Measured per vertical foot of lining, as measured from the benching to the bottom of the grade rings for new Cast-in-Place manhole installation and from the benching to the bottom of the frame for all types of manhole rehabilitations.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per vertical foot of “Manhole Liner” applied for:
 - a) Various sizes.
 - b) Various types.
 - c. The price bid shall include:
 - 1) Removal of roots
 - 2) Removal of existing liner
 - 3) Eliminating any leaks
 - 4) Removal of steps
 - 5) Repair/seal connection of the existing frame to chimney
 - 6) Repairs of any cracks in the existing structure chimney, corbel (cone), wall, bench, including any replacement of damaged rebar, and pipe
 - 7) Surface cleaning and preparation

- 1 8) Furnishing and installing liner as specified by the Drawings
- 2 9) Hauling
- 3 10) Disposal of excess material
- 4 11) Site Clean-up
- 5 12) Manhole and Invert Cleaning
- 6 13) Testing
- 7 2. New Precast Concrete Manholes
- 8 a. Measurement
- 9 1) This item is considered subsidiary to Precast Concrete Manhole
- 10 installation.
- 11 b. Payment
- 12 1) The work performed and materials furnished in accordance with this item
- 13 are subsidiary to the unit price bid per each Precast Concrete Manhole, and
- 14 per vertical foot of extra depth Precast Concrete Manhole installed.
- 15 3. Non-Manhole Structures
- 16 a. Measurement
- 17 1) Measured per square foot of area where the liner is applied.
- 18 b. Payment
- 19 1) The work performed and materials furnished in accordance with this item
- 20 and measured as provided under "Measurement" will be paid for at the unit
- 21 price bid per square foot of "Structure Liner" applied.
- 22 c. The price bid shall include:
- 23 1) Removal of roots
- 24 2) Removal of existing liner
- 25 3) Eliminating any leaks
- 26 4) Removal of steps
- 27 5) Repair/seal connection of the existing frame to chimney
- 28 6) Repairs of any cracks in the existing structure chimney, corbel (cone), wall,
- 29 bench, including any replacement of damaged rebar, and pipe
- 30 7) Surface cleaning and preparation
- 31 8) Furnishing and installing Liner as specified by the Drawings
- 32 9) Lining of wet well floor in new applications only
- 33 10) Hauling
- 34 11) Disposal of excess material
- 35 12) Site Clean-up
- 36 13) Manhole and Invert Cleaning
- 37 14) Testing

38 **1.3 REFERENCES**

- 39 A. Definitions
- 40 1. Lining and coating may be used interchangeably.
- 41 B. Reference Standards
- 42 1. Reference standards cited in this Section refer to the current reference standard
- 43 published at the time of the latest revision date logged at the end of this Section
- 44 unless a date is specifically cited.
- 45 2. ASTM International (ASTM):

- 1 a. D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical
- 2 Reagents.
- 3 b. D638, Standard Test Method for Tensile Properties of Plastics.
- 4 c. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
- 5 d. D790, Standard Test Methods for Flexural Properties of Unreinforced and
- 6 Reinforced Plastics and Electrical Insulating Materials.
- 7 e. D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by
- 8 the Taber Abraser.
- 9 f. D4414, Standard Practice for Measurement of Wet Film Thickness by Notch
- 10 Gages.
- 11 3. The Society for Protective Coatings/NACE International (SSPC/NACE):
- 12 a. SP 13/NACE No. 6, Surface Preparation of Concrete.
- 13 b. SP0188, Discontinuity (Holiday) Testing of New Protective Coatings on
- 14 Conductive Substrates.

15 **1.4 ADMINISTRATIVE REQUIREMENTS**

16 A. Sequencing

- 17 1. All paving activities, including any final grade adjustments for manholes outside
- 18 pavement, shall be completed before Contractor begins lining work.
- 19 2. After liner installation, Contractor shall wait a minimum of 48 hours to allow the
- 20 liner material to fully cure before returning the system to normal service.

21 **1.5 SUBMITTALS**

22 A. Submittals shall be in accordance with Section 01 33 00.

23 B. All submittals shall be approved by the City prior to delivery.

24 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

25 A. Product Data

- 26 1. Technical data sheet on each product used.
- 27 2. Material Safety Data Sheet (MSDS) for each product used.
- 28 3. Technical data sheet and project specific data for repair materials to be top-coated
- 29 with the lining product including application, cure time, and surface preparation
- 30 procedures.
- 31 4. Material and method for repair of leaks or cracks in the structure. This applies to
- 32 repair work on both existing structures, manholes, and newly installed manholes
- 33 (including Developer projects) that have been identified with cracks, voids, signs of
- 34 infiltration, other structural defects, or other related construction damage.

35 B. Certification

- 36 1. Current documentation from lining product manufacturer certifying Contractor's
- 37 training (and/or licensure) as an approved installer and equipment compliance with
- 38 the Quality Assurance requirements.

39 **1.7 CLOSEOUT SUBMITTALS**

40 A. Testing Documentation

- 41 1. Provide test results required in Article 3.7 to City.

- 1 a. Include the following manhole or structure location information:
- 2 1) Station number.
- 3 2) GIS ID number, if provided during construction.
- 4 b. Inspection report of each manhole/structure tested.

5 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

6 **1.9 QUALITY ASSURANCE**

7 A. Qualifications

8 1. Contractor

- 9 a. Trained by, or have training approved and certified by, the lining product
- 10 manufacturer for the handling, mixing, application, and inspection of the lining
- 11 product(s) to be used.
- 12 b. Initiate and enforce quality control procedures consistent with the lining
- 13 product(s) manufacturer recommendations and applicable NACE or SSPC
- 14 standards.

15 **1.10 DELIVERY, STORAGE, AND HANDLING**

16 A. Storage and Handling Requirements

- 17 1. Secure and maintain a location to store the material in accordance with Section 01
- 18 66 00.
- 19 2. Keep materials dry, protected from weather, and stored under cover.
- 20 3. Store lining materials between 50 degrees F and 90 degrees F.
- 21 4. Do not store near flame, heat, or strong oxidants.
- 22 5. Handle lining materials according to their material safety data sheets.

23 **1.11 FIELD CONDITIONS**

- 24 A. Provide confined space entry, flow diversion, and/or bypass plans as necessary to
- 25 perform the specified work. Active flows shall be diverted with flow through plugs as
- 26 required to ensure that flow is maintained off the surfaces to be lined.

27 **1.12 WARRANTY [NOT USED]**

28 **PART 2 - PRODUCTS**

29 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

30 **2.2 EQUIPMENT, PRODUCT TYPES, MATERIALS**

31 A. Manufacturers

32 1. Manufacturer List

- 33 a. SprayWall by Sprayroq, Inc.
- 34 b. SpectraShield

35 B. Repair and Resurfacing Products

- 36 1. Compatible with the specified lining product(s) in order to bond effectively, thus
- 37 forming a composite system
- 38 2. Used and applied in accordance with the manufacturer's recommendations

- 1 3. The repair and resurfacing products must meet the following:
 - 2 a. 100 percent solids, solvent-free epoxy grout specifically formulated for epoxy
 - 3 top coating compatibility
 - 4 b. Factory blended, rapid setting, high early strength, fiber reinforced, non-shrink
 - 5 repair mortar that can be troweled or pneumatically spray applied and
 - 6 specifically formulated to be suitable for top coating with the specified lining
 - 7 product used
- 8 C. Lining Product
 - 9 1. Capable of being installed and curing properly within a manhole or other concrete
 - 10 structure.
 - 11 2. Resistant to all forms of chemical or bacteriological attack found in municipal
 - 12 sanitary sewer systems, and capable of adhering to typical manhole structure
 - 13 substrates.
- 14 D. 100 Percent Solids, Rigid, Ultra High-build Polyurethane Lining System:
 - 15 1. Application Temperature – 50 degrees F, minimum
 - 16 2. Thickness – 125 mils minimum for newly installed structures.
 - 17 3. Color – Beige
 - 18 4. Compressive Strength, in accordance with ASTM D695 – 19,000 psi minimum
 - 19 5. Tensile Strength, in accordance with ASTM D638 – 7,400 psi minimum
 - 20 6. Hardness, Shore D, in accordance with ASTM D4541 – 90 minimum
 - 21 7. Abrasion Resistance, in accordance with ASTM D4060 CS 17F Wheel – 17.7 mg
 - 22 loss maximum
 - 23 8. Flexural Modulus, in accordance with ASTM D790 – 529,000 psi minimum
 - 24 9. Flexural Strength, in accordance with ASTM D790 – 14,000 psi minimum
 - 25 10. Adhesion to Concrete, mode of failure, in accordance with ASTM D4541 –
 - 26 Substrate (concrete) failure
 - 27 11. Chemical Resistance, in accordance with ASTM D543/G20, all types of service for:
 - 28 a. Municipal sanitary sewer environment
 - 29 b. Sulfuric acid, 70 percent
 - 30 c. Sodium hydroxide, 20 percent
- 31 E. Multi-layer Modified Polyurea and Polyurethane Lining System:
 - 32 1. Application Temperature – 50 degrees F, minimum
 - 33 2. Thickness – SpectraShield, 500 mils minimum
 - 34 3. Moisture Barrier and Final Corrosion Barrier
 - 35 a. Color – Pink
 - 36 b. Tensile Strength, in accordance with ASTM D412 – 2550 psi minimum
 - 37 c. Hardness, Shore D, in accordance with ASTM D2240 – 56 minimum
 - 38 d. Abrasion Resistance, in accordance with ASTM D4060 – 20 mg loss maximum
 - 39 e. Percent Elongation, in accordance with ASTM D412 – 269
 - 40 4. Surfacer
 - 41 a. Compressive Strength, in accordance with ASTM D1621 – 100 psi minimum
 - 42 b. Density, in accordance with ASTM D1622 – 5 lbs/cu ft minimum
 - 43 c. Shear Strength, in accordance with ASTM C273 – 230 psi minimum

- 1 d. Closed Cell Content, in accordance with ASTM D1940 – >95%
- 2 F. Lining Application Equipment
- 3 1. Manufacturer approved, heated, plural component spray equipment.
- 4 2. Hard to reach areas, primer application, and touch-up may be performed using hand
- 5 tools.
- 6 3. Applicator shall use approved specialty equipment adequate in size, capacity, and
- 7 number sufficient to accomplish the work in a timely manner.

8 **2.3 ACCESSORIES [NOT USED]**

9 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

10 **PART 3 - EXECUTION**

11 **3.1 INSTALLERS**

- 12 A. All installers shall be certified applicators approved by the manufacturers. Applicator
- 13 shall use adequate number of skilled, trained, experienced workmen for the approved
- 14 product.

15 **3.2 EXAMINATION [NOT USED]**

16 **3.3 PREPARATION**

17 A. Manhole Preparation

- 18 1. Stop active flows via damming, plugging, or diverting as required to ensure all
- 19 liquids are maintained below or away from the surfaces to be coated.
- 20 2. Maintain temperature of the surface to be coated between 40 and 120 degrees F.
- 21 3. Shield specified surfaces to avoid exposure of direct sunlight or other intense heat
- 22 source.
- 23 a. Where varying surface temperatures do exist, lining installation should be
- 24 scheduled when the temperature is falling versus rising.

25 B. Surface Preparation

- 26 1. Remove oils, roots, grease, incompatible existing linings, waxes, form release,
- 27 curing compounds, efflorescence, sealers, salts or other contaminants which may
- 28 affect the performance and adhesion of the lining to the substrate.
- 29 2. Remove any steps found in the structure.
- 30 3. Remove concrete and/or mortar damaged by corrosion, chemical attack, or other
- 31 means of degradation so only sound substrate remains.
- 32 4. Surface preparation method, or combination of methods, to be used are high
- 33 pressure water cleaning, high pressure water jetting, abrasive blasting, shotblasting,
- 34 grinding, scarifying, detergent water cleaning, hot water blasting, and others in
- 35 accordance with SSPC SP 13/NACE No. 6.
- 36 5. All methods used shall be performed in a manner that provides a uniform, sound,
- 37 clean, neutralized, surface suitable for the specified lining product.
- 38 6. After completion of surface preparation, inspect for leaks, cracks, holes, exposed
- 39 rebar, ring and cover condition, invert condition, and inlet/outlet pipe condition.

7. After defects in the structure have been identified, seal cracks, repair exposed rebar with new rebar to match existing, repair leaks and cracks with grout or other methods approved by the Manufacturer.
 - a. All new rebar shall be embedded in 1 1/2-inch epoxy mastic.
 - b. Replace/seal connection between existing frame and chimney if found loose or not attached.

3.4 INSTALLATION

A. General

1. Perform lining after the sewer line installation/repairs, grade adjustments, and grouting are complete.
2. Perform application procedures in accordance with the recommendations of the lining product manufacturer, including environmental controls, product handling, mixing, and application.

B. Temperature

1. Only perform application if surface temperature is between 40 and 120 degrees F.
2. Make no application if freezing is expected to occur inside the manhole within 24 hours after application.

C. Lining

1. Spray apply in accordance with the manufacturer's recommendation at a minimum film thickness as noted in Section 2.2.
2. Apply lining from and including the bench to the bottom of the grade rings for new installations and to the bottom of the frame for rehab projects.
3. After walls are coated, remove bench covers and spray bench/trough to at a minimum the same thickness as the walls.
4. Apply any topcoat or additional coats within the product's recoat window.
 - a. Additional surface preparation is required if the recoat window is exceeded.
5. Allow a minimum of 3 hours of cure time or be hard to touch before reactivating flow.

3.5 REPAIR [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL

- A. Each structure will be visually inspected by the City the same day following the application.
- B. Groundwater infiltration of the system shall be zero.
- C. All pipe connections shall be open and clear.
- D. The inspector will check for deficiencies, pinholes, voids, cracks, uncured spots, delamination, and thin spots. Any deficiencies in the liner shall be marked and repaired according to the procedures outlined by the Manufacturer.
- E. If leaks are detected they will be chipped back, plugged, and coated immediately with protective epoxy resin lining.

- 1 1. Make repair 24 hours after leak detection.
- 2 F. Lining Thickness Testing
- 3

- 1 1. Wet Film Thickness Testing
- 2 a. Take wet film thickness gauge measurements in accordance with ASTM D4414
- 3 at 3 locations within the manhole, 2 spaced equally apart along the wall and 1
- 4 on the bench.
- 5 1) Document and attest measurements and provide to the City.
- 6 2. Thickness Testing for modified polymer liner system
- 7 a. Upon installation of the Final Corrosion Barrier, insert probe into substrate for
- 8 depth of system measurement at 3 locations within the manhole, 2 spaced
- 9 equally apart along the wall and 1 on the bench.
- 10 1) Document and attest measurements and provide to the City.

11 G. Post Installation Lining Tests

- 12 1. Holiday Detection Testing
- 13 a. Holiday Detection test the liner in accordance with NACE SP0188. Mark all
- 14 detected holidays. Repair all holidays in accordance to coating manufacturer’s
- 15 recommendations.
- 16 1) Document and attest all test results and repairs made, and provide to the
- 17 City.
- 18 2) Contractor shall mark any location that shows a spark or potential for a
- 19 pinhole and repair these locations in accordance with manufacturer
- 20 recommendations.

21 H. Non-Conforming Work

- 22 1. City reserves the right to require additional testing depending on the rate of failure.
- 23 a. City will select testing locations.
- 24 2. Repair all defects according to the manufacturer’s recommendations.

25 **3.8 SYSTEM STARTUP [NOT USED]**

26 **3.9 ADJUSTING [NOT USED]**

27 **3.10 CLEANING [NOT USED]**

28 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

29 **3.12 PROTECTION [NOT USED]**

30 **3.13 MAINTENANCE [NOT USED]**

31 **3.14 ATTACHMENTS [NOT USED]**

32 **END OF SECTION**

33

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

- 1 c. The price bid shall include:
 - 2 1) Pavement removal
 - 3 2) Excavation
 - 4 3) Hauling
 - 5 4) Disposal of excess material
 - 6 5) Grade rings
 - 7 6) Reuse of the existing manhole frame and cover
 - 8 7) Furnishing, placement, and compaction of embedment and backfill
 - 9 8) Concrete base material
 - 10 9) Permanent asphalt patch or concrete paving repair, as required
 - 11 10) Clean-up
- 12 2. Manhole – Major Adjustment
 - 13 a. Measurement
 - 14 1) Measured per each manhole to be adjusted greater than 6 inches and
 - 15 requiring structural modification to the grade specified in the Drawings.
 - 16 b. Payment
 - 17 1) The work performed and materials furnished in accordance with this item
 - 18 and measured as provided under “Measurement” will be paid for at the unit
 - 19 price bid per each “Manhole Adjustment, Major” completed.
 - 20 c. The price bid shall include:
 - 21 1) Pavement removal
 - 22 2) Excavation
 - 23 3) Hauling
 - 24 4) Disposal of excess material
 - 25 5) Structural modifications and grade rings
 - 26 6) Reuse of the existing manhole frame and cover
 - 27 7) Furnishing, placement, and compaction of embedment and backfill
 - 28 8) Concrete base material
 - 29 9) Permanent asphalt patch or concrete paving repair, as required
 - 30 10) Clean-up
- 31 3. Manhole – Major Adjustment with Frame and Cover
 - 32 a. Measurement
 - 33 1) Measured per each manhole to be adjusted greater than 6 inches, requiring
 - 34 structural modification, and a new frame and cover to the grade specified in
 - 35 the Drawings.
 - 36 b. Payment
 - 37 1) The work performed and materials furnished in accordance with this item
 - 38 and measured as provided under “Measurement” will be paid for at the unit
 - 39 price bid per each “Manhole Adjustment, Major with Frame and Cover”
 - 40 completed.
 - 41 c. The price bid shall include:
 - 42 1) Pavement removal
 - 43 2) Excavation
 - 44 3) Hauling
 - 45 4) Disposal of excess material
 - 46 5) Structural modifications and grade rings
 - 47 6) Frame and cover
 - 48 7) Furnishing, placement, and compaction of embedment and backfill

- 1 8) Concrete base material
- 2 9) Permanent asphalt patch or concrete paving repair, as required
- 3 10) Clean-up
- 4 4. Inlet Adjustment
- 5 a. Measurement
- 6 1) Measured per each adjustment of an inlet requiring structural modifications
- 7 to the grade specified in the Drawings.
- 8 b. Payment
- 9 1) The work performed and materials furnished in accordance with this item
- 10 and measured as provided under “Measurement” will be paid for at the unit
- 11 price bid per each “Inlet Adjustment” completed.
- 12 c. The price bid shall include:
- 13 1) Pavement removal
- 14 2) Excavation
- 15 3) Hauling
- 16 4) Disposal of excess material
- 17 5) Structural modifications
- 18 6) Reuse of frame and covers (if applicable)
- 19 7) Furnishing, placement, and compaction of embedment and backfill
- 20 8) Concrete base material, as required
- 21 9) Surface restoration, permanent asphalt patch, or concrete paving repair, as
- 22 required
- 23 10) Clean-up
- 24 5. Valve Box Adjustment
- 25 a. Measurement
- 26 1) Measured per each valve box adjustment to the grade specified in the
- 27 Drawings.
- 28 b. Payment
- 29 1) The work performed and materials furnished in accordance with this item
- 30 and measured as provided under “Measurement” will be paid for at the unit
- 31 price bid per each “Valve Box Adjustment” completed.
- 32 c. The price bid shall include:
- 33 1) Pavement removal
- 34 2) Excavation
- 35 3) Hauling
- 36 4) Disposal of excess material
- 37 5) Adjustment device
- 38 6) Furnishing, placement, and compaction of embedment and backfill
- 39 7) Concrete base material, as required
- 40 8) Surface restoration, permanent asphalt patch, or concrete paving repair, as
- 41 required
- 42 9) Clean-up
- 43 6. Cathodic Protection Test Station Adjustment
- 44 a. Measurement
- 45 1) Measured per each adjustment of a cathodic protection test station to the
- 46 grade specified in the Drawings.
- 47

- 1 b. Payment
- 2 1) The work performed and materials furnished in accordance with this item
- 3 and measured as provided under “Measurement” will be paid for at the unit
- 4 price bid per each “Cathodic Protection Test Station Adjustment”
- 5 completed.
- 6 c. The price bid shall include:
- 7 1) Pavement removal
- 8 2) Excavation
- 9 3) Hauling
- 10 4) Disposal of excess material
- 11 5) Adjustment device
- 12 6) Furnishing, placement, and compaction of embedment and backfill
- 13 7) Concrete base material, as required
- 14 8) Surface restoration, permanent asphalt patch, or concrete paving repair, as
- 15 required
- 16 9) Clean-up
- 17 7. Fire Hydrant Adjustment
- 18 a. Measurement
- 19 1) Measured per each fire hydrant adjustment, requiring stem extensions, to
- 20 the grade specified in the Drawings.
- 21 b. Payment
- 22 1) The work performed and materials furnished in accordance with this item
- 23 and measured as provided under “Measurement” will be paid for at the unit
- 24 price bid per each “Fire Hydrant Stem Extension” completed.
- 25 c. The price bid shall include:
- 26 1) Pavement removal
- 27 2) Excavation
- 28 3) Hauling
- 29 4) Disposal of excess material
- 30 5) Adjustment materials
- 31 6) Furnishing, placement, and compaction of embedment and backfill
- 32 7) Concrete base material, as required
- 33 8) Surface restoration, permanent asphalt patch, or concrete paving repair, as
- 34 required
- 35 9) Clean-up
- 36 8. Miscellaneous Structure Adjustment
- 37 a. Measurement
- 38 1) Measured per each structure adjustment requiring structural modifications
- 39 to the grade specified in the Drawings.
- 40 b. Payment
- 41 1) The work performed and materials furnished in accordance with this item
- 42 and measured as provided under “Measurement” will be paid for at the unit
- 43 price bid per each “Miscellaneous Structure Adjustment” completed.
- 44 c. The price bid shall include:
- 45 1) Pavement removal
- 46 2) Excavation
- 47 3) Hauling
- 48 4) Disposal of excess material

- 1 5) Structural Modifications
- 2 6) Furnishing, placement, and compaction of embedment and backfill
- 3 7) Concrete base material
- 4 8) Permanent asphalt patch or concrete paving repair, as required
- 5 9) Clean-up

6 **1.3 REFERENCES**

7 A. Abbreviations

- 8 1. CLSM – Controlled Low Strength Material

9 B. Definitions

10 1. Minor Adjustment

- 11 a. Refers to a small elevation change, less than 6 inches, performed on an existing
- 12 manhole which does not require structural modifications.

13 2. Major Adjustment

- 14 a. Refers to a significant elevation change, greater than 6 inches, performed on an
- 15 existing manhole which requires structural modification.

16 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

17 **1.5 SUBMITTALS [NOT USED]**

18 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

19 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

20 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

21 **1.9 QUALITY ASSURANCE [NOT USED]**

22 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

23 **1.11 FIELD CONDITIONS [NOT USED]**

24 **1.12 WARRANTY [NOT USED]**

25 **PART 2 - PRODUCTS**

26 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

27 **2.2 MATERIALS**

28 A. Cast-in-Place Concrete

- 29 1. In accordance with Sections 03 00 00 and 03 30 00

30 B. Controlled Low Strength Material (CLSM)

- 31 1. In accordance with Section 03 34 13

32 C. Modifications to Existing Concrete Structures

- 33 1. In accordance with Section 03 80 00

34

- 1 D. Grade Rings
- 2 1. In accordance with Section 33 05 81
- 3 E. Frame and Cover
- 4 1. In accordance with Section 33 05 81
- 5 F. Backfill material
- 6 1. In accordance with Section 33 05 05
- 7 G. Water valve box extension
- 8 1. In accordance with Section 33 14 20
- 9 H. Fire Hydrant Adjustment
- 10 1. In accordance with Section 33 14 40
- 11 I. Cast-in-Place Concrete Manholes
- 12 1. In accordance with Section 33 05 61
- 13 J. Precast Concrete Manholes
- 14 1. In accordance with Section 33 05 62
- 15 K. Fiberglass Manholes
- 16 1. In accordance with Section 33 05 76

17 **2.3 ACCESSORIES [NOT USED]**

18 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

19 **PART 3 - EXECUTION**

20 **3.1 INSTALLERS [NOT USED]**

21 **3.2 EXAMINATION**

- 22 A. Verification of Conditions
- 23 1. Examine existing structure to be adjusted for damage or defects that may affect
- 24 grade adjustment.
- 25 a. Report issue to City for consideration before beginning adjustment.

26 **3.3 PREPARATION**

- 27 A. Grade Verification
- 28 1. For major adjustments, confirm the grade change noted on Drawings is consistent
- 29 with field measurements.
- 30 a. If not consistent, coordinate with City to verify final grade before beginning
- 31 adjustment.

32 **3.4 ADJUSTMENT**

- 33 A. Manholes, Inlets, and Miscellaneous Structures
- 34 1. For sanitary sewer adjustments, replace all 24-inch frame and cover assemblies
- 35 with 30-inch frame and cover assemblies.

- 1 2. Protect the bottom of structures using wood forms shaped to fit the structure to
- 2 prevent debris falling into the invert, inlet, or outlet piping during adjustments.
- 3 a. Do not use any more than a 2-piece bottom.
- 4 3. Use the least number of grade rings necessary to meet required grade.
- 5 a. The maximum height of proposed and existing grade rings shall be no more
- 6 than 12-inches for any combination of grade rings.
- 7 b. Use least amount of grade rings necessary.
- 8 1) For example, use 3, 4-inch rings in lieu of 6, 2-inch rings.
- 9 c. Adjustments which result in 12-inches or more of grade rings will be
- 10 considered major adjustments and will require structural modifications to
- 11 existing structure to accommodate this requirement.

- 12 B. Valve Boxes
- 13 1. Utilize standard 3-piece adjustable valve box for adjusting to final grade as shown
- 14 on the Drawings.

- 15 C. Fire Hydrants
- 16 1. Limit vertical adjustments to an increase of 2 vertical feet.
- 17 2. Decreasing grade for fire hydrants is not permitted and requires a complete
- 18 replacement of fire hydrant assembly in accordance with Section 33 14 40.

- 19 D. Backfill and Grading
- 20 1. Backfill area of excavation surrounding each adjustment in accordance with Section
- 21 33 05 05.

- 22 E. Pavement Repair
- 23 1. If required, perform pavement repair in accordance with Section 32 01 17 or
- 24 Section 32 01 29.

- 25 **3.5 REPAIR [NOT USED]**
- 26 **3.6 RE-INSTALLATION [NOT USED]**
- 27 **3.7 FIELD QUALITY CONTROL [NOT USED]**
- 28 **3.8 SYSTEM STARTUP [NOT USED]**
- 29 **3.9 ADJUSTING [NOT USED]**
- 30 **3.10 CLEANING [NOT USED]**
- 31 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 32 **3.12 PROTECTION [NOT USED]**
- 33 **3.13 MAINTENANCE [NOT USED]**
- 34

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

3

1 **SECTION 33 05 02**
2 **WATER LINE LOWERING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Locations where existing water lines are crossed by a new storm sewer, sanitary
7 sewer, or water transmission main and the existing water line is to be lowered under
8 proposed improvement without a design profile provided in the Drawings
9 2. Locations where a new water line is installed and crosses an existing underground
10 conflict which requires the water line to be lowered greater than two feet below the
11 standard depth and has not been detailed in the Drawings
12 3. Water lines 12-inch and larger are excluded from this Section and should be
13 specifically designed for lowering and paid for by unit price items

14 B. Deviations from this City of Denton Standard Specification:

- 15 1. None.

16 C. Related Specification Sections include but are not limited to:

- 17 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
18 Contract.
19 2. Division 1 - General Requirements.
20 3. Section 33 01 10 – Cleaning and Acceptance Testing of Water Mains.
21 4. Section 33 14 10 – Ductile Iron Pipe and Fittings.
22 5. Section 33 14 11 – Polyvinyl Chloride (PVC) Pressure Pipe.
23 6. Section 33 14 25 – Connection to Existing Water Mains.

24 **1.2 PRICE AND PAYMENT PROCEDURES**

25 A. Measurement and Payment

- 26 1. Water Line Lowering
27 a. Measurement
28 1) Measurement for this item shall be per each by size of each Water Line
29 Lowering performed.
30 b. Payment
31 1) The work performed and the materials furnished in accordance with this
32 item shall be paid for at the unit price bid per each "Water Line Lowering"
33 installed for:
34 a) Various Sizes.
35 b) Various Materials.
36 c. The price bid shall include:
37 1) Furnishing and installing Ductile Iron or PVC Pipe and Ductile Iron
38 Fittings
39 2) Polyethylene encasement
40 3) Paving removal

- 1 4) Excavation
- 2 5) Hauling
- 3 6) Disposal of excess material
- 4 7) Furnishing and placement of embedment
- 5 8) Furnishing, placement, and compaction of backfill
- 6 9) Thrust restraint
- 7 10) Bolts and nuts
- 8 11) Gaskets
- 9 12) Clean-up
- 10 13) Cleaning
- 11 14) Disinfection
- 12 15) Testing
- 13 16) Connections to the existing water line

14 **1.3 REFERENCES**

15 A. Reference Standards

- 16 1. Reference standards cited in this Section refer to the current reference standard
- 17 published at the time of the latest revision date logged at the end of this Section
- 18 unless a date is specifically cited.
- 19 2. Texas Administration Code:
- 20 a. Chapter 290, (30 TAC §290), Public Drinking Water.

21 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

22 **1.5 SUBMITTALS [NOT USED]**

23 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

24 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

25 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

26 **1.9 QUALITY ASSURANCE [NOT USED]**

27 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

28 **1.11 FIELD CONDITIONS [NOT USED]**

29 **1.12 WARRANTY [NOT USED]**

30 **PART 2 - PRODUCTS**

31 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

32 **2.2 EQUIPMENT, PRODUCT TYPES, MATERIALS**

33 A. Materials

- 34 1. If existing pipe material is ductile iron, use ductile iron pipe in accordance with this
- 35 Section. For all other pipe materials, use PVC in accordance with this Section.
- 36 2. When crossing under storm drain pipe 24-in and larger, use ductile iron pipe in
- 37 accordance with this Section.

3. When crossing under sanitary sewer, use ductile iron pipe in accordance with this Section.
4. Ductile Iron Pipe shall be in accordance with Section 33 14 10.
5. Ductile Iron Fittings with retainer glands shall be in accordance with Section 33 14 10.
6. Polyvinyl Chloride (PVC) Pressure Pipe shall be in accordance with Section 33 14 11.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION

A. Evaluation and Assessment

1. Verify elevation of conflict which requires the water line to be relocated.

3.3 PREPARATION [NOT USED]

3.4 INSTALLATION

A. General

1. Water lines lowered to resolve conflicts between the water line and a proposed utility shall be lowered to maintain a 2-foot separation between the outside diameters of the water line and the other buried utilities.
 - a. When approved by the City, the separation may be reduced to 12-inches.

B. Water Lines Crossing Sanitary Sewer

- a. Water lines crossing sanitary sewer shall be in accordance with Chapter 290, (30 TAC §290), Public Drinking Water and with Chapter 217, (30 TAC §217), Design Criteria for Sewerage System, no exceptions will be made.

C. Water Lines Crossing under Storm Drains

1. Water lines crossing less than 2 feet below storm drains shall be constructed of Ductile Iron Pipe in accordance with Section 33 14 10.

D. Install Ductile Iron Pipe in accordance with Section 33 14 10.

E. Install Ductile Iron Fittings with retainer glands in accordance with Section 33 14 10.

F. Install Polyvinyl Chloride (PVC) Pressure Pipe in accordance with Section 33 14 11.

G. Disinfect and test water line in accordance with Section 33 01 10.

H. Complete connections to existing water mains in accordance with Section 33 14 25.

3.5 REPAIR [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

1 **3.7 FIELD QUALITY CONTROL**

2 A. Hydrostatic testing of water mains:

- 3 1. Hydrostatically test the mains in accordance with Section 33 01 10.

4 **3.8 SYSTEM STARTUP [NOT USED]**

5 **3.9 ADJUSTING [NOT USED]**

6 **3.10 CLEANING**

7 A. Cleaning, disinfection, and bacteriological testing of water mains:

- 8 1. Clean, flush, pig, disinfect, and bacteriological test the mains in accordance with
9 Section 33 01 10.

10 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

11 **3.12 PROTECTION [NOT USED]**

12 **3.13 MAINTENANCE [NOT USED]**

13 **3.14 ATTACHMENTS [NOT USED]**

14 **END OF SECTION**

15

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

16

1 **1.2 PRICE AND PAYMENT PROCEDURES**

2 A. Measurement and Payment

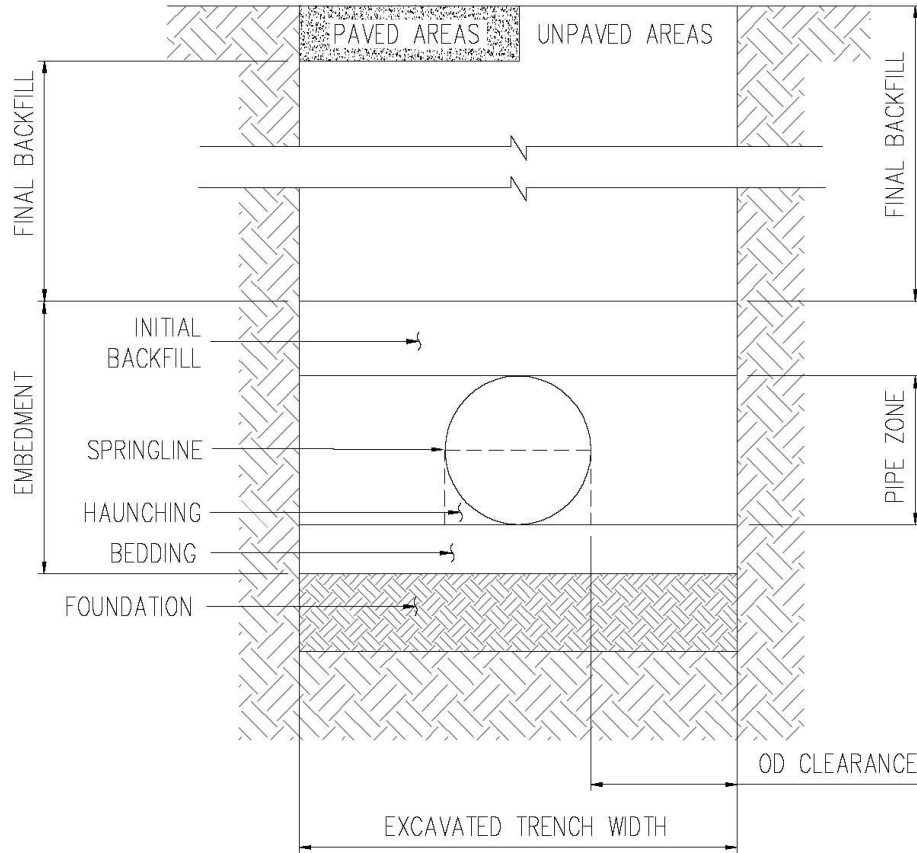
- 3 1. Trench Excavation, Embedment, and Backfill associated with the installation of an
4 underground utility
- 5 a. Measurement
- 6 1) This item is considered subsidiary to utility pipe installed.
- 7 b. Payment
- 8 1) The work performed and materials furnished in accordance with this item
9 are subsidiary to the unit price bid per linear foot of utility pipe installed.
- 10 2. Imported Embedment or Backfill
- 11 a. Measurement
- 12 1) Measured by cubic yard per plan quantity.
- 13 b. Payment
- 14 1) The work performed and materials furnished in accordance with this item
15 and measured as provided under “Measurement” will be paid for at the unit
16 price bid per cubic yard of “Imported Embedment/Backfill” per plan
17 quantity for:
- 18 a) Various embedment/backfill materials.
- 19 c. The price bid shall include
- 20 1) Furnishing of backfill or embedment in accordance with this Section
- 21 2) Hauling to the Site
- 22 3) Placement and compaction of backfill or embedment
- 23 3. Concrete Encasement for Utility Lines
- 24 a. Measurement
- 25 1) Measured by cubic yard per plan quantity.
- 26 b. Payment
- 27 1) The work performed and materials furnished in accordance with this item
28 and measured as provided under “Measurement” will be paid for at the unit
29 price bid per cubic yard of “Concrete Encasement for Utility Lines” per
30 plan quantity.
- 31 c. The price bid shall include
- 32 1) Furnishing, hauling, placing, and finishing concrete in accordance with
33 Section [03 30 00](#)
- 34 2) Clean-up
- 35 4. Groundwater Control
- 36 a. Measurement
- 37 1) Measurement shall be lump sum when a groundwater control plan is
38 specifically required by the Contract Documents. Otherwise this item is
39 considered subsidiary to the various items bid.
- 40 b. Payment
- 41 1) The work performed and the materials furnished in accordance with this
42 item shall be paid for at the lump sum price bid for “Groundwater Control”.
- 43

- 1 c. The price bid shall include:
 - 2 a) Submittals
 - 3 b) Additional Testing
 - 4 c) Groundwater control system installation
 - 5 d) Groundwater control system operations and maintenance
 - 6 e) Disposal of water
 - 7 f) Removal of groundwater control system
- 8 5. Clay Dams
 - 9 a. Measurement
 - 10 1) This item is considered subsidiary to utility pipe installed where indicated
 - 11 in the Drawings.
 - 12 b. Payment
 - 13 1) The work performed and materials furnished in accordance with this item
 - 14 are subsidiary to the unit price bid per linear foot of utility pipe installed.
- 15 6. Trench Safety
 - 16 a. Measurement
 - 17 1) Measured per linear foot of excavation for all trenches that require trench
 - 18 safety in accordance with OSHA excavation safety standards (29 CFR Part
 - 19 1926 Subpart P Safety and Health Regulations for Construction).
 - 20 b. Payment
 - 21 1) The work performed and materials furnished in accordance with this item
 - 22 and measured as provided under “Measurement” will be paid for at the unit
 - 23 price bid per linear foot of excavation to comply with OSHA excavation
 - 24 safety standards (29 CFR Part 1926 Subpart P Safety and Health
 - 25 Regulations for Construction).
 - 26 c. The price bid shall include:
 - 27 1) Submittals
 - 28 2) Conformance with trench safety plan

29 1.3 REFERENCES

- 30 A. Abbreviations
 - 31 1. CSS – Cement Stabilized Sand
 - 32 2. CLSM – Controlled Low Strength Material
- 33 B. Definitions
 - 34 1. General – Definitions used in this section are in accordance with Terminologies
 - 35 ASTM F412 and ASTM D8 and Terminology ASTM D653, unless otherwise
 - 36 noted.
 - 37

- 1 2. Definitions for trench width, backfill, embedment, initial backfill, pipe zone,
 2 haunching bedding, springline, pipe zone, and foundation are defined as shown in
 3 the following schematic:



- 4
- 5 3. Deleterious materials – Harmful materials such as clay lumps, silts, and organic
 6 material
- 7 4. Excavated Trench Depth – Distance from the surface to the bottom of the bedding
 8 or the trench foundation
- 9 5. Final Backfill Depth
- 10 a. Unpaved Areas – The depth of the final backfill measured from the top of the
 11 initial backfill to the surface
- 12 b. Paved Areas – The depth of the final backfill measured from the top of the
 13 initial backfill to bottom of permanent or temporary pavement repair

14 C. Reference Standards

- 15 1. Reference standards cited in this Section refer to the current reference standard
 16 published at the time of the latest revision date logged at the end of this Section,
 17 unless a date is specifically cited.
- 18 2. ASTM Standards:
- 19 a. C33, Standard Specification for Concrete Aggregates.
- 20 b. C40, Standard Test Method for Organic Impurities in Fine Aggregates for
 21 Concrete.

- c. C88, Standard Test Method for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
 - d. C94, Standard Specification for Ready-Mixed Concrete.
 - e. C123, Standard Test Method for Lightweight Particles in Aggregate.
 - f. C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - g. C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
 - h. C142, Standard Test Method for Clay Lumps and Friable Particles in Aggregates.
 - i. D448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - j. C535, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - k. D698, Test Methods for Laboratory Compaction Characteristics of Soil Using Stand and Effort (12,400 ft-lb/ft³ 600 Kn-m/M³).
 - l. D1632, Standard Practice for Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory.
 - m. D1633, Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders.
 - n. D1556, Standard Test Method for Density and Unit Weight of Soils in Place by Sand Cone Method.
 - o. D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - p. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 - q. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
3. Occupational Safety and Health Administration (OSHA)
- a. 29 CFR, Part 1926-Safety Regulations for Construction, Subpart P: Excavations.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination

- 1. Utility Company Notification
 - a. Notify area utility companies at least 48 hours in advance, excluding weekends and holidays, before starting excavation.
 - b. Request the location of buried lines and cables in the vicinity of the proposed work.

B. Sequencing

- 1. Sequence work for each section of the pipe installed to complete the embedment and backfill placement on the day the pipe foundation is complete.
- 2. Sequence work such that Proctors are complete in accordance with ASTM D698 prior to commencement of construction activities.

C. Excavation Protection

- 1. Excavation protection shall be in strict compliance with OSHA excavation safety standards (29 CFR Part 1926 Subpart P Safety and Health regulations for Construction).

2. Submit three (3) copies of a site-specific trench safety plan prepared by a licensed Professional Engineer in the State of Texas to the City prior to construction in accordance with Section 01 33 00.
 - a. The City will not review the submittal. Receipt of submittal is confirmation that the Contractor has prepared a trench safety plan as required by state and federal law.
 - b. The City assumes no responsibility for trench safety and shall be held harmless under the indemnification clause of the General Conditions.
3. Any changes in the trench excavation plan after initiation of construction will not be cause for an extension of time and will require a new submittal to the City.
4. The Contractor accepts sole responsibility for compliance with all applicable safety requirements.

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Submittals
 1. Designated storage area affidavit for storage on private property, if applicable.
- B. Shop Drawings
 1. Provide detailed drawings and explanation for groundwater and surface water control, if required.
 2. Trench Safety Plan in accordance with Article 1.4.
 3. Stockpiled excavation and/or backfill material
 - a. Provide a description of the storage of the excavated material only if the Contract Documents do not allow storage of materials in the right-of-way or the easement.

1.7 CLOSEOUT SUBMITTALS

- A. Test and Evaluation Reports
 1. All test reports generated during testing.

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Storage Requirements
 1. Secure and maintain a location to store the material in accordance with Section 01 66 00.
 2. Within Existing Rights-of-way (ROW)
 - a. Spoils and imported embedment and backfill materials may be stored within existing ROW, easements, or temporary construction easements, unless specifically disallowed in the Contract Documents or the City's Right-of-Way Ordinance.

- b. Do not block drainage ways, inlets, or driveways.
 - c. Provide erosion control in accordance with Section 31 25 14.
 - d. Store materials only in areas barricaded as provided in the traffic control plans.
 - e. In non-paved areas, do not store material on the root zone of any trees or in landscaped areas.
3. Designated Storage Areas
- a. If the Contract Documents do not allow the storage of spoils, embedment or backfill materials within the ROW, easement, or temporary construction easements, secure and maintain an adequate storage location.
 - b. Provide an affidavit that rights have been secured to store the materials on private property.
 - c. Provide erosion control in accordance with Section 31 25 14.
 - d. Do not block drainage ways, inlets, or driveways.
 - e. Only materials used for 1 working day will be allowed to be stored in the work zone.

1.11 FIELD CONDITIONS

A. Existing Conditions

- 1. Any data which has been or may be provided on subsurface conditions is not intended as a representation or warranty of accuracy or continuity between soils. It is expressly understood that neither the City nor the Engineer will be responsible for interpretations or conclusions drawn by the Contractor, in accordance with Section 00 72 00.
 - a. Data is made available for the convenience of the Contractor.

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Materials

- 1. Utility Sand
 - a. Granular and free flowing
 - b. Generally, meets or exceeds the limits on deleterious substances per Table 2 of ASTM C33 for fine aggregate
 - c. Reasonably free of organic material
 - d. Gradation tested in accordance with ASTM C136:

Sieve Size	Percent Retained
1 inch	0
3/8 inch	0-10
#30	40-75
#100	95

- 2. Crushed Rock
 - a. Durable crushed rock or recycled concrete
 - b. In accordance with the gradation of ASTM D448 size numbers 56, 57 or 67

- 1 c. May be unwashed
- 2 d. Free from significant silt clay or unsuitable materials
- 3 e. Percentage of wear not more than 40 percent in accordance with ASTM C131
- 4 or C535
- 5 f. Not more than a 12 percent maximum loss when subjective to 5 cycles of
- 6 sodium sulfate soundness per ASTM C88
- 7 3. Pea Gravel
- 8 a. Durable particles composed of small, smooth, rounded stones or pebbles
- 9 b. In accordance with the gradation of ASTM D448 size number 8
- 10 4. Fine Crushed Rock (Chat)
- 11 a. Durable crushed rock
- 12 b. In accordance with the gradation of ASTM D448 size numbers 8 or 89
- 13 c. May be unwashed
- 14 d. Free from significant silt clay or unsuitable materials.
- 15 e. Percentage of wear not more than 40 percent in accordance with ASTM C131
- 16 or C535
- 17 f. Not more than a 12 percent maximum loss when subjective to 5 cycles of
- 18 sodium sulfate soundness in accordance with ASTM C88
- 19 5. Ballast Stone
- 20 a. Stone ranging from 3 inches to 6 inches in greatest dimension.
- 21 b. May be unwashed
- 22 c. Free from significant silt clay or unsuitable materials
- 23 d. Percentage of wear not more than 40 percent per ASTM C131 or C535
- 24 e. Not more than a 12 percent maximum loss when subjected to 5 cycles of
- 25 sodium sulfate soundness in accordance with ASTM C88
- 26 6. Native Backfill Material
- 27 a. In-situ or imported soils classified as CL, CH, SC, or GC in accordance with
- 28 ASTM D2487
- 29 b. Free from deleterious materials, boulders over 6 inches in size, and organics
- 30 c. Free from voids
- 31 d. Must have 20 percent passing the number 200 sieve
- 32 7. Blended Backfill Material
- 33 a. In-situ soils classified as SP, SM, GP, or GM in accordance with ASTM D2487
- 34 b. Blended with in-situ or imported backfill material in accordance with the
- 35 requirements of Native Backfill Material
- 36 c. Free from deleterious materials, boulders over 6 inches in size and organics
- 37 d. Must have 20 percent passing the number 200 sieve
- 38 8. Unacceptable Backfill Material
- 39 a. In-situ soils classified as ML, MH, PT, OL, or OH in accordance with ASTM
- 40 D2487
- 41 9. Select Fill
- 42 a. Classified as SC or CL in accordance with ASTM D2487
- 43 b. Liquid limit less than 35
- 44 c. Plasticity index between 8 and 20
- 45 10. Cement Stabilized Sand (CSS)
- 46 a. Sand

- 1) Clean and durable, in accordance with grading requirements for fine aggregates of ASTM C33 and the following requirements:
 - a) Classified as SW, SP, or SM by the United Soil Classification System of ASTM D2487
 - b) Deleterious materials
 - (1) Clay lumps, ASTM C142, less than 0.5 percent
 - (2) Lightweight pieces, ASTM C123, less than 5.0 percent
 - (3) Organic impurities, ASTM C40, color no darker than standard color
 - (4) Plasticity index of 4 or less when tested in accordance with ASTM D4318.
 - b. Minimum of 4 percent cement content of Type I/II portland cement
 - c. Water
 - 1) Potable water, free of soils, acids, alkalis, organic matter or other deleterious substances, in accordance with the requirements of ASTM C94
 - d. Mix in a stationary pug mill, weigh-batch, or continuous mixing plant.
 - e. Strength
 - 1) 50 to 150 psi compressive strength at 2 days in accordance with ASTM D1633, Method A
 - 2) 200 to 250 psi compressive strength at 28 days in accordance with ASTM D1633, Method A
 - 3) The maximum compressive strength in 7 days shall be 400 psi.
 - a) Backfill that exceeds the maximum compressive strength shall be removed by the Contractor for no additional compensation.
 - f. Random samples of delivered product will be taken in the field at point of delivery for each day of placement in the work area. Specimens will be prepared in accordance with ASTM D1632.
11. Controlled Low Strength Material (CLSM)
 - a. Conform to Section [03 34 13](#)
12. Trench Geotextile Fabric
 - a. Soils other than ML or OH in accordance with ASTM D2487
 - 1) Needle punch, nonwoven geotextile composed of polypropylene fibers
 - 2) Fibers shall retain their relative position
 - 3) Inert to biological degradation
 - 4) Resist naturally occurring chemicals
 - 5) UV Resistant
 - 6) Mirafi 140N by Tencate, or approved equal
 - b. Soils Classified as ML or OH in accordance with ASTM D2487
 - 1) High-tenacity monofilament polypropylene woven yarn
 - 2) 8 to 10 percent open area
 - 3) Fibers shall retain their relative position
 - 4) Inert to biological degradation
 - 5) Resist naturally occurring chemicals
 - 6) UV Resistant
 - 7) Mirafi FW402 by Tencate, or approved equal
13. Concrete Encasement
 - a. In accordance with Sections [03 00 00](#) and [03 30 00](#).
14. Clay Dam

1 a. Provide clay (SC, CL, or CH) with a plasticity index of no less than 18.

2 **2.3 ACCESSORIES [NOT USED]**

3 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

4 **PART 3 - EXECUTION**

5 **3.1 INSTALLERS [NOT USED]**

6 **3.2 EXAMINATION**

7 A. Verification of Conditions

- 8 1. Review all known, identified, or marked utilities, whether public or private, prior to
9 excavation.
- 10 2. Locate and protect all known, identified, or marked utilities or underground
11 facilities as excavation progresses.
- 12 3. Notify all utility owners within the project limits 48 hours prior to beginning
13 excavation.
- 14 4. The information and data shown in the Drawings with respect to utilities is
15 approximate and based on record information or on physical appurtenances
16 observed within the project limits.
- 17 5. Coordinate with the owner(s) of underground facilities.
- 18 6. Immediately notify any utility owner of damages to underground facilities resulting
19 from construction activities.
- 20 7. Repair any damages resulting from the construction activities.

21 B. Differing Site Conditions

- 22 1. Notify the City immediately of any differing site condition in accordance with
23 Section 00 72 00.

24 **3.3 PREPARATION**

25 A. Protection of In-Place Conditions

26 1. Pavement

- 27 a. Conduct activities in such a way that does not damage existing pavement
28 designated to remain.
- 29 1) Where desired to move equipment not licensed for operation on public
30 roads or across pavement, provide means to protect the pavement from all
31 damage.
- 32 b. Repair or replace any pavement damaged due to the negligence of the
33 Contractor outside the limits designated for pavement removal at no additional
34 cost to the City.

35 2. Drainage

- 36 a. Maintain positive drainage during construction and re-establish drainage for all
37 swales and culverts affected by construction.

38 3. Trees

- 1 a. When operating outside of existing right-of-way (ROW), stake permanent and
2 temporary construction easements.
- 3 b. Restrict all construction activities to the designated easements and ROW.
- 4 c. Flag and protect all trees designated to remain in accordance with Section 31 10
5 00.
- 6 d. Conduct excavation, embedment, and backfill in a manner such that there is no
7 damage to the tree canopy.
- 8 e. Prune or trim tree limbs as specifically allowed by the Drawings or as
9 specifically allowed by the City.
 - 10 1) Pruning or trimming may only be accomplished with equipment
11 specifically designed for tree pruning or trimming.
- 12 f. Remove trees specifically designated to be removed in the Drawings in
13 accordance with Section 31 10 00.
- 14 4. Above ground Structures
 - 15 a. Protect all above ground structures adjacent to the construction.
 - 16 b. Remove above ground structures designated for removal in the Drawings in
17 accordance with Sections 02 41 13, 02 41 15, and 31 10 00.
- 18 5. Traffic
 - 19 a. Maintain existing traffic in accordance with Division 34, except as modified by
20 the traffic control plan.
 - 21 b. Do not block access to driveways or alleys for extended periods of time unless:
 - 22 1) Alternative access has been provided;
 - 23 2) Proper notification has been provided to the property owner or resident;
 - 24 3) It is specifically allowed in the traffic control plan.
 - 25 c. Use traffic rated plates to maintain access until access is restored.
- 26 6. Traffic Signal – Poles, Mast Arms, Pull boxes, Detector loops
 - 27 a. Notify the City a minimum of 48 hours prior to any excavation that could
28 impact the operations of an existing traffic signal.
 - 29 b. Protect all traffic signal poles, mast arms, pull boxes, traffic cabinets, conduit,
30 and detector loops.
 - 31 c. Notify the City immediately of damage to any component of the traffic signal
32 due to the construction activities.
 - 33 d. Repair any damage to the traffic signal poles, mast arms, pull boxes, traffic
34 cabinets, conduit, and detector loops as a result of the construction activities in
35 accordance with Division 34.
- 36 7. Fences
 - 37 a. Protect all fences designated to remain.
 - 38 b. Leave fence in the equal or better condition as prior to construction.

39 3.4 INSTALLATION

40 A. Excavation

- 41 1. Excavate to the depth indicated on the Drawings.
- 42 2. Trench excavations are defined as unclassified. No additional payment shall be
43 granted for rock or other in-situ materials encountered in the trench.
- 44 3. Excavate to a width sufficient for laying the pipe in accordance with the Drawings
45 and bracing in accordance with the Trench Safety Plan.
- 46 4. The bottom of the excavation shall be firm and free from standing water.

- 1 a. Notify the City immediately if the water and/or the in-situ soils do not provide
- 2 for a firm trench bottom.
- 3 b. The City will determine if any changes are required in the pipe foundation or
- 4 bedding.
- 5 5. Unless otherwise permitted by the Drawings or City, the limits of the excavation
- 6 shall not advance beyond the pipe placement so the trench may be backfilled in the
- 7 same day.
- 8 B. Over Excavation
- 9 1. Fill over excavated areas with bedding material specified for pipe installation.
- 10 2. No additional payment will be made for over excavation or additional bedding
- 11 material.
- 12 C. Unacceptable Backfill Materials
- 13 1. Separate in-situ soils classified as unacceptable backfill material from acceptable
- 14 backfill materials.
- 15 2. If the unacceptable backfill material is to be blended in accordance with this
- 16 Section, store material in a suitable location until the material is blended.
- 17 3. Remove all unacceptable material from the project site that is not intended to be
- 18 blended or modified.
- 19 D. Shoring, Sheet piling and Bracing
- 20 1. Furnish, install, and maintain a trench safety system in accordance with the Trench
- 21 Safety Plan and as required by Federal, State, or local safety requirements.
- 22 2. If soil or water conditions are encountered that are not addressed by the current
- 23 Trench Safety Plan, engage a Professional Engineer Licensed in the State of Texas
- 24 to modify the Trench Safety Plan and provide a revised submittal to the City.
- 25 3. Do not allow soil, or water containing soil, to migrate through the Trench Safety
- 26 System in quantities of sufficient amount to adversely affect the suitability of the
- 27 Trench Protection System.
- 28 4. Movable bracing, shoring plates, or trench boxes used to support the sides of the
- 29 trench excavation shall not:
- 30 a. Disturb the embedment located in the pipe zone or lower,
- 31 b. Alter the pipe's line and grade after the Trench Protection System is removed,
- 32 or
- 33 c. Compromise the compaction of the embedment located below the spring line of
- 34 the pipe and in the haunching.
- 35 E. Water Control
- 36 1. Surface Water
- 37 a. Furnish all materials and equipment and perform all incidental work required to
- 38 direct surface water away from the excavation.
- 39 2. Groundwater
- 40 a. Furnish all materials and equipment to dewater groundwater by a method which
- 41 preserves the undisturbed state of the subgrade soils.
- 42 b. Do not allow submergence of pipe within 24 hours after placement.
- 43 c. Do not allow water to flow over concrete until it has sufficiently cured.

- 1 d. Engage a Professional Engineer Licensed in the State of Texas to prepare a
2 Groundwater Control Plan if any of the following conditions are encountered:
3 1) A Groundwater Control Plan is specifically required by the Contract
4 Documents
5 2) If in the sole judgment of the City, groundwater is so severe that an
6 Engineered Groundwater Control Plan is required to protect the trench or
7 the installation of the pipe. Such situations may include, but are not limited
8 to:
9 a) Groundwater levels in the trench are unable to be maintained below the
10 top of the bedding.
11 b) A firm trench bottom cannot be maintained due to groundwater.
12 c) Groundwater entering the excavation undermines the stability of the
13 excavation.
14 d) Groundwater entering the excavation is transporting unacceptable
15 quantities of soils through the Trench Safety System.
16 e. In the event that there is no bid item for a Groundwater Control Plan and the
17 City requires an Engineered Groundwater Control Plan due to conditions
18 discovered at the site, the Contractor will be eligible to submit a Contract
19 Claim.
20 f. Control of groundwater shall be considered subsidiary to the excavation when:
21 1) No Groundwater Control Plan is specifically identified and required in the
22 Contract Documents.
23 g. Groundwater Control Plan installation, operation, and maintenance
24 1) Furnish all materials and equipment necessary to implement, operate, and
25 maintain the Groundwater Control Plan.
26 2) Once the excavation is complete, remove all groundwater control
27 equipment not called to be incorporated into the work.
28 h. Water Disposal
29 1) Dispose of groundwater in accordance with City policy or Ordinance.
30 2) Do not discharge groundwater onto or across private property without
31 written permission.
32 3) Permission from City is required prior to disposal into the sanitary sewer
33 system.
34 4) Disposal shall not violate any Federal, State, or local regulations.

35 F. Embedment and Pipe Placement

- 36 1. Water Lines less than or equal to 12 inches in diameter (non-HDPE):
37 a. Embedment zone shall be of uniform material.
38 b. Utility sand shall be generally used for embedment.
39 c. If groundwater is in sufficient quantity to cause sand to pump, use crushed
40 rock, fine crushed rock, or pea gravel as embedment.
41 d. Place evenly spread bedding material on a firm trench bottom.
42 e. Provide firm, uniform bedding a minimum of 6 inches below the pipe.
43 f. Place pipe on the bedding in accordance with the alignment of the Drawings.
44 g. Place embedment, including initial backfill, to 12 inches above the pipe.
45 h. Where gate valves are present, extend initial backfill to 6 inches above the
46 elevation of the valve nut.
47 i. Form all blocking against undisturbed trench wall to the dimensions in the
48 Drawings.

- 1 j. Compact embedment and initial backfill.
- 2 k. Place marker tape on top of the initial trench backfill in accordance with
- 3 Section [33 05 97](#).
- 4 2. Water Lines 16-inches through 24-inches in diameter (non-HDPE):
- 5 a. The entire embedment zone shall be of uniform material.
- 6 b. Use crushed rock or fine crushed rock for embedment.
- 7 c. Place evenly spread bedding material on a firm trench bottom.
- 8 d. Provide firm, uniform bedding a minimum of 6 inches below the pipe.
- 9 1) Additional bedding may be required if groundwater is present in the trench.
- 10 e. Place pipe on the bedding according to the alignment shown on the Drawings.
- 11 f. The pipe line shall be within:
- 12 1) ± 3 inches of the elevation on the Drawings
- 13 g. Place and compact embedment material to adequately support haunches in
- 14 accordance with the pipe manufacturer's recommendations.
- 15 h. Place remaining embedment, including initial backfill, to 12 inches above the
- 16 pipe.
- 17 i. Where valves are present and not placed within a vault or manhole, extend
- 18 initial backfill up to the valve nut.
- 19 j. Compact the embedment and initial backfill to a minimum of 95 percent of
- 20 Standard Proctor density in accordance with ASTM D698.
- 21 k. Place trench geotextile fabric on top of the initial backfill.
- 22 l. Place marker tape on top of the trench geotextile fabric in accordance with
- 23 Section [33 05 97](#).
- 24 3. Water Lines 30-inches and greater in diameter (non-HDPE):
- 25 a. Embedment zone shall be of uniform material.
- 26 b. Use crushed rock for embedment.
- 27 c. Place evenly spread bedding material on a firm trench bottom.
- 28 d. Provide firm, uniform bedding a minimum of 6 inches below the pipe.
- 29 1) Additional bedding may be required if groundwater is present in the trench.
- 30 e. Place pipe on the bedding according to the alignment shown on the Drawings.
- 31 f. The pipe line shall be within:
- 32 1) ± 1 inch of the elevation on the Drawings
- 33 g. Place and compact embedment material to adequately support haunches in
- 34 accordance with the pipe manufacturer's recommendations.
- 35 h. For steel pipe, the initial embedment lift shall not exceed the spring line prior to
- 36 compaction.
- 37 i. Place remaining embedment, including initial backfill, to 12 inches above the
- 38 pipe.
- 39 j. Where valves are present and not placed within a vault or manhole, extend
- 40 initial backfill up to the valve nut.
- 41 k. Compact the embedment and initial backfill to a minimum of 95 percent of
- 42 Standard Proctor density in accordance with ASTM D698.
- 43 l. Wrap trench geotextile fabric around entirety of pipe embedment.
- 44 m. Place marker tape on top of the trench geotextile fabric in accordance with
- 45 Section [33 05 97](#).
- 46 4. HDPE Pipe (All Uses), Gravity Sanitary Sewer Pipe (All Materials), and Force
- 47 Mains (All Materials) by Open Cut:
- 48 a. Embedment zone shall be of uniform material.

- 1 b. Use crushed rock for embedment.
- 2 c. Place evenly spread bedding material on a firm trench bottom.
- 3 d. Spread bedding so that lines and grades are maintained and that there are no
- 4 sags in the sanitary sewer pipe line.
- 5 e. Provide firm, uniform bedding a minimum of 6 inches below the pipe.
- 6 1) Additional bedding may be required if groundwater is present in the trench.
- 7 f. Place pipe on the bedding according to the alignment shown in the Drawings.
- 8 g. The pipe line shall be within:
- 9 1) ± 3 inches of the elevation on the Drawings for 24-inch and smaller water
- 10 lines and force mains
- 11 2) ± 1 inch of the elevation on the Drawings for 30-inch and larger water lines
- 12 and force mains
- 13 3) ± 0.1 inches of the elevation, and consistent with the grade shown on the
- 14 Drawings for gravity sanitary sewer.
- 15 h. Place and compact embedment material to adequately support haunches in
- 16 accordance with the pipe manufacturer's recommendations.
- 17 i. For lines 30 inches and greater in diameter, the embedment lift shall not exceed
- 18 the spring line prior to compaction.
- 19 j. Place remaining embedment, including initial backfill, to 12 inches above the
- 20 pipe.
- 21 k. Compact the embedment and initial backfill to a minimum of 95 percent of
- 22 Standard Proctor density in accordance with ASTM D698.
- 23 l. Place trench geotextile fabric on top of the initial backfill.
- 24 m. Place marker tape on top of the trench geotextile fabric in accordance with
- 25 Section [33 05 97](#).
- 26 5. Storm Sewer (RCP)
- 27 a. The bedding and the pipe zone up to the spring line shall be of uniform
- 28 material.
- 29 b. Use crushed rock for embedment up to the spring line.
- 30 c. The specified backfill material may be used above the spring line.
- 31 d. Place evenly spread bedding material on a firm trench bottom.
- 32 e. Spread bedding so lines and grades are maintained and there are no sags in the
- 33 storm sewer pipe line.
- 34 f. Provide firm, uniform bedding a minimum of 6 inches below the pipe.
- 35 1) Additional bedding may be required if groundwater is present in the trench.
- 36 g. Place pipe on the bedding according to the alignment of the Drawings.
- 37 h. The pipe line shall be within ± 0.1 inches of the elevation and consistent with
- 38 the grade shown on the Drawings.
- 39 i. Place embedment material up to the spring line.
- 40 1) Place embedment to ensure adequate support is obtained in the haunch.
- 41 j. Compact the embedment and initial backfill to a minimum of 95 percent of
- 42 Standard Proctor density in accordance with ASTM D698.
- 43 k. Place trench geotextile fabric on top of pipe and crushed rock.
- 44 6. Storm Sewer Reinforced Concrete Box
- 45 a. Crushed rock shall be used for bedding.
- 46 b. The pipe zone and the initial backfill shall be:
- 47 1) Crushed rock, or

- 1 2) Native backfill material compacted to a minimum of 95 percent of Standard
- 2 Proctor density in accordance with ASTM D698
- 3 c. Place evenly spread compacted bedding material on a firm trench bottom.
- 4 d. Spread bedding so lines and grades are maintained and there are no sags in the
- 5 storm sewer pipe line.
- 6 e. Provide firm, uniform bedding a minimum of 6 inches below the box.
- 7 1) Additional bedding may be required if groundwater is present in the trench.
- 8 f. Fill the annular space between multiple boxes with crushed rock or CLSM in
- 9 accordance with [03 34 13](#).
- 10 g. Place pipe on the bedding according to the alignment of the Drawings.
- 11 h. The pipe shall be within ± 0.1 inches of the elevation and consistent with the
- 12 grade shown on the Drawings.
- 13 i. Compact the embedment initial backfill to a minimum of 95 percent of
- 14 Standard Proctor density in accordance with ASTM D698.
- 15 7. Water Services (2 inches and smaller in Diameter)
- 16 a. The entire embedment zone shall be of uniform material.
- 17 b. Utility sand shall be generally used for embedment.
- 18 c. Place evenly spread bedding material on a firm trench bottom.
- 19 d. Provide firm, uniform bedding a minimum of 1 inch below the service line.
- 20 e. Place pipe on the bedding according to the alignment of the Drawings.
- 21 f. Place remaining embedment, including initial backfill, to 1-inch minimum
- 22 above the service line.
- 23 g. Compact the initial backfill.
- 24 8. Sanitary Sewer Services
- 25 a. The entire embedment zone shall be of uniform material.
- 26 b. Crushed rock or fine crushed rock shall be used for embedment.
- 27 c. Place evenly spread bedding material on a firm trench bottom.
- 28 d. Spread bedding so that lines and grades are maintained and that there are no
- 29 sags in the sanitary sewer pipe line.
- 30 e. Provide firm, uniform bedding, a minimum of 2 inches below the service line.
- 31 1) Additional bedding may be required if groundwater is present in the trench.
- 32 f. Place pipe on the bedding according to the alignment of the Drawings.
- 33 g. Place remaining embedment, including initial backfill, to 2 inches above the
- 34 service line.
- 35 h. Compact the initial backfill to a minimum of 95 percent of Standard Proctor
- 36 density in accordance with ASTM D698.
- 37 G. Trench Backfill
- 38 1. At a minimum, place backfill in such a manner that the required in-place density
- 39 and moisture content is obtained, and so that there will be no damage to the surface,
- 40 pavement or structures due to any trench settlement or trench movement.
- 41 a. Meeting the requirements of this Section does not relieve the responsibility to
- 42 damages associated with the Work.
- 43 2. Backfill Material
- 44 a. Final backfill depth less than 15 feet
- 45 1) Backfill with:
- 46 a) Native backfill material,
- 47 b) Blended backfill material, or
- 48 c) Select backfill material, CSS, or CLSM when specifically required.

- 1 b. Final backfill depth 15 feet or greater: (under pavement or future pavement)
- 2 1) Backfill depth from 0 to 15 feet deep
- 3 a) Backfill with:
- 4 (1) Native backfill material,
- 5 (2) Blended backfill material, or
- 6 (3) Select backfill material, CSS, or CLSM when specifically required.
- 7

- 1 2) Backfill depth from 15 feet and greater
- 2 a) Backfill with:
- 3 (1) Select Fill,
- 4 (2) CSS, or
- 5 (3) CLSM when specifically required.
- 6 c. Final backfill depth 15 feet or greater: (not under pavement or future pavement)
- 7 1) Backfill with:
- 8 a) Native backfill material, or
- 9 b) Blended backfill material.
- 10 d. Backfill for water and sewer service lines:
- 11 1) Match backfill requirement of the main being tapped.
- 12 3. Required Compaction and Density
- 13 a. Final backfill (depths less than 15 feet)
- 14 1) Compact native backfill material, blended backfill material or select
- 15 backfill to a minimum of 98 percent of Standard Proctor density in
- 16 accordance with ASTM D698 at moisture content within -2 to +4
- 17 percentage points of the optimum moisture.
- 18 2) CSS or CLSM requires no compaction.
- 19 b. Final backfill (depths 15 feet and greater/under existing or future pavement)
- 20 1) Compact select backfill to a minimum of 98 percent Standard Proctor in
- 21 accordance with ASTM D698 at moisture content within -2 to +4
- 22 percentage points of optimum moisture.
- 23 2) CSS or CLSM requires no compaction.
- 24 c. Final backfill (depths 15 feet and greater/not under existing or future pavement)
- 25 1) Compact native backfill material, blended backfill material, or select
- 26 backfill to a minimum of 98 percent Standard Proctor in accordance with
- 27 ASTM D698 at moisture content within -2 to +4 percentage points of
- 28 optimum moisture.
- 29 4. Saturated Soils
- 30 a. If in-situ soils consistently demonstrate that they are greater than 4 percentage
- 31 points over optimum moisture content, the soils are considered saturated.
- 32 b. Flooding the trench or water jetting is strictly prohibited.
- 33 c. If saturated soils are identified in the Drawings or Geotechnical Report in the
- 34 Appendix, Contractor shall proceed with Work following all backfill
- 35 procedures outlined in the Drawings for areas of soil saturation greater than 4
- 36 percentage points above optimum moisture content..
- 37 d. If saturated soils are encountered during Work but not identified in Drawings or
- 38 Geotechnical Report in the Appendix:
- 39 1) The Contractor shall:
- 40 a) Immediately notify the City.
- 41 b) Submit a Contract Claim for Extra Work associated with direction from
- 42 City.
- 43 2) The City shall:
- 44 a) Investigate soils and determine if Work can proceed in the identified
- 45 location.
- 46 b) Direct the Contractor of changed backfill procedures associated with
- 47 saturated soils that may include:
- 48 (1) Imported backfill

- 1 (2) A site specific backfill design
- 2 5. Placement of Backfill
- 3 a. Use only compaction equipment specifically designed for compaction of a
- 4 particular soil type and within the space and depth limitation experienced in the
- 5 trench.
- 6 b. Flooding the trench or water setting is strictly prohibited.
- 7 c. Place in loose lifts not to exceed 8 inches.
- 8 d. Compact to specified densities.
- 9 e. Compact only on top of initial backfill, undisturbed trench, or previously
- 10 compacted backfill.
- 11 f. Remove any loose materials due to the movement of any trench box, shoring,
- 12 or sloughing of the trench wall.
- 13 g. Install appropriate markers for water and sanitary sewer trenches in accordance
- 14 with Section [33 05 97](#).
- 15 6. Backfill Means and Methods Demonstration
- 16 a. Demonstration will be required to be performed at the City's discretion.
- 17 b. Notify the City in writing with sufficient time for the City to obtain samples
- 18 and perform Standard Proctor test in accordance with ASTM D698.
- 19 c. The results of the Standard Proctor
- 20 d. Test must be received prior to beginning excavation.
- 21 e. Upon commencing of backfill placement for the project, demonstrate means
- 22 and methods to obtain the required densities.
- 23 f. Demonstrate Means and Methods for compaction including:
- 24 1) Depth of lifts for backfill which shall not exceed 8 inches
- 25 2) Method of moisture control for excessively dry or wet backfill
- 26 3) Placement and moving trench box, if used
- 27 4) Compaction techniques in an open trench
- 28 5) Compaction techniques around structure
- 29 g. Provide a testing trench box to provide access to the recently backfilled
- 30 material.
- 31 h. The Contractor will provide a qualified testing lab full time during backfill
- 32 operations to randomly test density and moisture content.
- 33 1) The testing lab will provide results as available on the job site.
- 34 7. Varying Ground Conditions
- 35 a. Notify the City of varying ground conditions and the need for additional
- 36 Proctors.
- 37 b. Request additional Proctors when soil conditions change.
- 38 c. Significant changes in soil conditions will require an additional Means and
- 39 Methods demonstration.
- 40 H. Clay Dam
- 41 1. Install for a minimum of 8 linear feet along the pipe center line at the top of the clay
- 42 dam and 4 linear feet minimum along the bottom of the trench.
- 43 2. Install Clay Dam a minimum of 4 feet above top of pipe to bottom of pavement
- 44 base to topsoil.
- 45 3. Compact clay to 90 percent of Standard Proctor density in accordance with ASTM
- 46 D698.
- 47 4. Clay shall have a plasticity index of no less than 18.

1 5. Key Clay Dam minimum 12 inches into the bottom of trench.

2 **3.5 REPAIR [NOT USED]**

3 **3.6 RE-INSTALLATION [NOT USED]**

4 **3.7 FIELD QUALITY CONTROL**

5 A. Field Tests and Inspections

6 1. Proctors

- 7 a. Perform Proctors in accordance with ASTM D698.
8 b. Make test results available within 4 calendar days and distributed to:
9 1) City Project Manager
10 2) City Inspector
11 3) Engineer
12 c. Notify the City if the characteristic of the soil changes.
13 d. Perform new Proctors for varying soils:
14 1) When indicated in the geotechnical investigation in the Appendix
15 2) If notified by the City
16 e. Trenches where different soil types are present at different depths:
17 1) Base Proctors on the mixture of the soils.

18 2. Density Testing of Backfill

- 19 a. In accordance with ASTM D6938.
20 b. Provide testing trench protection for trench depths in excess of 5 feet.
21 c. Place, move and remove testing trench protection as necessary to facilitate any
22 City performed tests.
23 d. For final backfill depths less than 15 feet and trenches of any depth not under
24 existing or future pavement:
25 1) Perform density testing twice per working day when backfilling operations
26 are being conducted.
27 2) The testing lab shall take a minimum of 3 density tests of the current lift in
28 the available trench.
29 e. For final backfill depths 15 feet and greater deep and under existing or future
30 pavement:
31 1) Perform density testing twice per working day when backfilling operations
32 are being conducted.
33 2) The testing lab shall take a minimum of 3 density tests of the current lift in
34 the available trench.
35 3) The testing lab will remain onsite sufficient time to test 2 additional lifts.
36 f. Make the excavation available for City performed tests.
37 g. Provide results to the City's Inspector upon completion of the testing.
38 h. Provide a formal report to the City within 48 hours including:
39 1) Location of test by station number
40 2) Time and date of test
41 3) Depth of testing
42 4) Field moisture
43 5) Dry density
44 6) Proctor identifier
45 7) Percent Standard Proctor density
46

1 **SECTION 33 05 07**
2 **STEEL CASING PIPE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Minimum requirements for manufacturing, furnishing, and transporting Steel
7 Casing Pipe to be installed by Open Cut or by Other than Open Cut at the locations
8 specified in the Drawings.

9 B. Deviations from this City of Denton Standard Specification:

- 10 1. None.

11 C. Related Specification Sections include but are not limited to:

- 12 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
13 Contract.
14 2. Division 1 - General Requirements.
15 3. Section 33 05 05 – Utility Trench Excavation, Embedment and Backfill.
16 4. Section 33 05 10 – Auger Boring.
17 5. Section 33 05 11 – Hand Tunneling.
18 6. Section 33 05 15 – Installation of Carrier Pipe in Casing or Tunnel Liner Plate.

19 **1.2 PRICE AND PAYMENT PROCEDURES**

20 A. Measurement and Payment

21 1. Open Cut

22 a. Measurement

- 23 1) Measured horizontally along the ground surface for Steel Casing Pipe
24 installed.

25 b. Payment

- 26 1) The work performed and materials furnished in accordance with this item
27 and measured as provided under “Measurement” will be paid for at the unit
28 price bid per linear foot for “Casing by Open Cut” installed for:

29 a) Various Sizes.

30 c. The price bid shall include:

- 31 1) Furnishing and installing Steel Casing Pipe by Open Cut as specified by the
32 Drawings
33 2) Pavement Removal
34 3) Excavation
35 4) Hauling
36 5) Disposal of excess material
37 6) Furnishing, placement, and compaction of embedment
38 7) Furnishing, placement, and compaction of backfill
39 8) Clean-up
40

2. By Other than Open Cut
 - a. Measurement
 - 1) Measured horizontally along the ground surface of Steel Casing Pipe installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Casing or Tunnel Liner Plate by Other than Open Cut” installed for:
 - a) Various Sizes.
 - 2) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Casing by Other than Open Cut” installed for:
 - a) Various Sizes.
 - c. The price bid shall include:
 - 1) Furnishing and installing Steel Casing Pipe by Other than Open Cut as specified by the Drawings
 - 2) Launching Shaft
 - 3) Receiving Shaft
 - 4) Contact grouting, if required
 - 5) Pavement Removal
 - 6) Excavation
 - 7) Hauling
 - 8) Disposal of excess material
 - 9) Furnishing, placement, and compaction of backfill
 - 10) Clean-up

1.3 REFERENCES

A. Reference Standards

1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
2. ASTM International (ASTM):
 - a. A139, Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS Sizes 4 and Over).
3. American Water Works Association (AWWA):
 - a. C210, Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings.

1.4 ADMINISTRATIVE REQUIREMENTS *[NOT USED]*

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Product Data

1. Exterior Coating

- 1 a. Material data
- 2 b. Field touch-up procedures
- 3 2. Interior Coating
- 4 a. Material data
- 5 b. Field touch-up procedures
- 6 B. Shop Drawings
- 7 1. Shop drawings are not required for installation of steel casing pipe by open cut.
- 8 2. Provide the following shop drawings for installation of steel casing pipe by other
- 9 than open cut:
- 10 a. Furnish details for Steel Casing Pipe outlining the following:
- 11 1) Grout/lubrication ports
- 12 2) Joint details
- 13 3) Other miscellaneous items for furnishing and fabricating pipe
- 14 b. Submit calculations in a neat, legible format sealed by a Professional Engineer
- 15 Licensed in Texas, consistent with the information provided in the geotechnical
- 16 report (if applicable), including:
- 17 1) Calculations confirming pipe jacking capacity is adequate to resist
- 18 anticipated jacking loads for each crossing with a minimum safety factor of
- 19 2
- 20 2) Calculations confirming pipe capacity is adequate to safely support all other
- 21 anticipated loads, including earth and groundwater pressures, surcharge
- 22 loads, and handling loads
- 23 3) Calculations confirming jointing method will support all loading conditions

24 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

25 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

26 **1.9 QUALITY ASSURANCE [NOT USED]**

27

1 **1.10 DELIVERY, STORAGE, AND HANDLING**

2 A. Delivery, Storage and Handling Requirements

- 3 1. Secure and maintain a location to store the material in accordance with Section 01
4 66 00.
- 5 2. Prior to delivery of the pipe, end/internal bracing shall be furnished and installed as
6 recommended by the manufacturer, for protection during shipping and storage.
- 7 3. Deliver, handle, and store pipe in accordance with the manufacturer's
8 recommendations to protect coating systems.

9 **1.11 FIELD CONDITIONS [NOT USED]**

10 **1.12 WARRANTY [NOT USED]**

11 **PART 2 - PRODUCTS**

12 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

13 **2.2 MATERIALS**

14 A. Performance / Design Criteria

- 15 1. Contractor is fully responsible for the design of steel casing pipe which must meet
16 or exceed the design requirements of this Section for the intended installation
17 method.
- 18 2. For steel casing pipe to be installed by other than open cut:
- 19 a. Design of the casing pipe shall account for all installation and service loads
20 including:
- 21 1) Jacking loads
22 2) External groundwater and earth loads
23 3) Traffic loads
24 4) Practical consideration for handling, shipping and other construction
25 operations
26 5) Any other live or dead loads reasonable anticipated.
- 27 b. Design shall be signed and sealed by a Professional Engineer Licensed in
28 Texas.
- 29 c. The allowable jacking capacity shall not exceed 50 percent of the minimum
30 yield
31

- 1 3. Steel casing pipe shall have minimum wall thickness as follows. The Drawings or
2 other design criteria listed in this Section may require a higher wall thickness, but in
3 no case should the pipe wall thickness be less than the following:

Casing Pipe Diameter (inches)	Minimum Wall Thickness All Other Locations (inches)
32 and smaller	.5 (1/2)
36 – 42	.625 (5/8)
44 – 48	.6875 (11/16)
Greater than 48	Project specific design
Greater than 20-ft deep	Project specific design

- 4 4. Provide steel casing pipe with inside diameter sufficient to install the required
5 carrier pipe with casing spacers and in accordance with the minimum casing
6 diameter requirements in Section 33 05 15.
7 5. Furnish in lengths that are compatible with Contractor's shaft sizes and allowable
8 work areas.
9 6. Random segments of pipe will only be allowed for closing segments.
10 7. When required by installation method, provide grout/lubricant ports along the pipe
11 at intervals of 10 feet or less.
12 a. Attach ports and fittings to the pipe in a manner that will not materially affect
13 the strength of the pipe nor interfere with the installation of carrier pipe.
14 b. Provide plugs for sealing the fittings which are capable of withstanding all
15 external and internal pressures and loads without leaking.

16 **B. Materials**

- 17 1. Provide new, smooth-wall, carbon steel pipe in accordance with ASTM A139,
18 Grade B.
19 2. Allowed Dimensional Tolerances:
20 a. Minimum wall thickness (at any point): Minimum 87.5 percent of the nominal
21 wall thickness.
22 b. Outside circumference: Within 1.0 percent or 3/4 inch of the nominal
23 circumference, whichever is less.
24 c. Outside diameter: Within 1/8 inch of the nominal outside diameter.
25 d. Roundness (difference between the major and minor outside diameters):
26 Maximum 0.5 percent of the specified nominal outside diameter or 1/4 inch,
27 whichever is less.
28 e. Maximum allowable straightness deviation: 1/8 inch in any 10-foot length.
29 3. Provide square ends for all steel pipe.
30 a. Ensure pipe end section variations do not exceed 1/8 inch at any point from a
31 true plane perpendicular to the axis of the pipe and passing through the center
32 of the pipe at the end.
33 b. When pipe ends require a beveled edge for welding, bevel on the outside to an
34 angle of 35 degrees with a tolerance of $\pm 2\frac{1}{2}$ degrees and with a width of root
35 face 1/16 inch \pm 1/32 inch.
36 4. Fabricate steel casing pipe with longitudinal or spiral-welded seams.

- 1 a. Grind all girth weld seams flush.
- 2 C. Finishes
- 3 1. Clean and prepare steel casing pipe for coating and lining application in accordance
- 4 with the requirements of AWWA C210.
- 5 2. Coat and line steel casing pipe with a coal-tar epoxy in accordance with the
- 6 requirements of AWWA C210, meeting the following requirements:
- 7 a. Color: Black
- 8 b. Minimum Dry Film Thickness: 16 mils
- 9 c. Applied in accordance with manufacturer's recommendations

10 **2.3 ACCESSORIES [NOT USED]**

11 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

12 **PART 3 - EXECUTION**

13 **3.1 INSTALLERS [NOT USED]**

14 **3.2 EXAMINATION [NOT USED]**

15 **3.3 PREPARATION [NOT USED]**

16 **3.4 INSTALLATION**

17 A. Install steel casing pipe By Other Than Open Cut in accordance with Section 33 05 10
18 or Section 33 05 11 where specified in the Drawings. Install steel casing pipe By Open
19 Cut in accordance with Section 33 05 05 where specified in the Drawings.

- 20 1. Steel casing pipe connections shall be achieved by full penetration field butt
21 welding or an integral machine press-fit connection (Permalok or equal) prior to
22 installation of the pipe.
- 23 a. Install integral machined press-fit connections in accordance with the
24 manufacturer's installation procedures and recommendations.
- 25 2. Butt welding a square end piece of steel pipe to a 35-degree beveled end of steel
26 pipe in the field is acceptable.

27 B. Install carrier pipe inside steel casing pipe in accordance with Section 33 05 15.

28 C. Perform contact grouting of the annulus outside the casing pipe in accordance with
29 Section 33 05 10 or Section 33 05 11.

30 **3.5 REPAIR**

31 A. Touch-up external coating after field welds in accordance with manufacturer's
32 recommendations.

33 **3.6 RE-INSTALLATION [NOT USED]**

34 **3.7 FIELD QUALITY CONTROL [NOT USED]**

35 **3.8 SYSTEM STARTUP [NOT USED]**

36 **3.9 ADJUSTING [NOT USED]**

- 1 **3.10 CLEANING [NOT USED]**
- 2 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 3 **3.12 PROTECTION [NOT USED]**
- 4 **3.13 MAINTENANCE [NOT USED]**
- 5 **3.14 ATTACHMENTS [NOT USED]**

6 **END OF SECTION**

7

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

8

**SECTION 33 05 10
AUGER BORING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Minimum requirements for Auger Boring using 48-inch and smaller casing pipe with lengths less than 300 feet at the locations as specified in the Drawings.
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 33 05 05 – Utility Trench Excavation, Embedment and Backfill.
 - 4. Section 33 05 07 – Steel Casing Pipe.
 - 5. Section 33 05 11 – Hand Tunneling.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. This item is considered subsidiary to steel casing pipe construction.
 - 2. Payment
 - a. The work performed and materials furnished in accordance with this item are subsidiary to the unit price bid per linear foot of “Casing By Other Than Open Cut” to be complete in place, and no other compensation will be allowed.

1.3 REFERENCES

- A. Reference Standards
 - 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
 - 2. Occupational Safety and Health Administration (OSHA)
 - a. OSHA Regulations and Standards for Underground Construction, 29 CFR Part 1926, Subpart S, Underground Construction and Subpart P, Excavation.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation
 - 1. Provide notice to the City a minimum of 3 workings days in advance of the planned launch of Auger Boring operations.

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to delivery.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Shop Drawings

6 1. Submit the following:

- 7 a. Detailed description of the methods and equipment to be used in completing
8 each reach of boring operation.
- 9 b. Description of intended survey methods to ensure the tunnel is advanced and
10 within the line and grade tolerances specified in the Drawings.
- 11 c. Shaft layout drawings
- 12 1) Detailing dimensions and locations of all equipment, including overall
13 work area boundaries, crane, front-end loader, forklift, spoil stockpiles,
14 spoil hauling equipment, pumps, generator, pipe storage area, tool trailer or
15 containers, fences, and staging area
- 16 2) Required for all shaft locations and shall be to scale or show correct
17 dimensions.
- 18 3) Layout such that all equipment and operations are completely contained
19 within the allowable construction areas specified in the Drawings.
- 20 d. Schedule in accordance with Division 1 to include the following activities as
21 independent items:
- 22 1) Mobilization
- 23 2) Shaft excavation and support
- 24 3) Water control at shafts
- 25 4) Working slab construction
- 26 5) Thrust wall construction
- 27 6) Auger Boring
- 28 7) Shaft backfill
- 29 8) Site restoration
- 30 9) Cleanup
- 31 10) Demobilization

32 B. Daily Records

- 33 1. Submit samples of the boring logs or records to be used a minimum of 7 days prior
34 to beginning Auger Boring.
- 35 2. Submit daily records to the City's Inspector by noon on the day following any data
36 or records taken.
- 37 3. Daily records shall include:
- 38 a. Date
- 39 b. Time
- 40 c. Name of operator
- 41 d. Bore drive identification
- 42 e. Installed casing and corresponding tunnel length
- 43 f. Time required to bore each ring
- 44 g. Time required to set subsequent ring
- 45 h. Spoil volumes

- i. Grout volumes and pressures (if required)
- j. Soil conditions, including occurrences of unstable soils and estimated groundwater inflow rates, if any
- k. Line and grade offsets
- l. Any movement of the guidance system
- m. Problems encountered during boring
- n. Durations and reasons for delays
- o. Manually recorded observations made:
 - 1) At intervals of not less than 2 every 5 feet
 - 2) As conditions change
 - 3) As directed by the City

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

A. Qualifications

1. Contractor

- a. All boring work shall be performed by an experienced Subcontractor or Contractor who has at least 5 years of experience in performing auger boring work and has completed at least 5 boring projects of similar diameter and ground conditions.
 - 1) At least 1 of the projects shall have an individual boring length equal to or greater in length than the longest tunnel on this project.
 - 2) Submit details of referenced projects including owner's name and contact information, project superintendent, and machine operators.
- b. The project superintendent shall have at least 5 years of experience supervising boring construction.
 - 1) The Contractor may be required to submit details of any referenced project including owner's name, contact information, and project superintendent.
- c. The site safety representative and personnel responsible for air quality monitoring shall be experienced in tunnel construction and shall have current certification by OSHA.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

- 1. Secure and maintain a location to store the material in accordance with Section 01 66 00.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED [NOT USED]

1 **2.2 MATERIALS**

2 A. Description

- 3 1. Steel Casing Pipe in accordance with Section 33 05 07.
4 2. Tunnel Liner Plate is not permitted for use with Auger Boring.

5 B. Design Criteria

- 6 1. Design excavation methods and spoil conveyance system for the full range of
7 ground conditions described in the Geotechnical Reports.
8 2. Use methods and equipment to control ground movement (surface settlement and
9 heave) above the pipeline to prevent damage to existing utilities, facilities, and
10 improvements.
11 a. Limit any ground movements to values that shall not cause damage to adjacent
12 utilities or surface features.
13 b. Repair any damage caused by ground movements at no cost to the City.
14 c. Provide settlement monitoring to measure ground movement during Auger
15 Boring operations, as required by all applicable Federal, State, or local
16 requirements.

17 **2.3 ACCESSORIES [NOT USED]**

18 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

19 **PART 3 - EXECUTION**

20 **3.1 INSTALLERS [NOT USED]**

21 **3.2 EXAMINATION [NOT USED]**

22 **3.3 PREPARATION**

23 A. Commence boring operations upon completion of the following:

- 24 1. Review available utility drawings and location of conduits and underground utilities
25 in all areas where excavation is to be performed.
26 a. Notify the applicable one-call system prior to any excavation to avoid
27 interference with the existing conduits and utilities in accordance with Division
28 1.
29 b. Repair damage to existing utilities resulting from excavation at no additional
30 cost to the City.
31 c. Provide and follow notification requirements of permit provider (ie TxDOT,
32 Railroad) if applicable.
33 2. Complete pit excavations and support systems for each drive in accordance with the
34 requirements of the Contract Documents.

35 **3.4 INSTALLATION**

36 A. General

- 37 1. Immediately notify the City if any problems are encountered with equipment or
38 materials or if the Contractor believes the conditions encountered are materially and
39 significantly different than those represented within the Contract Documents.

- 1 2. Where pipe is required to be installed under railroad embankments or under
2 highways, streets, or other facilities, perform construction in such a manner to not
3 interfere with the operation of the railroad, street, highway, or other facility, and to
4 not weaken or damage any embankment or structure.
- 5 3. During construction operations, furnish and maintain barricades and lights to
6 safeguard traffic and pedestrians until the backfill has been completed. Once
7 complete, remove barricades and lights from the site.
- 8 4. Properly manage and dispose of groundwater inflows to the shafts in accordance
9 with requirements of applicable Sections and all permit conditions.
 - 10 a. Discharge of groundwater inflow into sanitary sewers is not allowed without
11 approval in writing from City.
- 12 5. Furnish all necessary equipment, power, water, and utilities for tunneling, spoil
13 removal and disposal, grouting, and other associated work required for the methods
14 of construction.
- 15 6. Promptly clean up, remove, and dispose of any spoil or slurry spillage.
- 16 7. Do not disturb roadways, railroads, canal channels, adjacent structures, landscaped
17 areas, or existing utilities.
 - 18 a. Immediately repair any damage caused to original or better condition and to the
19 satisfaction of the City, at no additional cost.
- 20 8. Whenever there is a condition that is likely to endanger the stability of the
21 excavation or adjacent structures, operate with a full crew 24 hours a day, including
22 weekends and holidays, without interruption, until those conditions no longer
23 jeopardize the stability of the Work.
- 24 9. Notify the Texas One Call system (800-245-4545) to request marking of utilities by
25 utility owners/operators that subscribe to One Call. Individually notify all other
26 known or suspected utilities to request marking of these utilities.
 - 27 a. Confirm all requested locates are performed prior to commencing boring
28 operations.
 - 29 b. Visually confirm and stake necessary existing lines, cables, or other
30 underground facilities. Expose necessary crossing utilities and utilities within
31 10 feet laterally of the designed tunnel.
 - 32 c. Control drilling and grouting practices to prevent damage to existing utilities.

33 B. Boring Methods

- 34 1. Tunnel liner plate shall not be used for Auger Boring.
- 35 2. Limit boring slopes/grades to less than 8-percent where profiles are not included, or
36 otherwise approved by City.
- 37 3. The Contractor shall be fully responsible for insuring the methods used are
38 adequate for the protection of workers, pipe, property, and the public.
- 39 4. The Contractor shall be fully responsible for providing a finished product as
40 required.
- 41 5. Blasting is not allowed.

42 C. Pits and Trenches

- 43 1. If the grade of the pipe at the end is below the ground surface, excavate suitable pits
44 or trenches for the purpose of conducting the jacking operations and for placing end
45 joints of the pipe.

- 1 2. Securely sheet and brace all areas of open excavation in a manner to prevent earth
- 2 from caving in where end trenches are cut in the sides of the embankment or
- 3 beyond it.
- 4 3. The location of the pit shall meet the approval of the City.
- 5 4. The pits of trenches excavated to facilitate these operations shall be backfilled in
- 6 accordance with Section 33 05 05 immediately after the casing and carrier pipe
- 7 installation has been completed.

8 D. Boring

- 9 1. Install steel casing pipe by boring hole with the earth auger and simultaneously
- 10 jacking pipe into place.
- 11 2. The boring shall proceed from a pit provided for the boring equipment and
- 12 workmen.
- 13 3. Pilot Hole
- 14 a. Required for Casing installed by bore for the following conditions:
- 15 1) Auger bore lengths exceeding 150-ft in length
- 16 2) Casing diameters exceeding 20-inches
- 17 b. Pilot bore approximate 2-inch hole the entire length of the crossing. Check for
- 18 line and grade on the opposite end of the bore from the work pit.
- 19 c. Pilot hole shall serve as the centerline of the larger diameter hole to be bored.
- 20 d. Place excavated material near the top of the working pit and dispose of as
- 21 required.
- 22 1) If sufficient room is unavailable, immediate haul-off is required.
- 23 e. In lieu of boring a pilot hole, auger shall be pulled, at a minimum, after every
- 24 40 linear feet of progress of steel casing pipe and line and grade shall be
- 25 evaluated.
- 26 1) Other methods of maintaining line and grade on the casing may be
- 27 acceptable, if approved by City.
- 28 4. The use of water or other fluids in connection with the boring operation will be
- 29 permitted only to the extent required to lubricate cuttings.
- 30 a. Jetting or sluicing will not be permitted.
- 31 5. In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting
- 32 of at least 10 percent of high grade carefully processed bentonite may be used to:
- 33 a. Consolidate cuttings of the bit
- 34 b. Seal the walls of the hole
- 35 c. Furnish lubrication for subsequent removal of cuttings and installation of the
- 36 pipe immediately thereafter
- 37 6. Allowable variation from the line and grade shall be as specified in this Section.

38 E. Contact Grouting

- 39 1. Contact grout any voids in excess of 2-inches caused by, or encountered during, the
- 40 boring or encountered outside of shafts.
- 41 a. Modify equipment and procedures as required to avoid recurrence of excessive
- 42 settlements or damage.
- 43 b. Perform contact grouting procedures in accordance with Section 33 05 11.

44 F. Control of Line and Grade

- 45 1. Tolerance

46

- 1 a. Pressurized Carrier pipe
- 2 1) Lateral or vertical variation in the final position of the pipe casing from the
- 3 line and grade established by the Drawings shall be permitted only to the
- 4 extent of 1 inch in 10 feet.
- 5 a) Variation allowed must be regular and only in the direction that will not
- 6 detrimentally affect the function of the carrier pipe and clearances from
- 7 other underground utilities or structures.
- 8 b. Gravity Carrier Pipe
- 9 1) Lateral variation in the final position of the pipe casing from the line and
- 10 grade established by the Drawings shall be permitted only to the extent of 1
- 11 inch in 10 feet.
- 12 a) Variation allowed must be regular and only in the direction that will not
- 13 detrimentally affect the function of the carrier pipe and clearances from
- 14 other underground utilities or structures.
- 15 2) Grades shown in Drawings must be maintained vertically with no allowable
- 16 variation.
- 17 2. Monitor line and grade continuously during boring operations.
- 18 a. Record deviation with respect to design line and grade once at each casing
- 19 joint.
- 20 3. If pipe installation does not meet the specified tolerances, correct the installation,
- 21 including any necessary redesign of the pipeline or structures and acquisition of
- 22 necessary easements.
- 23 4. See pilot bore requirements in this Section.
- 24 G. Obstructions
- 25 1. If the boring operations encounter an object or condition that impedes the forward
- 26 progress of the casing or adversely affects line and grade per this Section, notify the
- 27 City immediately.
- 28 2. Correct the condition and remove, clear, or otherwise make it possible for the
- 29 casing to advance past any objects or obstructions that impede forward progress.
- 30 3. Proceed with removal of the object or obstruction by methods submitted by the
- 31 Contractor and accepted by the City.
- 32 4. Compensation will be allowed by change order for removal of obstructions, as
- 33 defined as metallic debris, reinforced concrete, rocks, whole trees and other hard
- 34 objects with a maximum dimension larger than 40 percent of the outer diameter of
- 35 the casing pipe which:
- 36 a. Cannot be broken up by the cutting tools with diligent effort
- 37 b. Are located partially or wholly within the cross-sectional area of the bore
- 38 c. Contain utilities or ditch lines located longitudinally within the auger bore
- 39 horizon
- 40 5. No additional compensation will be allowed for removing, clearing or otherwise
- 41 making it possible for the casing to advance past objects consisting of cobbles,
- 42 boulders, wood, reinforced concrete, and other objects or debris with maximum
- 43 lateral dimensions less than 40 percent of the outer diameter of the casing.
- 44 6. Compensation
- 45 a. Payment will be negotiated with the Contractor on a case-by-case basis.
- 46 b. Provide the City an opportunity to view obstruction prior to removal.

- 1) Any removal process that does not allow direct inspection of the nature and position of the obstruction will not be considered for payment.

3.5 RESTORATION

- A. After completion of the boring, all construction debris, spoils, oil, grease, and other materials shall be removed from the pipe, pits, and all work areas.
1. Cleaning shall be incidental to the construction.
- B. Plug ends of casing with plywood and place temporary backfill if carrier pipe is installed at a later date.
- C. Backfill bore pits within 48 hours of successful installation of carrier pipe
- D. Restoration shall follow construction as the Work progresses.
1. Restore and repair any damage resulting from surface settlement caused by shaft excavation or boring.
2. Any property damaged or destroyed shall be restored to a condition equal to or better than existing condition prior to construction.
3. Restoration shall be completed no later than 14 days after boring is complete, or earlier if required as part of a permit or easement agreement.
4. This provision for restoration shall include all property affected by the construction operations.

3.6 RE-INSTALLATION [NOT USED]

3.7 SITE QUALITY CONTROL

- A. Field Tests and Inspections
1. Allow access to the City and furnish necessary assistance and cooperation to aid in the observations, measurements, data, and sample collection, including, but not limited to the following:
- a. The City shall have access to the boring system prior to, during, and following all boring operations.
- b. The City shall have access to the tunneling shafts prior to, during, and following all boring operations.
- 1) This shall include, but not be limited to, visual inspection of installed pipe and verification of line and grade.
- 2) The Contractor shall provide safe access in accordance with all safety regulations.
- c. The City shall have access to spoils removed from the boring excavation prior to, during, and following all boring operations.
- 1) The City shall be allowed to collect soil samples from the muck buckets or spoil piles a minimum of once every 10 feet and at any time when changes in soil conditions or obstructions are apparent or suspected.
- B. Safety
1. The Contractor is responsible for safety on the job site.
- a. Perform all Work in accordance with the current applicable regulations of the Federal, State and local agencies.

- 1 b. In the event of conflict, comply with the more restrictive applicable
2 requirement.
- 3 2. No gasoline powered equipment shall be permitted in receiving shafts/pits.
- 4 a. Diesel, electrical, hydraulic, and air powered equipment are acceptable, subject
5 to applicable Federal, State, and local regulations.
- 6 3. Furnish and operate a temporary ventilation system in accordance with applicable
7 safety requirements when personnel are underground.
- 8 a. Perform all required air and gas monitoring.
- 9 b. Ventilation system shall provide a sufficient supply of fresh air and maintain an
10 atmosphere free of toxic or flammable gasses in all underground work areas.
- 11 4. Perform all work in accordance with all current applicable regulations and safety
12 requirements of the Federal, State and local agencies.
- 13 5. Comply with all applicable provisions of OSHA 29 CFR Part 1926, Subpart S,
14 Underground Construction and Subpart P, Excavations.
- 15 a. In the event of conflict, comply with the more stringent requirements.
- 16 6. If personnel will enter the pipe during construction, develop an emergency response
17 plan for rescuing personnel trapped underground in a shaft excavation or pipe.
- 18 a. Keep all equipment required for emergency response at the Site in accordance
19 with all applicable Federal, State, and local requirements.

20 **3.8 SYSTEM STARTUP [NOT USED]**

21 **3.9 ADJUSTING [NOT USED]**

22 **3.10 CLEANING [NOT USED]**

23 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

24 **3.12 PROTECTION [NOT USED]**

25 **3.13 MAINTENANCE [NOT USED]**

26 **3.14 ATTACHMENTS [NOT USED]**

27 **END OF SECTION**

28

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

29

- 1 c. The price bid shall include:
- 2 1) Furnishing and installing Sanitary Sewer Carrier Pipe in Casing/Tunnel
- 3 Liner Plate as specified by the Drawings
- 4 2) Annular grouting, if required
- 5 3) Casing spacers
- 6 4) End seals
- 7 5) Excavation
- 8 6) Hauling
- 9 7) Disposal of excess material
- 10 8) Clean-up
- 11 2. Installation of Force Main Carrier Pipe in Casing/Tunnel Liner Plate
- 12 a. Measurement
- 13 1) Measured horizontally along the ground surface for Force Main Carrier
- 14 Pipe installed.
- 15 b. Payment
- 16 1) The work performed and materials furnished in accordance with this item
- 17 and measured as provided under “Measurement” will be paid for at the unit
- 18 price bid per linear foot for “Force Main Carrier Pipe” installed for:
- 19 a) Various Sizes.
- 20 b) Various Materials.
- 21 c. The price bid shall include:
- 22 1) Furnishing and installing Force Main Carrier Pipe in Casing/Tunnel Liner
- 23 Plate as specified by the Drawings
- 24 2) Annular grouting, if required
- 25 3) Casing spacers
- 26 4) End seals
- 27 5) Excavation
- 28 6) Hauling
- 29 7) Disposal of excess material
- 30 8) Clean-up
- 31 3. Installation of Water Carrier Pipe in Casing/Tunnel Liner Plate
- 32 a. Measurement
- 33 1) Measured horizontally along the ground surface for Water Carrier Pipe
- 34 installed.
- 35 b. Payment
- 36 1) The work performed and materials furnished in accordance with this item
- 37 and measured as provided under “Measurement” will be paid for at the unit
- 38 price bid per linear foot for “Water Carrier Pipe” installed for:
- 39 a) Various Sizes.
- 40 b) Various Materials.
- 41 c. The price bid shall include:
- 42 1) Furnishing and installing Water Carrier Pipe in Casing/Tunnel Liner Plate
- 43 as specified by the Drawings
- 44 2) Annular grouting, if required
- 45 3) Joint restraint
- 46 4) Casing spacers
- 47 5) End seals
- 48 6) Excavation

- 1 7) Hauling
- 2 8) Disposal of excess material
- 3 9) Clean-up

4 **1.3 REFERENCES**

5 A. Abbreviations

- 6 1. LDCC – Low Density Cellular Concrete (Grout)
- 7 2. PVC – Polyvinyl Chloride
- 8 3. DIP – Ductile Iron Pipe
- 9 4. HDPE – High Density Polyethylene
- 10 5. FRP – Fiberglass Reinforced Pipe

11 B. Definitions

- 12 1. Carrier Pipe – Permanent pipe for operational use that is used to convey flows.
- 13 2. Casing – A steel pipe or tunnel liner that supports the ground and provides a stable
- 14 underground excavation for installation of the carrier pipe.
- 15 3. Annular Grouting – Grouting of the space between the casing and carrier pipe.

16 C. Reference Standards

- 17 1. Reference standards cited in this Section refer to the current reference standard
- 18 published at the time of the latest revision date logged at the end of this Section
- 19 unless a date is specifically cited.
- 20 2. American Society of Testing and Materials (ASTM):
- 21 a. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete
- 22 Specimens.
- 23 b. C109, Standard Test Method for Compressive Strength of Hydraulic Cement
- 24 Mortars (Using 2-in or [50 mm] Cube Specimens).
- 25 c. D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated
- 26 Pipe (SDR Series).
- 27 3. International Organization for Standardization (ISO):
- 28 a. 9001, Quality Management Systems - Requirements.
- 29 4. Occupational Safety and Health Administration (OSHA):
- 30 a. OSHA Regulations and Standards for Underground Construction, 29 CFR Part
- 31 1926, Subpart S, Underground Construction and Subpart P, Excavation.
- 32 5. American Water Works Association (AWWA):
- 33 a. C200, Steel Water Pipe - 6 Inches and Larger.
- 34 b. C303, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
- 35 c. C900, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 IN
- 36 through 60 IN, for Water Transmission and Distribution.

37 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

38 **1.5 SUBMITTALS**

- 39 A. Submittals shall be in accordance with Section 01 33 00.
- 40 B. All submittals shall be approved by the City prior to delivery.

41 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

1

- 1 A. Product Data
- 2 1. Casing Spacers
- 3 a. Material Data
- 4 2. Annular Grout Mix
- 5 a. Material Data
- 6 B. Shop Drawings
- 7 1. Casing Spacers
- 8 a. Detail drawings and manufacturer's information for the casing spacers that will
- 9 be used.
- 10 1) Include dimensions, component materials, and documentation of
- 11 manufacturer's ISO 9001:2000 certification.
- 12 b. Alternatives to casing spacers may be allowed by the City on a case-by-case
- 13 basis.
- 14 1) For consideration of an alternate method, submit a substitution request in
- 15 accordance with Section 01 25 00.
- 16 2. End seal or bulkhead designs and locations for casing/liners.
- 17 3. Annular Grouting Work Plan and Methods including:
- 18 a. Grouting methods
- 19 b. Details of equipment
- 20 c. Grouting procedures and sequences including:
- 21 1) Injection methods
- 22 2) Injection pressures
- 23 3) Monitoring and recording equipment
- 24 4) Pressure gauge calibration data
- 25 5) Materials
- 26 d. Grout mix details including:
- 27 1) Proportions
- 28 2) Admixtures including:
- 29 a) Manufacturer's literature
- 30 b) Laboratory test data verifying the strength of the proposed grout mix
- 31 c) Proposed grout densities
- 32 d) Viscosity
- 33 e) Initial set time of grout
- 34 (1) Data for these requirements shall be derived from trial batches from
- 35 a qualified testing laboratory.
- 36 e. Submit a minimum of 3 other similar projects where the proposed grout mix
- 37 design was used.
- 38 f. Submit anticipated volumes of grout to be pumped for each application and
- 39 reach grouted.
- 40 4. Additional requirements for installations of carrier pipe 24-inch and larger:
- 41 a. Submit work plan describing the carrier pipe installation equipment, materials
- 42 and construction methods to be employed.
- 43 b. For installations without holding jacks or a restrained spacer, provide buoyant
- 44 force calculations for the pipe during grouting, and measures which will be
- 45 employed to prevent pipe flotation.
- 46 1) Calculations sealed by a Professional Engineer Licensed in the State of
- 47 Texas

1 c. Description of methods and devices to prevent buckling of carrier pipe during
 2 annular grouting, if required.

3 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

5 **1.9 QUALITY ASSURANCE**

6 A. Certifications

7 1. Casing spacer manufacturer shall be certified in accordance with ISO 9001:2000.

8 **1.10 DELIVERY, STORAGE, AND HANDLING**

9 A. Storage and Handling Requirements

10 1. Secure and maintain a location to store the material in accordance with Section 01
 11 66 00.

12 **1.11 FIELD CONDITIONS [NOT USED]**

13 **1.12 WARRANTY [NOT USED]**

14 **PART 2 - PRODUCTS**

15 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

16 **2.2 MATERIALS**

17 A. Performance / Design Criteria

18 1. Install carrier pipe within the horizontal and vertical tolerances as indicated in Part
 19 3 of this Section, incorporating all support/spacer dimensions required.

20 2. The following carrier pipe materials are permitted for installation in casing as
 21 indicated:

	Diameter (inches)	Material	Section Reference
Water Line	6-12	DIP (Restrained)	33 14 10
		PVC (C900, Restrained)	33 14 11
		HDPE	33 14 14
	16-30	DIP (Restrained)	33 14 10
		AWWA C303 (Restrained)	33 14 12
		HDPE	33 14 14
	36 and greater	DIP (Restrained)	33 14 10
		AWWA C303 (Restrained)	33 14 12
		AWWA C200 (Restrained)	33 14 13
HDPE		33 14 14	

22

1

	Diameter (inches)	Material	Section Reference
Gravity Sanitary Sewer	8-12	DIP (with Ceramic Epoxy)	33 14 10
		PVC (D2241 or D3034)	33 31 14
		PVC (C900)	33 14 11
		HDPE	33 14 14
14-16	14-16	DIP (with Ceramic Epoxy)	33 14 10
		PVC (C900)	33 14 11
		PVC (D3034)	33 31 14
18-24	18-24	DIP (with Ceramic Epoxy)	33 14 10
		FRP	33 31 10
		PVC (C900)	33 14 11
30 and greater	30 and greater	PVC (D3034)	33 31 14
		DIP (with Ceramic Epoxy)	33 14 10
FRP	All Sizes	FRP	33 31 10
		DIP (with Ceramic Epoxy, Restrained)	33 14 10
HDPE	All Sizes	HDPE	33 14 14

2
3
4

3. The minimum casing pipe or liner diameter required for nominal carrier pipe diameters will be as indicated below:

Nominal Carrier Pipe Size, All Materials (inches)	Minimum Casing Diameter (inches)	Minimum Liner Plate Diameter (inches)
8 and Smaller	18	48
10 - 15	24	48
16 – 18	30	48
20 - 21	36	48
24 – 27	42	48
30	48	54
Greater than 30	Project Specific Design	Project Specific Design

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4. Annular Grouting
- a. Water Line and Sewer Force Main
 - 1) No annular grouting will be required.
 - b. Gravity Sanitary Sewer
 - 1) Fill all voids between the carrier pipe and the casing or liner plate with low density cellular concrete grout.
5. Grout Mixes
- a. Low Density Cellular Concrete (Grout)
 - 1) Portland cement based grout mix with the addition of a foaming agent for the purpose of annular grouting.
 - 2) Develop 1 or more grout mixes designed to completely fill the annular space based on the following requirements:

- 1 a) Provide adequate retardation to completely fill the annular space in 1
2 monolithic pour.
3 b) Provide less than 1 percent shrinkage by volume.
4 c) Minimum compressive strength of 10 psi in 24 hours, 300 psi in 28
5 days
6 d) Design grout mix with the proper density and use proper methods to
7 prevent floating of the carrier pipe.
8 e) Proportion grout to flow and to completely fill all void between the
9 carrier pipe and the casing or liner plate.
- 10 6. End Seals
- 11 a. Provide end seals at each end of the casing or liner plate to contain the grout
12 backfill and/or to close the casing/liner ends to prevent the inflow of water or
13 soil.
- 14 1) Water Piping and Sewer Force Mains less than 24-inch diameter:
- 15 a) Mortared brick with non-shrink grout,
16 b) Link Seal manufactured by GPT, or
17 c) Approved equal.
- 18 2) Water Piping and Sewer Force Mains 24-inch diameter and greater:
- 19 a) Use pull-on, 1/8 inch thick synthetic rubber end seals, Model C
20 manufactured by GPT, or
21 b) Approved equal.
- 22 3) Gravity Sanitary Sewer Piping:
- 23 a) No end seals are required if the annulus is grouted.
- 24 7. Casing Spacers (Insulators)
- 25 a. Provide casing spacers to support the carrier pipe during installation and
26 grouting (where grout is used).
- 27 1) For AWWA C303 and C200 pipe, mortar bands may be allowed in lieu of
28 casing spacers in accordance with Section 33 14 12 and Section 33 14 13.
- 29 b. Provide restrained-style casing spacers to hold carrier pipe stable during
30 grouting operations and prevent floating or movement.
- 31 c. Provide dielectric strength sufficient to electrically isolate each component
32 from one another and from casing/liner.
- 33 d. Carrier pipe less than 12-inch diameter and in casing or liner less than or equal
34 to 150 linear feet:
- 35 1) Provide high density polyethylene spacers manufactured by Raci Spacers
36 North America, Inc.
- 37 2) Provide sufficient height to allow a minimum clearance of 2 inches
38 between the outside of carrier pipe bells or external restraint system and the
39 inside of the casing/liner surface.
- 40 e. Carrier pipe 12-inch diameter and larger, or all piping in casing/liner greater
41 than 150 linear feet:
- 42 1) Minimum 14 gauge
43 2) Stainless steel for water line and sewer force main
44 3) Coated steel for gravity sanitary sewer
45 4) Suitable for supporting weight of carrier pipe without deformation or
46 collapse during installation
47 5) Risers:
48 a) Design for proposed loading

- 1 b) 10 gauge steel
- 2 c) Stainless steel for water line and sewer force main
- 3 d) Provide sufficient height with attached runner to allow a minimum
- 4 clearance of 2 inches between the outside of carrier pipe bells or
- 5 couplings and the inside of the casing/liner surface.
- 6 6) Bands:
- 7 a) Stainless steel for water line and sewer force main
- 8 b) Provide polyvinyl chloride inner liner with:
- 9 (1) Minimum thickness of 0.09 inches
- 10 (2) Durometer "A" of 85-90 hardness
- 11 (3) Minimum dielectric strength of 58,000 volts
- 12 7) Runners:
- 13 a) Pressure-molded glass reinforced polymer or UHMW
- 14 b) Minimum 2 inches in width
- 15 c) Minimum 11 inches in length
- 16 d) Attach to the band or riser with minimum 3/8 inch welded steel or
- 17 stainless steel studs.
- 18 e) Recess runner studs and nuts well below wearing surface of the runner.
- 19 (1) Fill recess with corrosion inhibiting filler.

20 **2.3 ACCESSORIES [NOT USED]**

21 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

22 **PART 3 - EXECUTION**

23 **3.1 INSTALLERS [NOT USED]**

24 **3.2 EXAMINATION [NOT USED]**

25 **3.3 PREPARATION [NOT USED]**

26 **3.4 INSTALLATION**

27 A. General

- 28 1. Carrier pipe installation may not begin until completion of the following tasks:
- 29 a. All required submittals have been provided, reviewed, and accepted.
- 30 b. All casing/liner joints are watertight and no water is entering casing or liner
- 31 from any sources.
- 32 c. All contact grouting is complete, if required.
- 33 d. Casing/liner alignment record drawings have been submitted and accepted by
- 34 City to document deviations due to casing/liner installation.
- 35 e. Site safety representative has prepared a code of safe practices and an
- 36 emergency plan in accordance with applicable requirements.
- 37 2. Install the carrier pipe within the casing or liner between the limits and to the lines
- 38 and grades specified in the Drawings. Utilize methods which include due regard for
- 39 safety of workers, adjacent structures and improvements, utilities, and the public.

40 B. Control of Line and Grade

- 41 1. Install carrier pipe inside the casing or liner within the following tolerances:

- 1 a. Horizontally +/- 2 inches from design line
- 2 b. Vertically +/- 1 inch from design grade
- 3 2. Check line and grade set up prior to beginning carrier pipe installation.
- 4 3. Perform survey checks of line-and-grade of carrier pipe during installation
- 5 operations.
- 6 4. Contractor is fully responsible for the accuracy of the carrier pipe installation, and
- 7 correction of the installation, if required.
- 8 a. Where the carrier pipe installation does not satisfy specified tolerances, correct
- 9 the installation, including if necessary, redesign of the pipe or structures at no
- 10 additional cost to City.
- 11 C. Installation of Carrier Pipe
- 12 1. Pipe Installation
- 13 a. Remove all loose soil from casing or liner.
- 14 b. Grind smooth all rough welds at casing joints.
- 15 c. Install carrier pipe so that there is no metallic contact between the carrier pipe
- 16 and the casing or liner.
- 17 d. Install carrier pipe without sliding or dragging it on the ground or in the
- 18 casing/liner in a manner that could damage the pipe or coatings.
- 19 1) If guide rails are used, place cement mortar on both sides of the rails.
- 20 e. Electrically isolate the carrier pipe from the casing spacers and from the
- 21 casing/liner.
- 22 f. Grade the bottom of the trench adjacent to each end of the casing/liner to
- 23 provide firm, uniform, and continuous support for the pipe. If the trench
- 24 requires backfilling to establish the final trench bottom grade, place the backfill
- 25 in 6-inch lifts and compact in accordance with Section 33 05 05 prior to
- 26 installing the carrier pipe.
- 27 g. After the casing/liner has been placed, pump dry and maintain a dry surface
- 28 until the carrier pipe and end seals are installed.
- 29 2. Installation of Casing Spacers
- 30 a. Provide casing spacers, insulators, or other approved devices to prevent
- 31 flotation, movement, or damage to the pipe during installation and grout
- 32 backfill placement.
- 33 b. Assemble and securely fashion casing spacers to pipeline to be installed in
- 34 casing or liner.
- 35 c. Correctly assemble, evenly tighten, and prevent damage to pipe or casing
- 36 spacer during tightening and pipe insertion.
- 37 d. Install spacers in accordance with manufacturer's recommendations.
- 38 e. Coat the casing spacer runners with a non-corrosive/environmentally safe
- 39 lubricant to minimize friction when installing the carrier pipe.
- 40 3. Casing Spacer Spacing
- 41 a. Maximum distance between spacers is 6 feet 6 inches.
- 42 b. For 18 and 20-foot-long joints, install a minimum of 5 spacers for PVC and
- 43 HDPE pipe, and 4 spacers for all other materials.
- 44 1) Install 2 spacers within 1 foot on each side of bell or flange.
- 45 2) Space remaining 2 or 3 spacers evenly between pipe ends.
- 46 c. If the casing or liner is angled or bent, add 1 additional spacer and adjust
- 47 spacing evenly.

- 1 d. Provide 2 end spacers at each casing/liner end, within 6 inches of end of
- 2 casing/liner.
- 3 e. Install spacers on PVC pipe at the insertion line to prevent over-insertion of the
- 4 spigot into the bell.
- 5 4. After Carrier Pipe Installation
- 6 a. Mortar inside and outside of the joints, as applicable.
- 7 b. Verify electrical discontinuity between water carrier pipe and the casing/liner.
- 8 1) If continuity exists, remedy the short by all means necessary, including
- 9 removing and reinstalling the carrier pipe, prior to installing the annular
- 10 grout (if applicable).
- 11 c. If steel pipe is used and not welded prior to installing in casing/liner, welding of
- 12 pipe will only be allowed after annular grouting is complete (if applicable).
- 13 D. Installation of End Seals (Water and Sewer Force Main)
- 14 1. Pipe less than 24 inches in diameter:
- 15 a. Install mortared brick or Link Seal
- 16 2. Pipe 24-inches and greater in diameter:
- 17 a. Ground end of casing/liner minimum 6 inches and maximum 12 inches.
- 18 b. Place pull-on synthetic rubber end seals on the pipe and pull over the end
- 19 casing/liner. Securely fasten with stainless steel bands.
- 20 E. Annular Grouting (For Gravity Sewer Only)
- 21 1. Prepare pipe as necessary to prevent the pipe from floating during grouting
- 22 operations as necessary.
- 23 2. Mixing of Grout
- 24 a. Mix material in equipment of sufficient size to provide the desired amount of
- 25 grout material for each stage in a single operation.
- 26 1) The equipment shall be capable of mixing the grout at the required densities
- 27 for the approved procedure and shall be capable of changing the densities
- 28 as required by field conditions.
- 29 3. Backfill Annular Space with Grout
- 30 a. Prior to filling the annular space, test the gravity sewer carrier pipe in
- 31 accordance with Section 33 01 31.
- 32 b. Verify from the manufacturer, the maximum allowable external pressure the
- 33 carrier pipe may experience, and do not exceed this grout injection pressure.
- 34 c. After the installation of the carrier pipe, fill the remaining space (all voids) with
- 35 LDCC grout.
- 36 1) All exterior surfaces of the carrier pipe wall and interior surfaces of the
- 37 casing/liner shall be in contact with grout.
- 38 2) Pump grout through a pipe or hose.
- 39 3) Use grout pipes, or other appropriate materials, to avoid damage to carrier
- 40 pipe during grouting.
- 41 4. Injection of LDCC Grout
- 42 a. Grout injection pressure shall not exceed the carrier pipe manufacturer's
- 43 recommendations, or 5 psi, whichever is lower.
- 44 b. Provide pumping equipment of a size sufficient to inject grout at a volume,
- 45 velocity, and pressure compatible with the size/volume of the annular space.

- c. Once grouting operations begin, proceed with uninterrupted grouting, unless grouting procedures require multiple stages.
- d. Grout placements shall not be terminated until the estimated volume of annular grout has been injected.
5. Block the carrier pipe during grouting to prevent flotation during grout installation.
6. Protect and preserve the interior surfaces of the casing from damage during grouting.

3.5 REPAIR [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL

A. Grouting Reports and Records

1. Required for the following scenarios:
 - a. Carrier pipe 24-inch and greater
 - b. Carrier pipe of any size longer than 150 feet
2. Maintain and submit daily logs of grouting operations including:
 - a. Grouting locations
 - b. Pressures
 - c. Volumes
 - d. Grout mix pumped
 - e. Time of pumping
 - f. Any problems or unusual observations

B. Grout Strength Tests

1. Perform testing for 24-hour and 28 day compressive strength for the cylinder molds (ASTM C39) or grout cubes (ASTM C109) obtained during grouting operations.
2. Provide and test at least 1 set of 4-cylinder molds or grout cubes for each 100 cubic yards of grout injected, but not less than 1 set for each grouting shift.
3. Test remaining samples as directed by City.

C. Safety

1. Contractor is responsible for safety on the job site.
 - a. Perform all Work in accordance with the current applicable regulations of the Federal, State and local agencies.
 - 1) Comply with all applicable provisions of OSHA 29 CFR Part 1926, Subpart S, Underground Construction and Subpart P, Excavations.
 - 2) In the event of a conflict, comply with the more stringent requirement.
2. No gasoline powered equipment shall be permitted in jacking/launching shafts and receiving shafts/pits.
 - a. Diesel, electrical, hydraulic, and air powered equipment is acceptable subject to applicable Federal, State, and local regulations.
3. Methods of construction shall be such as to ensure the safety of the Work, Contractor, subcontractor, other personnel on the Site, and the public.
4. Furnish and operate a temporary ventilation system in accordance with applicable safety requirements when personnel are underground.
 - a. Perform all required air and gas monitoring.

- 1 b. Ventilation system shall provide a sufficient supply of fresh air and maintain an
2 atmosphere free of toxic or flammable gasses in all underground work areas.
- 3 5. If personnel will enter the pipe during construction, develop an emergency response
4 plan for rescuing personnel trapped underground in a shaft excavation or pipe.
5 a. Keep all equipment required for emergency response at the Site in accordance
6 with all applicable Federal, State, and local requirements.

7 **3.8 SYSTEM STARTUP [NOT USED]**

8 **3.9 ADJUSTING [NOT USED]**

9 **3.10 CLEANING [NOT USED]**

10 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

11 **3.12 PROTECTION [NOT USED]**

12 **3.13 MAINTENANCE [NOT USED]**

13 **3.14 ATTACHMENTS [NOT USED]**

14 **END OF SECTION**

15

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 33 05 61
CAST-IN-PLACE CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sanitary Sewer, Water Appurtenance, or Reclaimed Water Appurtenance Cast-in-Place Concrete Manholes.
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 03 00 00 – Concrete and Concrete Reinforcing.
 - 4. Section 03 30 00 – Cast-in-Place Concrete.
 - 5. Section 03 34 13 – Controlled Low Strength Material (CLSM).
 - 6. Section 03 80 00 – Modifications to Existing Concrete Structures.
 - 7. Section 33 01 31 – Sewer and Manhole Testing.
 - 8. Section 33 01 40 – Liners for Sanitary Sewer Structures.
 - 9. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.
 - 10. Section 33 05 81 – Frame, Cover, and Grade Rings.
 - 11. Section 33 14 10 – Ductile Iron Pipe and Fittings.
 - 12. Section 33 31 14 – Polyvinyl Chloride (PVC) Gravity Sanitary Sewer Pipe.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Manhole
 - a. Measurement
 - 1) Measured per each “Manhole” installed to a maximum depth of 6 feet.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each “Manhole” installed for:
 - a) Various sizes.
 - b) Various types.
 - c. The price bid shall include:
 - 1) Furnishing and installing manhole structure as specified by the Drawings
 - 2) Excavation
 - 3) Forms
 - 4) Reinforcing steel, if required

- 1 5) Concrete
- 2 6) Foundation
- 3 7) Drop pipe, if required
- 4 8) Vent piping, if required
- 5 9) Pipe stubs
- 6 10) Frame
- 7 11) Cover
- 8 12) Grade rings
- 9 13) Pipe connections
- 10 14) Pavement removal
- 11 15) Hauling
- 12 16) Disposal of excess material
- 13 17) Furnishing, placement, and compaction of backfill
- 14 18) Clean-up
- 15 2. Extra Depth Manhole
- 16 a. Measurement
- 17 1) Measured per each vertical foot of manhole depth beyond 6 feet from rim
- 18 to flow line, measured to the nearest foot.
- 19 b. Payment
- 20 1) The work performed and materials furnished in accordance with this item
- 21 and measured as provided under “Measurement” will be paid for at the unit
- 22 price bid per each “Extra Depth Manhole” installed for:
- 23 a) Various sizes.
- 24 c. The price bid shall include:
- 25 1) Furnishing and installing extra depth manhole structure as specified by the
- 26 Drawings
- 27 2) Excavation
- 28 3) Forms
- 29 4) Reinforcing steel (if required)
- 30 5) Concrete
- 31 6) Foundation
- 32 7) Drop pipe (if required)
- 33 8) Pipe stubs
- 34 9) Frame
- 35 10) Cover
- 36 11) Grade rings
- 37 12) Pipe connections
- 38 13) Pavement removal
- 39 14) Hauling
- 40 15) Disposal of excess material
- 41 16) Furnishing, placement, and compaction of backfill
- 42 17) Clean-up
- 43 3. Sanitary Sewer Junction Structure
- 44 a. Measurement
- 45 1) Measured per each Sewer Junction Structure installed.
- 46 b. Payment

- 1
 - 2
 - 3
 - 4
- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each “Sewer Junction Structure” installed.

- 1 c. The price bid shall include:
- 2 1) Furnishing and installing junction structure as specified by the Drawings
- 3 2) Excavation
- 4 3) Forms
- 5 4) Reinforcing steel
- 6 5) Concrete
- 7 6) Foundation
- 8 7) Drop pipe, if required
- 9 8) Vent piping, if required
- 10 9) Pipe stubs
- 11 10) Frame
- 12 11) Cover
- 13 12) Grade rings
- 14 13) Pipe connections
- 15 14) Pavement removal
- 16 15) Hauling
- 17 16) Disposal of excess material
- 18 17) Furnishing, placement, and compaction of backfill
- 19 18) Clean-up

20 **1.3 REFERENCES**

21 A. Definitions

- 22 1. Manhole Type
- 23 a. Standard Manhole
- 24 1) Up to 6 feet deep (from rim to flowline).
- 25 b. Standard Drop Manhole
- 26 1) Standard Manhole with external drop connection(s).
- 27 c. Extra Depth Manhole
- 28 1) Additional manhole depth in excess of 6 feet (from rim to flowline).

29 B. Reference Standards

- 30 1. Reference standards cited in this Section refer to the current reference standard
- 31 published at the time of the latest revision date logged at the end of this Section
- 32 unless a date is specifically cited.
- 33 2. American Society for Testing and Measurement (ASTM):
- 34 a. C923 – Standard Specification for Resilient Connectors Between Reinforced
- 35 Concrete Manholes Structures, Pipes, and Laterals.

36 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

37 **1.5 SUBMITTALS**

- 38 A. Submittals shall be in accordance with Section 01 33 00.
- 39 B. All submittals shall be approved by the City prior to delivery.

40 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

41 A. Product Data

- 42 1. Drop connection materials
- 43 2. Pipe connections at manhole walls

- 1 3. Stubs and stub plugs
- 2 4. Concrete mix design in accordance with Section 03 00 00.

3 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

5 **1.9 QUALITY ASSURANCE [NOT USED]**

6 **1.10 DELIVERY, STORAGE, AND HANDLING**

7 A. Storage and Handling Requirements

- 8 1. Secure and maintain a location to store the material in accordance with Section 01
- 9 66 00.

10 **1.11 SITE CONDITIONS [NOT USED]**

11 **1.12 WARRANTY [NOT USED]**

12 **PART 2 - PRODUCTS**

13 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

14 **2.2 MATERIALS**

15 A. Materials

- 16 1. Class 'S' Concrete in accordance with Section 03 00 00.
- 17 2. Reinforcing steel in accordance with Section 03 00 00.
- 18 3. Frame, cover, and grade rings in accordance with Section 33 05 81.
- 19 4. Pipe Connections
- 20 a. Utilize an elastomeric PVC or rubber boot-type connector installed in a circular
- 21 block out opening conforming to ASTM C923.
- 22 5. Drop piping in accordance with Sections 33 14 10 or 33 31 14.
- 23 a. Use same material as sanitary sewer main.
- 24 6. Steps are not allowed.

25 B. Finishes

- 26 1. Interior lining in accordance with Section 33 01 40, if required.
- 27 2. Exterior coating not required for cast-in-place concrete manholes.

28 C. Manhole Sizing

- 29 1. 4-foot diameter
- 30 a. Used with pipe ranging from 8-inch to 12-inch for depths 12-feet or less.
- 31 2. 5-foot diameter
- 32 a. Used with pipe ranging from 8-inch to 12-inch for depths greater than 12-feet.
- 33 b. Used with pipe ranging from 15-inch to 27-inch.
- 34 3. 6-foot diameter
- 35 a. Used with pipe ranging from 30-inch to 36-inch.

1 **2.3 ACCESSORIES [NOT USED]**

2 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

3 **PART 3 - EXECUTION**

4 **3.1 INSTALLERS [NOT USED]**

5 **3.2 EXAMINATION**

6 A. Evaluation and Assessment

- 7 1. Verify lines and grades are in accordance with the Drawings.

8 **3.3 PREPARATION**

9 A. Foundation Preparation

- 10 1. Excavate 12-inches below proposed manhole foundation.
- 11 2. Replace excavated soil with 12-inches of crushed rock in accordance with Section
- 12 33 05 05.
- 13 a. If soil conditions or ground water prevent use of crushed rock base, a 4-inch
- 14 mud slab may be substituted if permitted by City.
- 15 1) Do not place forms on mud slab until concrete is demonstrated to have
- 16 cured to 2,000 psi compressive strength or 7-days have elapsed.

17 **3.4 INSTALLATION**

18 A. Manhole

- 19 1. Construct manhole to dimensions specified in the Drawings.
- 20 2. Cast manhole foundation and wall monolithically.
- 21 a. A cold joint with PVC water stop will only be allowed when the manhole depth
- 22 exceeds 12-feet.
- 23 b. No other joints are allowed unless specified in the Drawings.
- 24 3. Place, finish, and cure concrete in accordance with Section 03 30 00.
- 25 a. Allow concrete for manholes to cure a minimum of 3 days before backfilling
- 26 around structure.

27 B. Pipe connection at Manhole

- 28 1. Do not construct joints of sewer pipe within wall sections of manhole.

29 C. Invert

- 30 1. Construct invert channels to provide a smooth waterway with no disruption of flow
- 31 at pipe-manhole connections.
- 32 2. For direction changes of mains, construct channels tangent to mains with maximum
- 33 possible radius of curvature.
- 34 a. Provide curves for side inlets.
- 35 3. Provide invert depth to spring line of pipe, and taper manhole bench to top of
- 36 largest pipe at manhole wall in accordance with the Drawings.

37 D. Drop Manhole Connection

- 1 1. Install drop connection when sewer lines enter manholes with 24-inches or more
2 above the manhole invert.
3 2. Embed drop piping with cement stabilized sand (CSS) or controlled low strength
4 material (CLSM) in accordance with Sections 33 05 05 or 03 34 13, respectively.

5 E. Final Rim Elevation

- 6 1. Grade Rings
7 a. New structures should be constructed so the total height of grade rings is as
8 close to 6-inches as practical to allow for future adjustments to no more than
9 12-inches of grade rings.
10 b. Install grade rings on a load bearing shoulder of manhole.
11 c. Install joint sealant for grade rings in accordance with Section 33 05 81.
12 1) Remove all debris, stones, and dirt between all grade rings to ensure a
13 watertight seal.
14 d. Install Infi-Shield External Gator Wrap on the exterior of all grade rings in
15 accordance with Section 33 05 81.
16 2. Frame and Cover
17 a. Install joint sealant between frame and manhole or grade rings in accordance
18 with Section 33 05 81.
19 1) Remove all debris, stones, and dirt between frame and manhole or grade
20 rings to ensure a watertight seal.

21 F. Internal Coating

- 22 1. Install manhole liner where specified in the Drawings in accordance with Section
23 33 01 40.

24 G. External Coating

- 25 1. No external coating is required for cast-in-place manholes.

26 H. Modifications and pipe penetrations in accordance with Section 03 80 00.

27 I. Junction Structures to be installed as specified in the Drawings.

28 **3.5 REPAIR [NOT USED]**

29 **3.6 RE-INSTALLATION [NOT USED]**

30 **3.7 SITE QUALITY CONTROL**

31 A. Site Tests and Inspections

- 32 1. Perform manhole vacuum testing in accordance with Section 33 01 31.

- 1 **3.8 SYSTEM STARTUP [NOT USED]**
- 2 **3.9 ADJUSTING [NOT USED]**
- 3 **3.10 CLEANING [NOT USED]**
- 4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 5 **3.12 PROTECTION [NOT USED]**
- 6 **3.13 MAINTENANCE [NOT USED]**
- 7

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 33 05 62**
2 **PRECAST CONCRETE MANHOLES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Sanitary Sewer, Water Appurtenance, or Reclaimed Water Appurtenance Precast
7 Concrete Manholes.

8 B. Deviations from this City of Denton Standard Specification:

- 9 1. None.

10 C. Related Specification Sections include but are not limited to:

- 11 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
12 Contract.
13 2. Division 1 - General Requirements.
14 3. Section 03 34 13 – Controlled Low Strength Material (CLSM).
15 4. Section 03 80 00 – Modifications to Existing Concrete Structures.
16 5. Section 33 01 31 – Sewer and Manhole Testing.
17 6. Section 33 01 40 – Liners for Sanitary Sewer Structures.
18 7. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.
19 8. Section 33 05 81 – Frame, Cover, and Grade Rings.
20 9. Section 33 14 10 – Ductile Iron Pipe and Fittings.
21 10. Section 33 31 14 – Polyvinyl Chloride (PVC) Gravity Sanitary Sewer Pipe.

22 **1.2 PRICE AND PAYMENT PROCEDURES**

23 A. Measurement and Payment

24 1. Manhole

25 a. Measurement

- 26 1) Measured per each “Manhole” installed to a maximum depth of 6 feet.

27 b. Payment

- 28 1) The work performed and materials furnished in accordance with this item
29 and measured as provided under “Measurement” will be paid for at the unit
30 price bid per each “Manhole” installed for:
31 a) Various sizes.
32 b) Various types.

33 c. The price bid shall include:

- 34 1) Furnishing and installing manhole structure as specified by the Drawings
35 2) Excavation
36 3) Forms
37 4) Reinforcing steel, if required
38 5) Concrete
39 6) Foundation

- 1 7) Drop pipe, if required
- 2 8) Vent piping, if required
- 3 9) Pipe stubs
- 4 10) Interior lining
- 5 11) Frame
- 6 12) Cover
- 7 13) Grade rings
- 8 14) Pipe connections
- 9 15) Pavement removal
- 10 16) Hauling
- 11 17) Disposal of excess material
- 12 18) Furnishing, placement, and compaction of backfill
- 13 19) Clean-up
- 14 2. Extra Depth Manhole
- 15 a. Measurement
- 16 1) Measured per each vertical foot of manhole depth beyond 6 feet from rim
- 17 to flow line, measured to the nearest foot.
- 18 b. Payment
- 19 1) The work performed and materials furnished in accordance with this item
- 20 and measured as provided under "Measurement" will be paid for at the unit
- 21 price bid per each "Extra Depth Manhole" installed for:
- 22 a) Various sizes.
- 23 c. The price bid shall include:
- 24 1) Furnishing and installing extra depth manhole structure as specified by the
- 25 Drawings
- 26 2) Excavation
- 27 3) Forms
- 28 4) Reinforcing steel, if required
- 29 5) Concrete
- 30 6) Foundation
- 31 7) Drop pipe, if required
- 32 8) Pipe stubs
- 33 9) Interior lining
- 34 10) Frame
- 35 11) Cover
- 36 12) Grade rings
- 37 13) Pipe connections
- 38 14) Pavement removal
- 39 15) Hauling
- 40 16) Disposal of excess material
- 41 17) Furnishing, placement, and compaction of backfill
- 42 18) Clean-up

43 1.3 REFERENCES

44 A. Definitions

45 1. Manhole Type

46 a. Standard Manhole

- 47 1) Up to 6 feet deep (from rim to flowline).

- 1 b. Standard Drop Manhole
- 2 1) Same as Standard Manhole with external drop connection(s).
- 3 c. Extra Depth Manhole
- 4 1) Additional manhole depth in excess of 6 feet (from rim to flowline).
- 5 B. Reference Standards
- 6 1. Reference standards cited in this Section refer to the current reference standard
- 7 published at the time of the latest revision date logged at the end of this Section
- 8 unless a date is specifically cited.
- 9 2. American Society for Testing and Measurement (ASTM):
- 10 a. C443 – Standard Specification for Joint for Concrete Pipe and Manholes, Using
- 11 Rubber Gaskets.
- 12 b. C478 – Standard Specification for Precast Reinforced Concrete Manhole
- 13 Sections.
- 14 c. C923 – Standard Specification for Resilient Connectors Between Reinforced
- 15 Concrete Manholes Structures, Pipes, and Laterals.
- 16 d. D1187 – Standard Specification for Asphalt-Base Emulsion for Use as
- 17 Protective Coatings for Metal.
- 18 e. D1227 – Standard Specification for Emulsified Asphalt Used as a Protective
- 19 Coating for Roofing.

20 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

21 **1.5 SUBMITTALS**

- 22 A. Submittals shall be in accordance with Section 01 33 00.
- 23 B. All submittals shall be approved by the City prior to delivery.

24 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 25 A. Product Data
- 26 1. Precast Concrete Manhole
- 27 2. Drop connection materials
- 28 3. Pipe connections at manhole walls
- 29 4. Stubs and stub plugs
- 30 B. Shop Drawings
- 31 1. Pre-cast manhole drawings

32 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

33 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

34 **1.9 QUALITY ASSURANCE [NOT USED]**

35 **1.10 DELIVERY, STORAGE, AND HANDLING**

- 36 A. Storage and Handling Requirements
- 37 1. Secure and maintain a location to store the material in accordance with Section 01
- 38 66 00.

39 **1.11 SITE CONDITIONS [NOT USED]**

1 **1.12 WARRANTY [NOT USED]**

2 **PART 2 - PRODUCTS**

3 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

4 **2.2 MATERIALS**

5 A. Materials

- 6 1. Precast reinforced concrete sections shall be in accordance with ASTM C478.
- 7 2. Precast Joints
- 8 a. Provide gaskets in accordance with ASTM C443.
- 9 b. Minimize number of joints.
- 10 c. Joint length to increase with manhole depth.
- 11 1) For example, use long joints at the bottom of manhole and shorter joints
- 12 toward the top.
- 13 d. Include manufacturer's stamp on each section.
- 14 3. Lifting Devices
- 15 a. Manhole sections and cones may be furnished with lift lugs or lift holes.
- 16 1) If lift lugs are provided, place 180 degrees apart.
- 17 2) If lift holes are provided, place 180 degrees apart and grout during manhole
- 18 installation.
- 19 4. Frame, cover, and grade rings in accordance with Section 33 05 81.
- 20 5. Pipe Connections
- 21 a. Utilize an elastomeric PVC or rubber boot-type connector installed in a circular
- 22 block out opening conforming to ASTM C923.
- 23 6. Drop piping in accordance with Sections 33 14 10 or 33 31 14.
- 24 a. Use same material as sanitary sewer main.
- 25 7. Steps are not allowed.

26 B. Finishes

- 27 1. **Interior lining is required for all pre-cast concrete manholes in accordance**
- 28 **with Section 33 01 40.**
- 29 2. Exterior Coating
- 30 a. Coat with non-fibered asphaltic emulsion in accordance with ASTM D1187
- 31 Type I and ASTM D1227 Type III Class I.

32 C. Manhole Sizing

- 33 1. 4-foot diameter
- 34 a. Used with pipe ranging from 8-inch to 12-inch for depths 12-feet or less.
- 35 2. 5-foot diameter
- 36 a. Used with pipe ranging from 8-inch to 12-inch for depths greater than 12-feet.
- 37 b. Used with pipe ranging from 15-inch to 27-inch.
- 38 3. 6-foot diameter
- 39 a. Used with pipe ranging from 30-inch to 36-inch.

40 **2.3 ACCESSORIES [NOT USED]**

1 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

2 **PART 3 - EXECUTION**

3 **3.1 INSTALLERS [NOT USED]**

4 **3.2 EXAMINATION**

5 A. Evaluation and Assessment

- 6 1. Verify lines and grades are in accordance with the Drawings.

7 **3.3 PREPARATION**

8 A. Foundation Preparation

- 9 1. Excavate 12-inches below proposed manhole foundation.
10 2. Replace excavated soil with 12-inches of crushed rock in accordance with Section
11 33 05 05.
12 a. If soil conditions or ground water prevent use of crushed rock base, a 4-inch
13 mud slab may be substituted if permitted by City.
14 1) Do not place forms on mud slab until concrete is demonstrated to have
15 cured to 2,000 psi compressive strength, or 7-days have elapsed.

16 **3.4 INSTALLATION**

17 A. Manhole

- 18 1. Construct manhole to dimensions specified in the Drawings.
19 2. Precast Sections
20 a. Provide bell-and-spigot design incorporating a premolded joint sealing
21 compound for wastewater use.
22 1) Install Infi-Shield External Gator Wrap on the exterior of all precast joints.
23 b. Clean bell spigot and gaskets, lubricate, and join.
24 c. Minimize number of segments.
25 d. Joint length to increase with manhole depth.

26 B. Invert

- 27 1. Construct invert channels to provide a smooth waterway with no disruption of flow
28 at pipe-manhole connections.
29 2. For direction changes of mains, construct channels tangent to mains with maximum
30 possible radius of curvature.
31 a. Provide curves for side inlets.
32 3. Provide invert depth to spring line of pipe, and taper manhole bench to top of
33 largest pipe at manhole wall in accordance with the Drawings.

34 C. Drop Manhole Connection

- 35 1. Install drop connection when sewer lines enter manholes with 24-inches or more
36 above the manhole invert.
37 2. Embed drop piping with cement stabilized sand (CSS) or controlled low strength
38 material (CLSM) in accordance with Sections 33 05 05 or 03 34 13, respectively.
39

1 D. Final Rim Elevation

2 1. Grade Rings

- 3 a. New structures should be constructed so the total height of grade rings is as
4 close to 6-inches as practical to allow for future adjustments to no more than
5 12-inches of grade rings.
6 b. Install grade rings on a load bearing shoulder of manhole.
7 c. Install joint sealant for grade rings in accordance with Section 33 05 81.
8 1) Remove all debris, stones, and dirt between all grade rings to ensure a
9 watertight seal.
10 d. Install Infi-Shield External Gator Wrap on the exterior of all grade rings in
11 accordance with Section 33 05 81.

12 2. Frame and Cover

- 13 a. Install joint sealant between frame and manhole or grade rings in accordance
14 with Section 33 05 81.
15 1) Remove all debris, stones, and dirt between frame and manhole or grade
16 rings to ensure a watertight seal.

17 E. Internal Coating

- 18 **1. Install manhole liner for all precast concrete manholes in accordance with**
19 **Section 33 01 40.**

20 F. External coating

- 21 1. Remove dirt, dust, oil, and other contaminants that could interfere with adhesion of
22 the coating.
23 2. Install coating in accordance with manufacturer's recommendations.

24 G. Modifications and pipe penetrations in accordance with Section 03 80 00.

25 **3.5 REPAIR [NOT USED]**

26 **3.6 RE-INSTALLATION [NOT USED]**

27 **3.7 SITE QUALITY CONTROL**

28 A. Site Tests and Inspections

- 29 1. Perform manhole vacuum testing in accordance with Section 33 01 31.

30 **3.8 SYSTEM STARTUP [NOT USED]**

31 **3.9 ADJUSTING [NOT USED]**

32 **3.10 CLEANING [NOT USED]**

33 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

34 **3.12 PROTECTION [NOT USED]**

35 **3.13 MAINTENANCE [NOT USED]**

36

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

- 1 a. 350, Code Requirements for Environmental Engineering Concrete Structures
2 and Commentary.
- 3 3. ASTM International (ASTM):
 - 4 a. C857, Standard Practice for Minimum Structural Design Loading for
5 Underground Precast Concrete Utility Structures.
 - 6 b. C858, Standard Specification for Underground Precast Concrete Utility
7 Structures.
 - 8 c. C891, Standard Practice for Installation of Underground Precast Concrete
9 Utility Structures.
 - 10 d. C923, Standard Specification for Resilient Connectors Between Reinforced
11 Concrete Manholes Structures, Pipes, and Laterals.
- 12 4. Occupational Safety and Health Administration (OSHA)
 - 13 a. 29 CFR 1910.23, Guarding Floor and Wall Openings and Holes

14 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

15 **1.5 SUBMITTALS**

- 16 A. Submittals shall be in accordance with Section 01 33 00.
- 17 B. All submittals shall be approved by the City prior to delivery.

18 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 19 A. Product Data
 - 20 1. Precast Concrete Vault (if applicable)
 - 21 2. Connection materials
 - 22 3. Pipe connections at vault walls
 - 23 4. Stubs and stub plugs
 - 24 5. Ladder
 - 25 6. External coating material
 - 26 7. Wall penetration materials

27 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

28 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

29 **1.9 QUALITY ASSURANCE**

- 30 A. Qualifications
 - 31 1. In accordance with the requirements of ACI 350

32 **1.10 DELIVERY, STORAGE, AND HANDLING**

- 33 A. Delivery and Acceptance Requirements
 - 34 1. Precast Vaults:
 - 35 a. Deliver vault or panels (units) to project site in such quantity to assure
36 continuity of installation.
- 37 B. Storage and Handling Requirements

1. Secure and maintain a location to store the material in accordance with Section 01 66 00.
2. Store units at the project site in a manner which prevents cracking, distortion, staining, or other physical damage.
3. Lift units by designing lifting points or supports.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Performance / Design Criteria

1. Vault
 - a. Dimensions in accordance with the Drawings.
 - b. Opening in accordance with the Drawings.
 - c. Incorporate a sump into the base or floor of the vault.
 - 1) Avoid conflicts with piping
 - 2) Do not locate directly under the access location, if applicable
 - d. Place floor on a minimum 2 percent slope toward the sump.
 - e. Design precast vaults in accordance with ASTM C857 and C858.
2. Water Pipe Penetrations
 - a. Use adjustable-linked rubber seal devices or epoxy grout to provide seals around pipe penetrations.
3. Vault Access
 - a. Cover/Door
 - 1) Meter Vaults:
 - a) H20 load rated 48-inch x 72-inch aluminum double leaf door, Bilco Type JAL-H20 model
 - 2) Other Vaults:
 - a) H20 load rated 48-inch x 72-inch aluminum double leaf door, Bilco Type JAL-H20 model or standard 30-inch clear opening frame and cover in accordance with Section 33 05 81 as specified in the Drawings
 - 3) Where hatches are used, provide the following:
 - a) An automatic hold-open arm with release handle and locking device
 - b) Bilco type fall protection grating under aluminum door that meets OSHA 29 CFR 1910.23 requirements or approved equal
 - c) Drain gutter with an outlet to the exterior of the vault lid
 - b. Ladder
 - 1) Provide aluminum ladder in accordance with the Drawings.
 - 2) Provide ladder to dimensions specified in the Drawings.

B. Materials

1. Concrete and reinforcing steel in accordance with Sections 03 00 00 and 03 30 00.
2. Frame, cover, and grade rings in accordance with Section 33 05 81.

- 1 3. Sanitary sewer pipe connections in accordance with Sections 33 05 61, 33 05 62,
2 and 33 05 76.
- 3 4. Adjustable-linked rubber seal devices
- 4 a. Manufactured by Link-Seal or approved equal.
- 5 5. Interior coating or liner in accordance with Section 33 01 40 if specified in the
6 Drawings.
- 7 6. Exterior Coating
- 8 a. Coal tar bitumastic for below grade damp proofing
- 9 b. Dry film thickness (DFT) no less than 12 mils and no greater than 30 mils
- 10 c. Solids content is 68 percent by volume +/- 2 percent

11 **2.3 ACCESSORIES [NOT USED]**

12 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

13 **PART 3 - EXECUTION**

14 **3.1 INSTALLERS [NOT USED]**

15 **3.2 EXAMINATION**

16 A. Evaluation and Assessment

- 17 1. Verify lines and grades are in accordance with the Drawings.

18 **3.3 PREPARATION [NOT USED]**

19 **3.4 INSTALLATION**

20 A. Vault

- 21 1. Perform installation in accordance with ASTM C891.
- 22 2. Construct vault to dimensions specified in the Drawings.
- 23 3. Precast Sections
- 24 a. Clean bell and spigot gaskets
- 25 1) Lubricate and join
- 26 b. Minimize number of segments
- 27 4. Vault Base
- 28 a. Place vault base on 6-inch minimum compacted crushed rock (in accordance
29 with Section 33 05 05) over undisturbed soils and grade level to elevation
30 specified in the Drawings.

31 B. Water Pipe Penetrations

- 32 1. Install adjustable-linked rubber seal devices around pipe penetrations in accordance
33 with manufacturer's recommendations, and in accordance with ASTM C923.

34 C. Modifications and pipe penetrations into vaults in accordance with Section 03 80 00.

35 **3.5 REPAIR [NOT USED]**

36 **3.6 RE-INSTALLATION [NOT USED]**

37 **3.7 FIELD QUALITY CONTROL [NOT USED]**

- 1 **3.8 SYSTEM STARTUP [NOT USED]**
- 2 **3.9 ADJUSTING [NOT USED]**
- 3 **3.10 CLEANING [NOT USED]**
- 4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 5 **3.12 PROTECTION [NOT USED]**
- 6 **3.13 MAINTENANCE [NOT USED]**
- 7 **3.14 ATTACHMENTS [NOT USED]**

8 **END OF SECTION**

9

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
[2019 JAN 01]		

10

- 1 4) Concrete foundation
- 2 5) Drop pipe, if required
- 3 6) Vent piping, if required
- 4 7) Pipe stubs
- 5 8) Frame
- 6 9) Cover
- 7 10) Grade rings
- 8 11) Pipe connections
- 9 12) Pavement removal
- 10 13) Hauling
- 11 14) Disposal of excess material
- 12 15) Furnishing, placement, and compaction of backfill
- 13 16) Clean-up
- 14 2. Extra Depth Manhole
- 15 a. Measurement
- 16 1) Measured per each vertical foot of manhole depth beyond 6 feet from rim
- 17 to flow line, measured to the nearest foot.
- 18 b. Payment
- 19 1) The work performed and materials furnished in accordance with this item
- 20 and measured as provided under "Measurement" will be paid for at the unit
- 21 price bid per each "Extra Depth Manhole" installed for:
- 22 a) Various sizes.
- 23 c. The price bid shall include:
- 24 1) Furnishing and installing extra depth manhole structure as specified by the
- 25 Drawings
- 26 2) Excavation
- 27 3) Forms
- 28 4) Concrete foundation
- 29 5) Drop pipe, if required
- 30 6) Pipe stubs
- 31 7) Frame
- 32 8) Cover
- 33 9) Grade rings
- 34 10) Pipe connections
- 35 11) Pavement removal
- 36 12) Hauling
- 37 13) Disposal of excess material
- 38 14) Furnishing, placement, and compaction of backfill
- 39 15) Clean-up

40 1.3 REFERENCES

41 A. Definitions

- 42 1. Manhole Type
- 43 a. Standard Manhole
- 44 1) Up to 6 feet deep (from rim to flowline).
- 45 b. Standard Drop Manhole
- 46 1) Standard Manhole with external drop connection(s).
- 47 c. Extra Depth Manhole

1
2

- 1) Additional manhole depth in excess of 6 feet (from rim to flowline).

1 B. Reference Standards

- 2 1. Reference standards cited in this Section refer to the current reference standard
3 published at the time of the latest revision date logged at the end of this Section
4 unless a date is specifically cited.
- 5 2. American Society for Testing and Measurement (ASTM):
6 a. C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain
7 and Sewer Pipe.
8 b. D3753, Standard Specification for Glass-Fiber-Reinforced Polyester
9 Manholes and Wetwells.

10 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

11 **1.5 SUBMITTALS**

12 A. Submittals shall be in accordance with Section 01 33 00.

13 B. All submittals shall be approved by the City prior to delivery.

14 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

15 A. Product Data

- 16 1. Fiberglass material data
17 2. Installation instructions for Fiberglass Manholes
18 3. Drop connection materials
19 4. Pipe connections at manhole walls
20 5. Materials for stubs and stub plugs, if applicable
21 6. Grade ring materials
22 7. External coating materials
23 8. Plugs for hydrostatic testing

24 B. Shop Drawings

- 25 1. Design and fabrication details of Fiberglass Manholes

26 C. Certifications

- 27 1. Manufacturer's certification verifying fiberglass manholes meet or exceed the
28 requirements of ASTM D3753.

29 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

30 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

31 **1.9 QUALITY ASSURANCE**

32 A. Certifications

- 33 1. Upon completion of fabrication provide independent certification consisting of the
34 manufacturer's testing report including test results verifying the manhole has been
35 sampled, tested, and inspected in accordance with and meets all the requirements of
36 ASTM D3753.
37

1 **1.10 DELIVERY, STORAGE, AND HANDLING**

2 A. Storage and Handling Requirements

- 3 1. Secure and maintain a location to store the material in accordance with Section 01
4 66 00.

5 **1.11 SITE CONDITIONS [NOT USED]**

6 **1.12 WARRANTY [NOT USED]**

7 **PART 2 - PRODUCTS**

8 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

9 **2.2 MATERIALS**

10 A. Manufacturers

- 11 1. Manufacturer List
12 a. L.F. Manufacturing, Inc.
13 b. Containment Solutions, Inc.
14 2. Substitution requests for manufacturers or models not indicated above shall be
15 processed in accordance with Section 01 25 00.

16 B. Materials

- 17 1. Resin
18 a. Commercial grade unsaturated polyester resin or other suitable vinyl ester resin.
19 2. Reinforcing Materials
20 a. Commercial grade "E" type glass in the form of mat, continuous roving, chop
21 roving, roving fabric, or a combination of the above, with a coupling agent that
22 will provide a suitable bond between the glass reinforcement and the resin.
23 3. Interior Surfacing Material
24 a. Resin-rich layer of 0.010 to 0.020 inch thick.
25 4. Exterior Surface
26 a. Provide a UV inhibitor in the resin to a minimum of 0.125 inches.
27 1) Gel coat, paint, or other coatings are not permitted.
28 5. Fillers and Additives
29 a. Inert to the environment and manhole construction.
30 b. Thixotropic agents, catalysts, promoters, etc. may be added as required by the
31 specific manufacturing process to be used to meet the requirements of this
32 Section. The resulting reinforced-plastic material be in accordance with the
33 requirements of this Section.
34 1) Sand is not permitted as a filler.
35 6. Stub Outs
36 a. Factory install and glass in pipe stubs for all connections.
37 1) Field cuts of fiberglass manhole are not permitted.
38 2) Boot type connectors are not permitted.
39 b. Pipe stubs to be installed shall be in accordance with Sections 33 14 10, 33 14
40 11, 33 14 14, 33 31 10, or 33 31 14.

- 1 1) Use same material as sanitary sewer main.
2 7. Invert and manhole bench should be factory installed.
3 a. Provide invert depth to spring line of pipe, and taper manhole bench to top of
4 largest pipe at manhole wall.

5 C. Performance / Design Criteria

- 6 1. Provide Prefabricated Fiberglass Manholes in accordance with the shape, size,
7 dimensions, and details specified in the Drawings.
8 2. Unless modified in the Drawings, use manhole sections in accordance with ASTM
9 D3753.
10 3. Provide the following markings in 1-inch minimum tall stenciled letters on the
11 inside and outside of the barrel:
12 a. Manufacturer's name or trademark
13 b. Manufacturer's factory location
14 c. Manufacturer's serial number
15 d. Total height and nominal diameter
16 e. Complies with ASTM D3753
17 4. Provide wall section thickness for depth of manhole according to ASTM D3753,
18 but not less than 0.48 inches in thickness.
19 5. Provide fabricated reducer bonded at factory to form a continuous unit at top of
20 manhole barrel to accept grade rings, frame, and cover.
21 6. Provide factory installed fiberglass bottom with 3-inch minimum anti-flotation
22 flange.
23 7. Load Rating
24 a. Complete manhole shall be designed to meet the following requirements:
25 1) HS-20 load rated, allowing a minimum dynamic load rating of 16,000
26 pounds when tested in accordance with ASTM D3753.
27 a) To establish this rating, the manhole may not leak, crack, or suffer
28 other damage when load tested to 40,000 pounds and shall not deflect
29 vertically downward more than 0.25-inches at the point of load
30 application when loaded to 24,000 pounds.
31 8. Stiffness
32 a. The manhole cylinder shall have the minimum pipe stiffness value as indicated
33 below when tested in accordance with ASTM D3753:
34

Height (feet)	F/Y (psi)
0 to 10	1.26
10 to 20	2.01
21 to 25	3.02
26 to 30	5.24

35
36 D. Manhole Sizing

- 37 1. 4-foot diameter
38 a. Used with pipe ranging from 8-inch to 12-inch for depths 12-feet or less.
39 2. 5-foot diameter
40 a. Used with pipe ranging from 8-inch to 12-inch for depths greater than 12-feet.

- 1
 - 2
- b. Used with pipe ranging from 15-inch to 27-inch.

- 1 3. 6-foot diameter
- 2 a. Used with pipe ranging from 30-inch to 36-inch.
- 3 E. Fiberglass Manhole Locations
- 4 1. Only permitted in non-paved areas which will not be paved in the future, unless
- 5 approved by City.
- 6 F. Drop Piping
- 7 1. Drop piping in accordance with Sections 33 14 10, 33 14 11, or 33 31 14.
- 8 a. Use same material as sanitary sewer main.
- 9 G. Concrete Manhole Base
- 10 1. Class 'S' concrete in accordance with Section 03 00 00.
- 11 H. Reinforcing Steel
- 12 1. In accordance with Section 03 00 00
- 13 I. Frame, Cover, and Grade Rings
- 14 1. In accordance with Section 33 05 81

15 **2.3 ACCESSORIES [NOT USED]**

16 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

17 **PART 3 - EXECUTION**

18 **3.1 INSTALLERS [NOT USED]**

19 **3.2 EXAMINATION**

20 A. Evaluation and Assessment

- 21 1. Verify lines and grades are in accordance with the Drawings.

22 **3.3 PREPARATION**

23 A. Foundation Preparation

- 24 1. Excavate 20-inches below proposed manhole foundation.
- 25 2. Replace bottom 12-inches of excavated soil with crushed rock in accordance with
- 26 Section 33 05 05.
- 27 a. If soil conditions or ground water prevent use of crushed rock base, a 4-inch
- 28 mud slab may be substituted if permitted by City.
- 29 1) Do not place forms on mud slab until concrete is demonstrated to have
- 30 cured to 2,000 psi compressive strength, or 7-days have elapsed.
- 31 3. Replace top 8-inches of excavated soil with Class 'A' concrete a minimum of 12-
- 32 inches outside proposed manhole barrel, and install in accordance with Section 03
- 33 30 00.
- 34 4. Embed No. 4 steel reinforcement hooks at 12-inch centers in concrete foundation
- 35 circumferentially to prevent manhole flotation.
- 36 5. Do not place fiberglass manhole on foundation until concrete is demonstrated to
- 37 have cured to 3,000 psi compressive strength, or 14-days have elapsed.
- 38

1 **3.4 INSTALLATION**

2 A. Manhole

- 3 1. Construct manhole to dimensions specified in the Drawings.
4 2. Lower manhole barrel onto base section.
5 3. Ensure circumferential hooks are oriented to anchor flanges.
6 4. Pour additional 4-inches of Class ‘A’ concrete on hooks in accordance with the
7 Drawings and Section 03 30 00.
8 5. Backfill entire excavation to 12-inches below final grade with cement stabilized
9 sand (CSS) or controlled low strength material (CLSM) in accordance with Section
10 33 05 05 or 03 34 13.
11 a. Native backfill or select backfill will not be permitted.

12 B. Drop Manhole Connection

- 13 1. Install drop connection when sewer lines enter manholes with 24-inches or more
14 above the manhole invert.
15 2. Embed drop piping with cement stabilized sand (CSS) or controlled low strength
16 material (CLSM) in accordance with Sections 33 05 05 or 03 34 13.

17 C. Final Rim Elevation

18 1. Grade Rings

- 19 a. New structures should be constructed so the total height of grade rings is no
20 more than 6-inches.
21 b. Install grade rings on a load bearing shoulder of manhole.
22 c. Install joint sealant for grade rings in accordance with Section 33 05 81.
23 1) Remove all debris, stones, and dirt between all grade rings to ensure a
24 watertight seal.
25 d. Install Infi-Shield External Gator Wrap on the exterior of all grade rings in
26 accordance with Section 33 05 81.

27 2. Frame and Cover

- 28 a. Install joint sealant between frame and manhole or grade rings in accordance
29 with Section 33 05 81.
30 1) Remove all debris, stones, and dirt between frame and manhole or grade
31 rings to ensure a watertight seal.

32 **3.5 REPAIR [NOT USED]**

33 **3.6 RE-INSTALLATION [NOT USED]**

34 **3.7 SITE QUALITY CONTROL**

35 A. Site Tests and Inspections

- 36 1. Perform manhole vacuum testing in accordance with Section 33 01 31.

37 **3.8 SYSTEM STARTUP [NOT USED]**

38 **3.9 ADJUSTING [NOT USED]**

39 **3.10 CLEANING [NOT USED]**

40 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

- 1 **3.12 PROTECTION [NOT USED]**
- 2 **3.13 MAINTENANCE [NOT USED]**
- 3 **3.14 ATTACHMENTS [NOT USED]**

4 **END OF SECTION**

5

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

6

- 1 4) Reinforcing Steel
- 2 5) Concrete
- 3 6) Backfill
- 4 7) Pavement Removal
- 5 8) Hauling
- 6 9) Disposal of excess material
- 7 10) Furnishing, placement, and compaction of backfill
- 8 11) Clean-up
- 9 12) Additional pavement around perimeter of concrete collar as required for
- 10 rim adjustment on existing manhole

11 **1.3 REFERENCES**

12 A. Reference Standards

- 13 1. Reference standards cited in this Section refer to the current reference standard
- 14 published at the time of the latest revision date logged at the end of this Section
- 15 unless a date is specifically cited.
- 16 2. ASTM International (ASTM)
- 17 a. A48, Standard Specification for Gray Iron Castings.
- 18 b. A536, Standard Specification for Ductile Iron Castings.
- 19 3. American Association of State Highways and Transportation Officials (AASHTO)
- 20 a. AASHTO M306 – Standard Specification for Drainage, Sewer, Utility and
- 21 Related Castings

22 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

23 **1.5 SUBMITTALS**

- 24 A. Submittals shall be in accordance with Section 01 33 00.
- 25 B. All submittals shall be approved by the City prior to delivery.

26 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

27 A. Product Data

- 28 1. All castings shall be cast with:
- 29 a. Approved foundry's name
- 30 b. Part number
- 31 c. Country of origin
- 32 2. Manufacturers:
- 33 a. Specifications
- 34 b. Load tables
- 35 c. Dimension diagrams
- 36 d. Anchor details
- 37 e. Installation instructions

38 B. Certificates

- 39 1. Manufacturer shall certify castings are manufactured in accordance with applicable
- 40 ASTM and AASHTO designations, including but not limited to, ASTM A48, A536,
- 41 and AASHTO M306.

42 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

1 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

2 **1.9 QUALITY ASSURANCE [NOT USED]**

3 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

4 **1.11 FIELD CONDITIONS [NOT USED]**

5 **1.12 WARRANTY [NOT USED]**

6 **PART 2 - PRODUCTS**

7 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

8 **2.2 MATERIALS**

9 A. Manufacturers

10 1. Water and Sanitary Sewer

11 a. Standard Cast Iron Frame and Cover

12 1) EJ – V1420 4-1/2” Frame with 6 Flange Holes

13 2) EJ – V1480A 32” Solid Cover Sanitary Sewer Min. 200 Lbs.

14 b. Water-Tight Cast Iron Frame and Ductile Iron Cover

15 1) EJ – V1420 4-1/2” Frame with 6 Flange Holes

16 2) EJ – V1480 CAM LOCK Cover

17 c. Composite Molded Frame and Cover

18 1) Composite Access Products – CAP ONE-30

19 2. Storm Drain

20 a. Manholes and Junction Structures

21 1) Bass & Hays – VRM-30 BASS Cover

22 2) Bass & Hays – VRM-30 Ring

23 b. Inlets

24 1) Bass & Hays – VRM-30 BASS Cover

25 2) Bass & Hays – VRM-30 Ring

26 3. Substitution requests for manufacturers or models not indicated above shall be
27 processed in accordance with Section 01 25 00.

28 B. Castings – Allowed in all Areas

29 1. Cast iron castings in accordance with ASTM A48, Class 35B or better.

30 2. Ductile iron castings in accordance with ASTM A536, Grade 70-50-05 or better.

31 a. Ductile iron will only be allowed for water-tight manhole covers, all other
32 castings shall be cast-iron.

33 3. Capable of withstanding application of AASHTO HS-20 vehicle loading with
34 permanent deformation

35 4. Covers

36 a. Size to set flush with frame with no larger than a 1/8-inch gap between frame
37 and cover

38 b. Provide 2-inch wide pick slots in lieu of pick holes

39 c. Provide gasket in frame and cover

40

1 C. Moldings – Allowed in Non-Traffic Areas Only

- 2 1. Consist of thermosetting resin matrix blended and/or combined with reinforcing
3 fiber rovings, short fiber filaments, or equivalent nonmetallic reinforcing
4 structure(s)
5 2. Thermosetting resin matrix shall be polymer, vinylester or a blend of both.
6 3. Thoroughly deflash and clean all moldings at parting lines, holes, notches, and
7 exposed edges before removing from molding operation.
8 4. Capable of withstanding application of AASHTO HS-25 vehicle loading with
9 permanent deformation.
10 5. Frame wall thickness shall be a minimum of 0.75 inches.
11 6. Add UV stabilizers with concentrations between 0.05% and 5% prior to shaping by
12 injection molding.

13 D. Standard Dimensions

- 14 1. Sanitary Sewer, Water, and Storm Drain
15 a. Provide a clear opening of 30 inches for all frames and cover assemblies unless
16 otherwise specified in the Contract Documents.

17 E. Standard Labels

- 18 1. Water
19 a. Cast lid with the word “WATER” in 1-inch minimum letters across the lid and
20 in accordance with the Drawings.
21 2. Sanitary Sewer
22 a. Cast lid with the words “SANITARY SEWER” in 1-inch minimum letters
23 across the lid and in accordance with the Drawings.
24 3. Storm Drain
25 a. Cast lid with the phrases “DUMP NO WASTE DRAINS TO RIVER”,
26 “STORM SEWER”, and bass picture, in accordance with the Drawings.

27 F. Hinged Covers are not permitted

28 G. Grade Rings

- 29 1. Provide grade rings in sizes from 2 inch up to 6 inch.
30 2. New structures should be constructed such that the total height of grade rings is no
31 more than 6 inches.
32 3. Total grade ring height on existing structures as result of an adjustment shall be
33 limited to the height specified in Section 33 01 35.
34 4. Materials
35 a. Concrete in traffic loading areas
36 b. Concrete or HDPE in non-traffic areas
37 1) HDPE shall have a minimum allowable traffic loading meeting AASHTO
38 HS-25.
39

- 1 H. Joint Sealant
- 2 1. Provide a pre-formed or trowelable bitumastic sealant in an extrudable flat tape
- 3 form.
- 4 2. Provide a sealant that is not dependent on a chemical action for its adhesive
- 5 properties or cohesive strength.
- 6 3. Install Infi-Shield External Gator Wrap on the exterior of all grade rings in
- 7 accordance with the Drawings.

- 8 I. Concrete Collar
- 9 1. Concrete and reinforcing steel in accordance with Section 03 00 00.
- 10 2. Cast concrete collar in accordance with Section 03 30 00.

11 **2.3 ACCESSORIES [NOT USED]**

12 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

13 **PART 3 - EXECUTION**

14 **3.1 INSTALLERS [NOT USED]**

15 **3.2 EXAMINATION [NOT USED]**

16 **3.3 PREPARATION [NOT USED]**

17 **3.4 INSTALLATION**

- 18 A. Grade Rings
- 19 1. Place as indicated in the Drawings.
- 20 2. Do not use steel shims, wood, stones, or other unspecified material to obtain final
- 21 surface elevation of the manhole frame.
- 22 3. Clean surfaces of dirt, sand, mud, or other foreign matter before placing sealant.
- 23 4. Seal each grade ring with sealant specified in this Section and as indicated in the
- 24 Drawings.
- 25 B. Frame and Cover
- 26 1. Water
- 27 a. For water structures install frame, cover, and grade rings in accordance with the
- 28 Drawings.
- 29 2. Sanitary Sewer
- 30 a. For sanitary sewer structures outside the 100-yr flood plain, install standard
- 31 frame, cover, and grade rings in accordance with the Drawings.
- 32 b. For sanitary sewer structures within the 100-yr flood plain, install water-tight
- 33 frame, cover, and grade rings in accordance with the Drawings.
- 34 3. Storm Drain
- 35 a. For storm drain structures install frame, cover, and grade rings in accordance
- 36 with the Drawings.
- 37 C. Joint Sealing
- 38 1. Seal frame, grade rings, and structure with specified sealant.

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SECTION 33 05 97
UTILITY MARKERS/LOCATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Buried and surface utility markers for utility construction
 - 2. Surface utility markers for water and sewer mains as indicated in the Drawings
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. This item is considered subsidiary to pipeline and pipeline appurtenance installation.
 - 2. Payment
 - a. The work performed and materials furnished in accordance with this item are subsidiary to the various pipeline and pipeline appurtenance bid items will be installed.
 - 3. The following items will be considered part of Utility Markers, and subsidiary to the bid items indicated above:
 - a. Furnishing and installing surface markers as specified in the Drawings
 - b. Furnishing and installing tracer wire for all PVC and HDPE water lines and HDPE force mains
 - c. Furnishing and installing detectable warning tape for all buried pipelines
 - d. Continuity testing of tracer wire
 - e. Replacement of non-continuous tracer wire
 - f. Mobilization
 - g. Pavement removal
 - h. Excavation
 - i. Hauling
 - j. Disposal of excess material
 - k. Furnishing, placement, and compaction of backfill
 - l. Clean-up

1.3 REFERENCES

- A. Reference Standards

- 1 2. Reference standards cited in this Section refer to the current reference standard
- 2 published at the time of the latest revision date logged at the end of this Section
- 3 unless a date is specifically cited.
- 4 3. American Public Works Association (APWA):
- 5 a. Uniform Color Code.
- 6 3. ASTM International (ASTM):
- 7 a. B170, Standard Specification for Oxygen-Free Electrolytic Copper – Refinery
- 8 Shapes.
- 9 b. B227, Standard Specification for Hard-Drawn Copper-Clad Steel Wire.
- 10 c. B910/B910M, Standard Specification for Annealed Copper-Clad Steel Wire.
- 11 d. B1010/B1010M, Standard Specification for Copper-Clad Steel Electrical
- 12 Conductor for Tracer Wire Applications.
- 13 e. D1248, Standard Specification for Polyethylene Plastics Extrusion Materials
- 14 for Wire and Cable.

15 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

16 **1.5 SUBMITTALS**

- 17 A. Submittals shall be in accordance with Section 01 33 00.
- 18 B. All submittals shall be approved by the City prior to delivery.

19 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 20 A. Product Data
- 21 1. Buried Markers
- 22 2. Surface Markers

23 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

24 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

25 **1.9 QUALITY ASSURANCE [NOT USED]**

26 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

27 **1.11 FIELD CONDITIONS [NOT USED]**

28 **1.12 WARRANTY [NOT USED]**

29 **PART 2 - PRODUCTS**

30 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

31 **2.2 MATERIALS**

- 32 A. Manufacturers
- 33 1. Provide new Utility Markers/Locators from a manufacturer regularly engaged in the
- 34 manufacturing of Utility Markers/Locators.
- 35 B. Materials

- 1 1. Buried Markers
- 2 a. Detectable Warning Tape
- 3 1) 5.0 mil overall thickness
- 4 2) Width – 3 inch minimum
- 5 3) Weight – 27.5 pounds per inch per 1,000 square feet
- 6 4) Triple Layer with:
- 7 a) Minimum thickness 0.35 mils solid aluminum foil encased in a
- 8 protective inert plastic jacket
- 9 (1) 100 percent virgin low density polyethylene
- 10 (2) Impervious to all known alkalis, acids, chemical reagents, and
- 11 solvents within soil
- 12 (3) Aluminum foil visible to both sides
- 13 5) Locatable by conductive and inductive methods
- 14 6) Printing encased to avoid ink rub-off
- 15 7) Color and Legends
- 16 a) Potable water lines
- 17 (1) Color – Blue (in accordance with APWA Uniform Color Code)
- 18 (2) Legend – Caution Potable Water Line Below (repeated every 24
- 19 inches)
- 20 b) Reclaimed water lines
- 21 (1) Color – Purple (in accordance with APWA Uniform Color Code)
- 22 (2) Legend – Caution Reclaimed Water Line Below (repeated every 24
- 23 inches)
- 24 c) Sewer Line
- 25 (1) Color – Green (in accordance with APWA Uniform Color Code)
- 26 (2) Legend – Caution Sewer Line Below (repeated every 24 inches)
- 27 b. Tracer Wire and Appurtenances
- 28 1) Tracer Wire
- 29 a) Color
- 30 (1) Blue for domestic water (potable) lines.
- 31 (2) Green for sanitary sewer gravity lines and force mains.
- 32 (3) Purple for raw and recycled water (non-potable) lines.
- 33 b) Open Cut Installation
- 34 (1) Copper-clad steel 12-AWG high strength, high carbon tracer wire
- 35 in accordance with ASTM B170, B227, B910/910M, and
- 36 B1010/1010M.
- 37 (2) Minimum 450 lb tensile break load
- 38 (3) Minimum 30 mils minimum high molecular-high density
- 39 polyethylene jacket in accordance with ASTM D1248.
- 40 c) Directional Bore or Carrier Pipe Installation
- 41 (1) Two (2) Copper-clad steel 12-AWG high strength, high carbon
- 42 tracer wires in accordance with ASTM B170, B227, B910/910M,
- 43 and B1010/1010M.
- 44 (2) Minimum 1,150 lb tensile break load
- 45 (3) Minimum 45 mils high molecular-high density polyethylene jacket
- 46 in accordance with ASTM D1248.
- 47 d) Pipe Bursting Installation

- 1 (1) 7 x 7 stranded copper-clad steel 12-AWG high strength, high
- 2 carbon tracer wire in accordance with ASTM B170, B227,
- 3 B910/910M, and B1010/1010M.
- 4 (2) Minimum 4,700 lb tensile break load
- 5 (3) Minimum 50 mils high molecular-high density polyethylene jacket
- 6 in accordance with ASTM D1248.
- 7 2) Connectors
- 8 a) Splice along continuous runs of tracer wire for repair of a wire break,
- 9 or replacement of a failed segment of wire with 3M Brand DBR Direct
- 10 Bury Splice Kit or approved equal.
- 11 (1) Provide secure connection for two or more wires.
- 12 (2) Provide moisture sealing by means of a dielectric non-hardening
- 13 silicone sealant.
- 14 (3) Splice Kit shall be intended for use in direct bury applications.
- 15 (4) Rated for a minimum of 50V.
- 16 b) Branch connections for laterals, turnouts, services, and appurtenances
- 17 shall utilize DryConn Direct Bury Lug Aqua, or approved equal.
- 18 (1) Provide secure connection one or two wires to the main tracer wire
- 19 without cutting the main tracer wire.
- 20 (2) Provide moisture sealing by means of a dielectric non-hardening
- 21 silicone sealant.
- 22 (3) Branch connector shall be intended for use in direct bury
- 23 applications.
- 24 (4) Rated for a minimum of 50V.
- 25 3) Grounding
- 26 a) Grounding is required for all dead-ends/stub-outs
- 27 b) Drive-in magnesium grounding anode rod with a minimum of 20-feet
- 28 of 12-AWG red HDPE insulated copper-clad steel wire connected to
- 29 the rod and specifically manufactured for this purpose.
- 30 2. Surface Markers
- 31 a. Provide as follows:
- 32 1) 4-inch wide, 6-foot minimum length, fiberglass composite, double-sided
- 33 marker, or approved equal
- 34 2) Posts with colored, ultraviolet resistant decals as follows:
- 35 a) Water Lines
- 36 (1) Color – Blue (in accordance with APWA Uniform Color Code)
- 37 (2) Legend – Caution Potable Water Line Below
- 38 b) Reclaimed water lines
- 39 (1) Color – Purple (in accordance with APWA Uniform Color Code)
- 40 (2) Legend – Caution Reclaimed Water Line Below
- 41 c) Sewer lines
- 42 (1) Color – Green (in accordance with APWA Uniform Color Code)
- 43 (2) Legend – Caution Sewer Line Below

1 **2.3 ACCESSORIES [NOT USED]**

2 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

3 **PART 3 - EXECUTION**

4 **3.1 INSTALLERS [NOT USED]**

5 **3.2 EXAMINATION [NOT USED]**

6 **3.3 PREPARATION [NOT USED]**

7 **3.4 INSTALLATION**

8 A. Buried Markers

- 9 1. Detectable Warning Tape – For all underground water and sanitary sewer lines
10 a. Install in accordance with manufacturer’s recommendations below natural
11 ground surface and directly above the utility for which it is marking.
12 1) Allow 18 inches minimum between utility and marker.
13 2) Bury to a depth of 3 feet or as close to the grade as is practical for optimum
14 protection and detectability.
- 15 2. Tracer Wire and Appurtenances
16 a. Install tracer wire such that it can be easily accessed for connection of line
17 tracing equipment, wire can be located without loss or deterioration of low
18 frequency signal, and without distortion of signal caused by more than one wire
19 being installed in close proximity to another.
20 b. Install tracer wire in the same trench or inside casing with pipe during pipe
21 installation.
22 1) Secure wire to the pipe at a maximum of 5-foot intervals and in accordance
23 with manufacturer recommendations, and the City Standard Details.
24 a) Do not place the tracer wire between service saddles and the main.
25 2) Securely bond all wire joints with an approved watertight connector to
26 provide electrical continuity.
27 3) Install wire at all tracer wire access points in accordance with City Standard
28 Details, providing no less than 24-inches of coiled wire.
29 c. Provide continuous tracer wire without splices from each tracer wire access
30 point, except where approved by City for spliced-in repair or replacement
31 connections.
32 d. Install tracer wire as a continuous single wire. No looping or coiling of wire is
33 permitted.
34 e. Protect wire insulation from damage during installation of embedment and
35 backfill.
36 f. Replace all wire that has broken, cut, or damaged insulation
37 g. Treat all connections between existing metallic pipe and plastic pipe as a
38 mainline dead-end, and ground using an approved waterproof connection to a
39 grounding anode, buried at the same depth as the tracer wire.
40 h. Connect new tracer wire to an existing utility that is being extended or tied into,
41 using approved splice connectors.

- i. At all main end caps, extend a minimum of 6 feet of tracer wire beyond the end of the pipe, coil, and secured to the pipe for future connections. Splice the end of the tracer wire to a grounding rod in accordance with manufacturer's recommendations and City Standard Details and bury grounding rod at the same elevation as the main.
- j. Place tracer wire access valve boxes spaced in accordance with City Standard Details.

B. Surface Markers

1. Bury a minimum of 2 feet deep, with a minimum of 4 feet above ground
2. The warning sign for all surface markers shall be 21 inches (not including decaled portion).
3. Place surface markers near fixed objects, if possible
4. Place Surface Markers at the following locations:
 - a. Unimproved areas only
 - b. Buried Features
 - 1) Place directly above a buried feature.
 - c. Above-Ground Features
 - 1) Place a maximum of 2 feet away from an above-ground feature.
 - d. Water lines 12-inches and larger:
 - 1) Each right-of-way line (or end of casing pipe) for:
 - a) Highway crossings
 - b) Railroad crossings
 - 2) Utility crossings such as:
 - a) High pressure or large diameter gas lines
 - b) Fiber optic lines
 - c) Underground electric transmission lines
 - d) Or other locations specified in the Drawings or directed by the City
 - e. For sanitary sewer lines:
 - 1) In undeveloped areas, place marker maximum of 2 feet away from an above-ground feature such as a manhole or combination air valve vault.
 - f. Place at 500-foot intervals along the pipeline.
 - g. As specified in Drawings.

3.5 REPAIR [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL

A. Testing

1. After all trench backfill is completed and prior to final surface repair, perform continuity and trace tests on all tracer wire in the presence of the City.
2. If the tracer wire is found to be non-continuous after testing, repair or replace the failed segment of weire.

- 1 **3.8 SYSTEM STARTUP [NOT USED]**
- 2 **3.9 ADJUSTING [NOT USED]**
- 3 **3.10 CLEANING [NOT USED]**
- 4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 5 **3.12 PROTECTION [NOT USED]**
- 6 **3.13 MAINTENANCE [NOT USED]**
- 7 **3.14 ATTACHMENTS [NOT USED]**

8 **END OF SECTION**

9

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

10

1 **SECTION 33 05 98**
2 **LOCATION OF EXISTING UTILITIES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
 - 6 1. Locating and verifying the location and elevation of existing underground utilities
 - 7 at proposed connection points or that may conflict with proposed facilities, by use
 - 8 of:
 - 9 a. Exploratory Excavation
 - 10 b. Vacuum Excavation
- 11 B. Deviations from this City of Denton Standard Specification:
 - 12 1. None.
- 13 C. Related Specification Sections include but are not limited to:
 - 14 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
 - 15 Contract.
 - 16 2. Division 1 - General Requirements.
 - 17 3. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.

18 **1.2 PRICE AND PAYMENT PROCEDURES**

- 19 A. Measurement and Payment
 - 20 1. Location of Existing Utilities
 - 21 a. Measurement
 - 22 1) Measurement for this item shall be by lump sum.
 - 23 b. Payment
 - 24 1) The work performed and materials furnished in accordance with this item
 - 25 shall be paid for at the lump sum price bid for “Location of Existing
 - 26 Utilities” at proposed connection points and all proposed crossings.
 - 27 c. The price bid shall include:
 - 28 1) Coordination with utility owners
 - 29 2) Grade survey
 - 30 3) Pavement removal
 - 31 4) Excavation
 - 32 5) Vacuum excavation
 - 33 6) Utility location
 - 34 7) Hauling
 - 35 8) Disposal of excess material
 - 36 9) Furnishing, placement, and compaction of embedment
 - 37 10) Furnishing, placement, and compaction of backfill
 - 38 11) Clean-up
 - 39 12) Surface restoration

40 **1.3 REFERENCES**

41

1 A. Definitions

- 2 1. Exploratory Excavation: Commonly referred to as “potholing”, a method used to
3 locate existing 10” and smaller underground utilities through the use of standard
4 excavation equipment.
5 2. Vacuum Excavation: Method used to locate existing underground utilities of all
6 sizes, but which must be used for utilities 12 inches and larger, through the use of
7 geophysical prospecting equipment such as vacuum excavation.

8 B. Reference Standards

- 9 1. Reference standards cited in this Section refer to the current reference standard
10 published at the time of the latest revision date logged at the end of this Section
11 unless a date is specifically cited.
12 2. American Society of Civil Engineers (ASCE)
13 a. ASCE Publication CI/ASCE 38 (Standard Guideline for the Collection and
14 Depiction of Existing Subsurface Utility Data)

15 **1.4 ADMINISTRATIVE REQUIREMENTS**

16 A. Coordination

- 17 1. Stake areas for location at least 1 week prior to commencement of location.
18 2. Coordinate location of all utilities within vicinity of excavation prior to
19 commencing location.
20 3. Coordinate with City at least 48 hours prior to commencing on site for location of
21 utilities.

22 B. Sequencing

- 23 1. Location of utilities shall be performed prior to construction of the entire Work.

24 C. Scheduling

- 25 1. For critical utility locations, City may choose to be present during excavation.
26 2. Alter schedule for location of existing utilities to accommodate City personnel.

27 **1.5 SUBMITTALS [NOT USED]**

28 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

29 **1.7 CLOSEOUT SUBMITTALS**

30 A. Report of Utility Location

- 31 1. Horizontal location of utility as surveyed
32 2. Vertical elevation of utility as surveyed
33 a. Top of utility
34 b. Spring line of utility
35 c. Existing ground
36 3. Material type, diameter, and description of the condition of existing utility

37 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

38 **1.9 QUALITY ASSURANCE [NOT USED]**

39 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

1 **1.11 FIELD CONDITIONS [NOT USED]**

2 **1.12 WARRANTY [NOT USED]**

3 **PART 2 - PRODUCTS [NOT USED]**

4 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

5 **2.2 MATERIALS [NOT USED]**

6 **2.3 ACCESSORIES [NOT USED]**

7 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

8 **PART 3 - EXECUTION**

9 **3.1 INSTALLERS [NOT USED]**

10 **3.2 EXAMINATION**

11 A. Verification of Conditions

- 12 1. Verify location of existing utilities in accordance with Division 1 and the Drawings.

13 **3.3 PREPARATION [NOT USED]**

14 **3.4 INSTALLATION**

15 A. Exploratory Excavation

- 16 **1. Do not perform Exploratory Excavation on 12 inch and larger utilities.**
- 17 2. Verify location of **all** existing 10 inch and smaller utilities which cross or connect
- 18 to proposed facilities for construction.
- 19 a. Acquire record documentation from and coordinate with utility companies as
- 20 necessary to locate utility.
- 21 b. Expose to utility spring line.
- 22 c. Excavate and backfill trench for the Exploratory Excavation in accordance with
- 23 Section 33 05 05.

24 B. Vacuum Excavation

- 25 1. Verify location of **all** existing 12 inch and larger utilities which cross or connect to
- 26 proposed facilities for construction.
- 27 a. Designate the horizontal position of the existing underground utilities using
- 28 geophysical prospecting equipment.
- 29 b. Acquire record documentation from and coordinate with utility companies as
- 30 necessary to locate utility.
- 31 c. Perform excavation in general accordance with the recommended practices and
- 32 procedures described in ASCE Publication CI/ASCE 38.

33 C. Submit a report of the findings upon completion of location of existing utilities.

34 D. Notify City for appropriate design modifications if location of utility is in conflict with

35 the proposed facilities indicated in the Drawings.

- 1 E. Place embedment and backfill in accordance with Section 33 05 05.
- 2 F. Once necessary data is obtained, immediately restore surface to existing conditions to:
 - 3 1. Obtain a safe driving surface, if applicable
 - 4 2. Ensure the safety of the general public
 - 5 3. The satisfaction of the City

- 6 **3.5 REPAIR [NOT USED]**
- 7 **3.6 RE-INSTALLATION [NOT USED]**
- 8 **3.7 FIELD QUALITY CONTROL [NOT USED]**
- 9 **3.8 SYSTEM STARTUP [NOT USED]**
- 10 **3.9 ADJUSTING [NOT USED]**
- 11 **3.10 CLEANING [NOT USED]**
- 12 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 13 **3.12 PROTECTION [NOT USED]**
- 14 **3.13 MAINTENANCE [NOT USED]**
- 15 **3.14 ATTACHMENTS [NOT USED]**

16 **END OF SECTION**

17

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

18

- 1 b. Payment
2 1) The work performed and materials furnished in accordance with this item
3 are subsidiary to the unit price bid for the item being installed and no other
4 compensation will be allowed.

5 **1.3 REFERENCES**

6 A. Reference Standards

- 7 1. Reference standards cited in this Section refer to the current reference standard
8 published at the time of the latest revision date logged at the end of this Section
9 unless a date is specifically cited.
- 10 2. American Iron and Steel Institute (AISI).
- 11 3. American Society of Mechanical Engineers (ASME):
12 a. PCC-1-2012 Guidelines for Pressure Boundary Bolted Flange Joint Assembly.
- 13 4. American Society of Testing and Materials (ASTM):
14 a. A193, Standard Specification for Alloy-Steel and Stainless-Steel Bolting for
15 High Temperature or High Pressure Service and Other Special Purpose
16 Applications.
17 b. A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for
18 High Pressure or High Temperature Service, or Both.
19 c. A242, Standard Specification for High-Strength Low-Alloy Carbon Structural
20 Steel.
21 d. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
- 22 5. American Water Works Association (AWWA):
23 a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and
24 Fittings.
25 b. C115, Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded
26 Flanges.
27 c. C207, Steel Pipe Flanges for Waterworks Service – Sizes 4 In. Through 144 In.
28 (100 mm Through 3,600 mm).
29 d. C217, Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel
30 Water Pipe and Fittings.
31 e. C600, Installation of Ductile-Iron Mains and Their Appurtenances.
32 f. M11, Steel Pipe.
33 g. M41, Ductile-Iron Pipe and Fittings.
- 34 6. Fastener Quality Act (FQA):
35 a. Public Law 106-34 (P.L. 106-34).
- 36 7. NSF International (NSF):
37 a. 61, Drinking Water System Components - Health Effects.
38 a. 372, Drinking Water System Components - Lead Content.
- 39 8. Society for Protective Coating (SSPC) Surface Preparation Standards (SP):
40 a. SP1, Solvent Cleaning.
41 b. SP2, Hand Tool Cleaning.
42 c. SP3, Power Tool Cleaning.
43 d. SP5, White Metal Blast Cleaning.
44 e. SP10, Near White Blast Cleaning.

45 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

1

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to delivery.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Product Data

6 1. Bolts and nuts for mechanical and/or flange joints

7 2. Gaskets

8 B. Certificates

9 1. Furnish an affidavit certifying all fasteners, excluding T-Bolts, shall conform to the
10 Fastener Quality Act (FQA) (P.L. 106-34).

11 2. Furnish an affidavit certifying the Xylan coating is applied by Whitford
12 Corporation or a Whitford Corporation certified applicator.

13 3. Furnish a certificate stating buried bolts and nuts conform to ASTM B117.

14 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

15 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

16 **1.9 QUALITY ASSURANCE**

17 A. Qualifications

18 1. Manufacturers

19 a. Fastener manufacturing operations (bolts, nuts, gaskets, and coatings) shall be
20 performed under the control of the manufacturer.

21 b. All gaskets shall be in accordance with the latest revisions NSF 61, NSF 372,
22 and the requirements of this Section.

23 B. Preconstruction Testing

24 1. The City may, at its own cost, subject random fittings for destructive testing by an
25 independent laboratory for compliance with this Specification.

26 a. The compliance test shall be performed in the United States.

27 b. Any visible defects or failure to meet the quality standards herein will be
28 grounds for rejecting the entire order.

29 **1.10 DELIVERY, STORAGE, AND HANDLING**

30 A. Storage and Handling Requirements

31 1. Secure and maintain a location to store the material in accordance with Section 01
32 66 00.

33 **1.11 FIELD CONDITIONS [NOT USED]**

34 **1.12 WARRANTY [NOT USED]**

35 **PART 2 - PRODUCTS**

36 **2.1 CITY-FURNISHED [NOT USED]**

1 **2.2 EQUIPMENT, PRODUCT TYPES AND MATERIALS**

2 A. Regulatory Requirements

- 3 1. All fasteners, excluding T-Bolts, shall be in accordance with the Fastener Quality
4 Act (FQA) (P.L. 106-34), including the marking requirements.

5 B. T-Bolts and Nuts

- 6 1. Standard Xylan Coated T-bolt and Nuts
7 a. High strength, corrosion-resistant, low-carbon weathering steel in accordance
8 with AWWA/ANSI C111/A21.11 and ASTM A242.
9 b. Xylan Coating in accordance with this Section.

10 C. Flange Bolts and Nuts

- 11 1. Stainless Steel Bolts and Xylan Coated Stainless Steel Nuts
12 a. In accordance with AWWA C207 or C115 depending on pipe material
13 b. Bolts
14 1) ASTM A193, Grade B8M, Class 1 (AISI 316 Stainless Steel, carbide
15 solution treated)
16 c. Nuts and Washers
17 1) ASTM A194, Grade 8M Nuts with AISI 316 Stainless Steel Washers
18 2) Coat nuts and washers with Xylan in accordance with this Section.

19 D. Threaded Rods

- 20 1. In accordance with AWWA C207.
21 2. Rods
22 a. ASTM A193, Grade B8M, Class 1 (AISI 316 Stainless Steel, carbide solution
23 treated)
24 3. Nuts and Washers
25 a. ASTM A194, Grade 8M Nuts with AISI 316 Stainless Steel Washers
26 b. Coat nuts and washers with Xylan in accordance with this Section.

27 E. Push-on Gaskets

- 28 1. In accordance with physical and marking requirements specified in ANSI/AWWA
29 C111/A21.11.
30 2. In accordance with NSF 61 and 372.
31 3. Free from porous areas, foreign material, and other defects that make them unfit for
32 intended use.
33 4. Size and shape required to provide an adequate compressive force against the plain
34 end and socket after assembly to affect a positive seal under all combinations of
35 joint and gasket tolerances.
36 5. Rubber gaskets shall be made of vulcanized styrene butadiene rubber SBR, unless
37 otherwise specified in Drawings.

38 F. Mechanical Joint Gaskets

- 39 1. In accordance with the physical and marking requirements specified in
40 ANSI/AWWA C111/A21.11.
41 2. In accordance with the latest revisions NSF 61 and 372.
42 3. Free from porous areas, foreign material, and other defects that make them unfit for
43 intended use.

- 1 4. Rubber gaskets shall be made of vulcanized styrene butadiene rubber SBR, unless
2 otherwise specified in Drawings.

3 G. Flange Gaskets

- 4 1. Class E Flanges
5 a. Full face
6 b. Manufactured true to shape from minimum 80 durometer SBR rubber stock of a
7 thickness not less than 1/8 inch
8 c. Virgin stock
9 d. In accordance with the physical and test requirements specified in
10 AWWA/ANSI C111/A21.11.
11 e. All gaskets shall be in accordance with the latest revisions NSF 61 and 372.
12 f. Finished gaskets shall have holes punched by the manufacturer and shall match
13 the flange pattern in every respect.
14 g. Frayed cut edges are not acceptable.
15 h. Field cut sheet gaskets are not acceptable.

16 H. Hydrocarbon Resistant Gaskets

- 17 1. Furnish Viton® (Fluorocarbon) Rubber, or approved equal, hydrocarbon resistant
18 gaskets, when required.

19 I. Flange Isolation Kits

- 20 1. In accordance with Section 33 01 12.
21 2. For bolts used with isolation sleeves in accordance with Section 33 01 12, threading
22 must extend to bolt head with no grip to ensure sleeves fit properly.

23 J. Petrolatum Tape System

- 24 1. In accordance with AWWA C217
25 a. Petrolatum Tape Primer: Denso Paste or approved equal
26 b. Molding and Filler mastic: Densyl Mastic or approved equal
27 c. All Purpose Petrolatum Tape: Densyl Tape or approved equal

28 K. Xylan Coating

- 29 a. Coat nuts and bolts with a ceramic-filled, baked on fluorocarbon resin, when
30 required.
31 b. Coated nuts and bolts shall be prepared “near white” (SSPC SP10) or “white”
32 (SSPC SP5) when coated to the coating manufacturer’s recommended thickness
33 by a certified applicator.
34 c. Manufactured by Whitford Corporation and applied by Whitford Corporation
35 or Whitford Corporation certified applicator.
36 d. Free from holidays and defects.
37 e. Thickness shall be between 0.0007-inches and 0.0012-inches and shall be such
38 that the nut turns freely on the bolt.
39 f. Test in accordance with the performance requirements of ASTM B117, “Salt
40 Spray Test”, and provide a certificate of conformance.

41 **2.3 ACCESSORIES [NOT USED]**

42 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION [NOT USED]**

5 **3.4 INSTALLATION**

6 A. Mechanical Joints

- 7 1. Assemble mechanical joints in accordance with ANSI/AWWA C111/A21.11
8 Appendix A, AWWA C600, and AWWA Manual M41.

9 B. Flanged Joints

- 10 1. Install in accordance with ASME PCC-1-2012.
11 2. Wrap all buried steel flanges for AWWA C200, C301, or C303 pipe with a
12 Petrolatum Tape System in accordance with AWWA C217.
13 a. If only 1 flange in a joint is steel (AWWA C200, C301, or C303), petrolatum
14 tape wrapping will be required.
15 b. If a joint is made between two ductile iron flanges, the joint should be
16 polyethylene encased in accordance with Section 33 14 10.
17 3. During assembly, tighten nuts gradually and equally using a three-pass method in
18 accordance with ASME PCC-1-2012.
19 a. First pass
20 1) Tighten the nuts to 50 percent at diametrically opposite sides to prevent
21 misalignment and to ensure that all bolts carry equal loads.
22 b. Second pass
23 1) Tighten the nuts to 100 percent again in a diametrically opposite pattern.
24 2) Allow a minimum of 1 hour to pass to provide time for settlement between
25 bolts and nuts and gasket relaxation.
26 c. Third pass
27 1) Check each bolt in a clockwise pattern. Each nut should be tightened until
28 it will no longer turn. This step compensates for elastic interaction and
29 brings all bolts into parity.
30 4. The threads of the bolts should protrude a minimum of 1/2-inch from the nuts.

31 C. Flanged Joints with Isolation Kit

- 32 1. Flange Isolation Kits installed in accordance with Section 33 01 12.
33 2. Prior to backfilling connection, verify Electrical Isolation in accordance with
34 Section 33 01 12.

35 D. Threaded Rod

- 36 1. Install as part of joint harness assembly in accordance with AWWA Manual M11.
37 2. Space rods evenly around the pipe.
38 3. During assembly, tighten nuts gradually and equally using a two-pass method in
39 accordance with ASME PCC-1-2012.
40 a. First pass

- 1) Tighten the nuts to 50 percent at diametrically opposite sides to prevent misalignment and to ensure that all bolts carry equal loads.
 - b. Second pass
 - 1) Tighten the nuts to 100 percent again in a diametrically opposite pattern.
 4. The threads of the bolts should protrude a minimum of 1/2-inch from the nuts.
 5. Wrap joint harness assembly with Petrolatum Tape System.
- E. Petrolatum Tape System
1. Install in accordance with AWWA C217.
 2. Surfaces should be free from dirt, loose rust, scale, or flaking coatings.
 - a. Clean surfaces in accordance with SSPC SP1, SP2, or SP3.
 - 1) High pressure wash of 3,000 to 7,000 psi is also suitable.
 - b. Surfaces may be damp but shall not have droplets or continuous film of water.
 3. Apply a uniform, thin coat of Petrolatum Tape Primer to the entire surface by stiff brush, gloved hand, or rag at normal ambient temperatures.
 4. Apply Molding and Filler Mastic to a rounded configuration to fill irregular shapes and reduce sharp-edged surfaces by hand application.
 5. Spirally wrap All Purpose Petrolatum Tape with a minimum overlap of 1 inch.
 - a. For severely corrosive environments or pipe soil-to-air areas, an overlap of 50 percent is recommended.
 - b. Press air pockets out and smooth all lap seams.
 6. For additional mechanical protection, overwrap may be applied to increase impact strength and electrical resistance.

3.5 REPAIR [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL

A. Field Inspections

1. All buried flanges and joint harnesses require City inspection prior to installation of embedment and backfill.

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 33 14 10
DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ductile Iron Pipe 3-inch through 64-inch for potable water, wastewater, and reuse applications.
 - 2. Ductile Iron Fittings 3-inch through 64-inch for potable water, wastewater, and reuse applications for use with Ductile Iron Pipe (all sizes) and C900 Polyvinyl Chloride (PVC) Pipe (4-inch through 12-inch).
 - 3. Mechanical wedge type retainer glands.
 - 4. Ductile Iron external joint restraint harness for 4-inch through 12-inch C900 PVC Pipe.
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 03 00 00 – Concrete and Concrete Reinforcing
 - 4. Section 03 30 00 – Cast-in-Place Concrete.
 - 5. Section 33 01 10 – Cleaning and Acceptance Testing of Water and Sewer Force Mains.
 - 6. Section 33 01 12 – Joint Bonding and Electrical Isolation.
 - 7. Section 33 01 30 – Closed Circuit Television (CCTV) Inspection.
 - 1. Section 33 01 31 – Sewer and Manhole Testing.
 - 2. Section 33 01 32 – Cleaning of Sewer Mains.
 - 3. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.
 - 4. Section 33 05 97 – Utility Markers/Locators.
 - 5. Section 33 14 05 – Bolts, Nuts and Gaskets.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Ductile Iron Pipe
 - a. Measurement
 - 1) Measured horizontally along the ground surface from center line to center line of fitting, manhole, or appurtenance of Ductile Iron Pipe installed.
 - b. Payment

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “Ductile Iron Pipe” installed for:
 - a) Various sizes.
 - b) Various types of backfill.
 - c) Various linings.
- c. The price bid shall include:
 - 1) Furnishing and installing Ductile Iron Pipe as specified by the Drawings
 - 2) Polyethylene encasement
 - 3) Lining
 - 4) Coating
 - 5) Utility Markers/Locators
 - 6) Pavement Removal
 - 7) Excavation
 - 8) Hauling
 - 9) Disposal of excess material
 - 10) Furnishing, placement and compaction of embedment
 - 11) Furnishing, placement and compaction of backfill
 - 12) Clay Dams
 - 13) Thrust restraint
 - 14) Ductile Iron Fittings with Restraint
 - 15) Bolts and nuts
 - 16) Gaskets
 - 17) Clean-up
 - 18) Cleaning
 - 19) Disinfection
 - 20) Testing
2. Ductile Iron Fittings with Restraint
 - a. Measurement
 - 1) This item is considered subsidiary to Ductile Iron Pipe or Polyvinyl Chloride (PVC) Pipe installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item are subsidiary to the unit price bid per linear foot of Ductile Iron Pipe or Polyvinyl Chloride (PVC) installed.

1.3 REFERENCES

- A. Abbreviations
 1. DFT – Dry Film Thickness
- B. Definitions
 1. Gland or Follower Gland
 - a. Non-restrained, mechanical joint fitting
 2. Retainer Gland
 - a. Mechanically restrained mechanical joint fitting, consisting of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10
- C. Reference Standards

- 1 2. Reference standards cited in this Section refer to the current reference standard
2 published at the time of the latest revision date logged at the end of this Section
3 unless a date is specifically cited.
- 4 2. American Society of Mechanical Engineers (ASME):
5 a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125 and 250).
- 6 3. ASTM International (ASTM):
7 a. A536, Standard Specification for Ductile Iron Castings.
8 b. A674, Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for
9 Water or Other Liquids.
- 10 4. American Water Works Association (AWWA):
11 a. M41, Ductile-Iron Pipe and Fittings.
- 12 5. American Water Works Association/American National Standards Institute
13 (AWWA/ANSI):
14 a. C104/A21.4, Cement–Mortar Lining for Ductile-Iron Pipe and Fittings.
15 b. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
16 c. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
17 d. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
18 e. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron
19 Threaded Flanges.
20 f. C150/A21.50, Thickness Design of Ductile-Iron Pipe.
21 g. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.
22 h. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
23 i. C600, Installation of Ductile-Iron Water Mains and their Appurtenances.
- 24 6. International Organization for Standardization (ISO):
25 a. 8179-1, Ductile Iron Pipes, Fittings, Accessories and their Joints – External
26 Zinc-Based Coating – Part 1: Metallic Zinc with Finishing Layer.
- 27 7. NSF International (NSF):
28 a. 61, Drinking Water System Components - Health Effects.
29 b. 372, Drinking Water System Components – Lead Content.
- 30 8. Society for Protective Coatings (SSPC):
31 a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.

32 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

33 **1.5 SUBMITTALS**

- 34 A. Submittals shall be in accordance with Section 01 33 00.
- 35 B. All submittals shall be approved by the City prior to fabrication and delivery.

36 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 37 A. Product Data
38 1. Ductile Iron Pipe
39 a. Pressure or special thickness class
40 b. Interior lining
41 c. Exterior coating
42 d. Joint type
43 2. Ductile Iron Fittings

- 1 a. Pressure class
- 2 b. Interior lining
- 3 c. Exterior coating
- 4 d. Joint type
- 5 3. Polyethylene encasement and tape
- 6 a. Planned method of installation
- 7 b. Polyethylene type
- 8 c. Polyethylene thickness
- 9 4. Interior Lining
- 10 a. If other than cement mortar lining in accordance with AWWA/ANSI
- 11 C104/A21.4, provide:
- 12 1) Material.
- 13 2) Application Recommendations.
- 14 3) Field touch-up procedures.
- 15 5. Thrust Restraint
- 16 a. Retainer glands
- 17 b. PVC joint harnesses
- 18 c. Other means
- 19 6. Gaskets
- 20 a. In accordance with Section 33 14 05.
- 21 7. Isolation Flanges
- 22 a. In accordance with Section 33 01 12.
- 23 8. Bolts and Nuts
- 24 a. Mechanical Joints
- 25 1) Provide bolts and nuts in accordance with Section 33 14 05.
- 26 b. Flanged Joints
- 27 1) In accordance with AWWA/ANSI C115/A21.15.
- 28 2) Provide bolts and nuts in accordance with Section 33 14 05.
- 29 9. Flange Coatings
- 30 a. Connections to Steel Flanges
- 31 1) Coat buried connections with steel flanges with a Petrolatum Tape System
- 32 in accordance with Section 33 14 05.
- 33 B. Shop Drawings
- 34 1. For 16-inch and 20-inch diameter Ductile Iron Pipe used in the water distribution
- 35 system or wastewater force mains, provide:
- 36 a. Thrust restraint calculations for all fittings, valves and deflections sealed by a
- 37 Professional Engineer Licensed in Texas.
- 38 b. Lay schedule sealed by a Professional Engineer Licensed in Texas including:
- 39 1) Pipe class
- 40 2) Joint type
- 41 3) Fittings
- 42 4) Stationing
- 43 5) Transitions
- 44 6) Joint deflection
- 45 2. For 24-inch and greater diameter Ductile Iron Pipe used in the water distribution
- 46 system or wastewater force mains, provide:

- 1 a. Wall thickness design calculations sealed by a Professional Engineer Licensed
- 2 in Texas including:
- 3 1) Working Pressure
- 4 2) Surge Pressure
- 5 3) Deflection
- 6 b. Thrust restraint calculations for all fittings, valves, and deflections sealed by a
- 7 Professional Engineer Licensed in Texas.
- 8 c. Lay drawings (with schedule) sealed by a Professional Engineer Licensed in
- 9 Texas including:
- 10 1) Pipe class
- 11 2) Joint type
- 12 3) Fittings
- 13 4) Stationing
- 14 5) Transitions
- 15 6) Joint deflection

16 C. Certificates

- 17 1. Furnish an affidavit certifying the Ductile Iron Pipe meets the provisions of this
- 18 Section, all inspections have been made, and that all tests have been performed in
- 19 accordance with AWWA/ANSI C151/A21.51.
- 20 2. Furnish an affidavit certifying the Ductile Iron Fittings meet the provisions of this
- 21 Section and meet the requirements of AWWA/ANSI C110/A21.10 or
- 22 AWWA/ANSI C153/A21.53.

23 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

24 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

25 **1.9 QUALITY ASSURANCE**

26 A. Qualifications

- 27 1. Manufacturers
- 28 a. Finished pipe shall be the product of 1 manufacturer.
- 29 1) Change orders, specials, and field changes may be provided by a different
- 30 manufacturer upon City approval.
- 31 b. Pipe manufacturing operations (pipe, lining, and coatings) shall be performed
- 32 under the control of the manufacturer.
- 33 c. Fittings manufacturing operations (fittings, lining, and coatings) shall be
- 34 performed under the control of the manufacturer.
- 35 d. Ductile Iron Pipe
- 36 1) Manufactured in accordance with AWWA/ANSI C151/A21.51
- 37 a) Perform quality control tests and maintain results as outlined within
- 38 standard to assure compliance.
- 39 b) Hydrostatically test each pipe segment to 500 psi for a minimum
- 40 duration of 10 seconds.
- 41 e. Ductile Iron Fittings
- 42 1) Manufactured in accordance with AWWA/ANSI C110/A21.10 or
- 43 AWWA/ANSI C153/A21.53.
- 44 a) Perform quality control tests and maintain results as outlined within
- 45 standards to assure compliance.

1 B. Preconstruction Testing

- 2 1. The City may, at its own cost, subject random lengths of pipe and random fittings
3 for testing by an independent laboratory for compliance with this Section.
4 a. The compliance test will be performed in the United States.
5 b. Any visible defects or failure to meet the quality standards herein will be
6 grounds for rejecting the entire order.

7 **1.10 DELIVERY, STORAGE, AND HANDLING**

8 A. Storage and Handling Requirements

- 9 1. Secure and maintain a location to store the material in accordance with Section 01 66
10 00.
11 2. Store and handle in accordance with the guidelines as stated in AWWA M41.

12 **1.11 FIELD CONDITIONS [NOT USED]**

13 **1.12 WARRANTY [NOT USED]**

14 **PART 2 - PRODUCTS**

15 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

16 **2.2 MATERIALS**

17 A. Manufacturers

- 18 1. Manufacturer List
19 a. Ductile Iron Pipe
20 1) American Cast Iron Pipe Company
21 a) Fastite Joint Pipe – Sizes 4” to 64”
22 b) Flex-Ring Restrained Joint Pipe – Sizes 4” to 54”
23 c) Lok-Ring Restrained Joint Pipe – Sizes 54” to 64”
24 2) McWane Ductile
25 a) Tyton Joint Pipe – Sizes 3” to 36”
26 b) TR Flex Restrained Joint Pipe – Sizes 4” to 36”
27 3) US Pipe
28 a) Tyton Joint Pipe – Sizes 3” to 64”
29 b) TR Flex Restrained Joint Pipe – Sizes 4” to 36”
30 c) HP LOK Restrained Joint Pipe – Sizes 30” to 64”
31 b. Ductile Iron Fittings
32 1) Tyler Union
33 2) Star Pipe Products
34 3) SIP Industries
35 c. Retainer Glands
36 1) Star Pipe Products – StarGrip 3000, 3100, 4000, 4100
37 2) EBAA Iron – Megalug 1100, 2000PV
38 3) Ford Meter Box – Uni-Flange 1400, 1500
39 d. PVC Joint Harness
40 1) Star Pipe Products – Series 1100 Pipe Restrainers
41 2) EBAA Iron – Series 1900 Split Serrated Restraint Harness
42 3) Ford Meter Box – Uni-Flange Series 1390

- 1 e. Restrained Flange Adapters
 2 1) EBAA Iron – Series 2100 Mega Flange
 3 2. Substitution requests for manufacturers or models not indicated above shall be
 4 processed in accordance with Section 01 25 00.

5 B. Ductile Iron Pipe

- 6 1. In accordance with AWWA/ANSI C111/A21.11, AWWA/ANSI C150/A21.15 and
 7 AWWA/ANSI C151/A21.51.
 8 2. All pipe shall meet the requirements of NSF 61 and 372.
 9 3. Pipe shall have a lay length of 18 feet or 20 feet except for special fittings or
 10 closure pieces and as necessary to comply with the Drawings.
 11 4. As a minimum the following pipe classes apply. The Drawings or the pressure and
 12 deflection design criteria may require a higher wall thickness, but in no case should
 13 the pipe classes be less than the following:

Nominal Diameter (inches)	Min Pipe Class
3 through 24	Special Thickness Class 52
30 through 64	Pressure Class 350

- 14
 15
 16 5. Pipe markings shall meet the minimum requirements of AWWA/ANSI
 17 C151/A21.51. Minimum pipe markings shall be as follows:
 18 a. “DI” or “Ductile” shall be clearly labeled on each pipe
 19 b. Weight, pressure, or special thickness class, and nominal thickness of each pipe
 20 c. Year and country pipe was cast
 21 d. Manufacturer’s mark
 22 6. Pressure and Deflection Design
 23 a. Pipe design shall be based on trench conditions, design pressure and as
 24 specified in the Drawings.
 25 b. Pipe shall be designed according to the methods indicated in AWWA/ANSI
 26 C150/A21.50, AWWA/ANSI C151/A21.51, and AWWA M41 for trench
 27 construction, using the following parameters:
 28 1) Unit Weight of Fill (w) = 130 pcf
 29 2) Live Load
 30 a) Cooper E-80 for railroad crossings
 31 b) AASHTO HS-20 for all other installations
 32 3) Trench Depth = 12 feet minimum or as indicated in Drawings
 33 4) Bedding Conditions = Type 4
 34 5) Working Pressure (P_w) = 150 psi
 35 6) Surge Allowance (P_s) = 100 psi
 36 7) Design Internal Pressure (P_i) = $P_w + P_s$ or 2:1 safety factor of the actual
 37 working pressure plus the actual surge pressure, whichever is greater.
 38 a) Test Pressure
 39 (1) No less than 1.25 minimum times the stated working pressure
 40 (187.5 psi minimum) of the pipeline measured at the highest
 41 elevation along the test section.

- 1 (2) No less than 1.5 times the stated working pressure (225 psi
2 minimum) at the lowest elevation of the test section.
- 3 8) Maximum Calculated Deflection (D_x) = 3 percent
- 4
- 5 c. Trench depths shall be verified after existing utilities are located.
- 6 1) Vertical alignment changes required because of existing utility or other
7 conflicts shall be accommodated by an appropriate change in pipe design
8 depth.
- 9 2) In no case shall pipe be installed deeper than its design allows.
- 10 7. Provisions for Thrust
- 11 a. Mechanically restrain all bends, tees, plugs, or other fittings with retainer
12 glands in accordance with this Section.
- 13 b. Restrain all joints within casing pipe.
- 14 c. No thrust restraint contribution allowed for the restrained length of pipe within
15 the casing.
- 16 d. Utilize restrained joints for a sufficient distance from each side of the bend, tee,
17 plug, valve, or other fitting to resist thrust developed at the design pressure of
18 the pipe. For the purpose of thrust, the following shall apply:
- 19 1) Calculate valves as dead ends.
- 20 2) Restrained Joint Safety Factor (S_f) = 1.5
- 21 3) Design Internal Pressure (P_i) = $P_w + P_s$
- 22 a) $P_w = 150$ psi and $P_s = 100$ psi, or
- 23 b) 2:1 safety factor of the actual working pressure plus the actual surge
24 pressure, whichever is greater.
- 25 4) Restrained joints consist of approved mechanical restrained or push-on
26 restrained joints as listed in this Section.
- 27 5) The distance for thrust restraint shown on the Drawings is the minimum
28 restraint and does not relieve the manufacturer from calculating the restraint
29 needs as specified herein.
- 30 a) In no case shall the restrained distance be less than indicated on the
31 Drawings.
- 32 e. Thrust restraint design
- 33 1) The length of pipe with restrained joints to resist thrust forces shall be the
34 complete responsibility of the pipe manufacturer in accordance with
35 AWWA M41 and the following:
- 36 a) Calculate the weight of earth (W_e) as the weight of the projected soil
37 prism above the pipe.
- 38 (1) Soil Density
- 39 (a) Unsaturated soil conditions = 110 pounds per cubic foot
40 (maximum value to be used)
- 41 (b) Locations with groundwater = buoyant weight for the backfill
42 below the water table
- 43 8. Joints
- 44 a. In accordance with AWWA/ANSI C111/A21.11.
- 45 b. Push-On Joints
- 46 c. Mechanical Joints
- 47 d. Push-On Restrained Joints
- 48 1) Restraining Push-on joints by means of a special gasket is not permitted

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- 2) Push-on Restrained Joint bell and spigot
 - a) Only those products listed in this Section.
 - b) Pressure rating shall exceed the working and test pressure of the pipe line.

- 1 e. Flanged Joints
2 1) In accordance with AWWA/ANSI C115/A21.15 and ASME B16.1, Class
3 125.
4 f. Flange bolt circles and bolt holes in accordance with ASME B16.1, Class 125.
5 g. Field fabricated flanges are prohibited.
- 6 9. Exterior Coatings
7 a. 12-inch and smaller Ductile Iron Pipe:
8 1) Minimum 1-mil thick asphaltic coating.
9 b. 16-inch and larger Ductile Iron Pipe:
10 1) Minimum 200 grams per square meter application of metallic zinc in
11 accordance with ISO 8179-1.
12 2) Minimum 1-mil thick asphaltic finishing layer.
- 13 10. Interior Lining
14 a. Cement Mortar Lining
15 1) Line all Ductile Iron Pipe for potable water with a cement mortar lining.
16 a) In accordance with AWWA/ANSI C104/A21.04, NSF 61, and 372.
17 b. Ceramic Epoxy or Epoxy Linings
18 1) Line all Ductile Iron Pipe for use in wastewater applications with a ceramic
19 epoxy or epoxy lining.
20 2) Apply lining at minimum of 40 mils DFT.
21 3) Due to the tolerances involved, the gasket area, and spigot end up to 6
22 inches back from the end of the spigot end must be coated with 6 mils
23 nominal, 10 mils maximum, using a joint compound as supplied by the
24 manufacturer.
25 a) Apply the joint compound by brush to ensure coverage.
26 b) Care should be taken that the joint compound is smooth without excess
27 buildup in the gasket seat or on the spigot ends.
28 c) Coat the gasket seat and spigot ends after the application of the lining.
29 4) Surface preparation shall be in accordance with the manufacturer's
30 recommendations.
31 5) Check thickness using a magnetic film thickness gauge in accordance with
32 the method outlined in SSPC PA 2.
33 6) Test the interior lining of all pipe barrels for pinholes with a non-
34 destructive 2,500-volt test.
35 a) Repair any defects prior to shipment.
36 7) Mark each fitting with the date of application of the lining system along
37 with its numerical sequence of application on that date and records
38 maintained by the applicator of his work.
39 8) For all Ductile Iron Pipe in wastewater service where the pipe has been cut,
40 coat the exposed surface with the touch-up material as recommended by the
41 manufacturer
42 a) The touch-up material and the lining shall be of the same manufacturer.
- 43 C. Ductile Iron Fittings
44 1. In accordance with AWWA/ANSI C110/A21.10 and AWWA/ANSI C153/A21.53.
45 2. All fittings for potable water service shall be in accordance with NSF 61 and 372.
46 3. Ductile Iron Fittings, at a minimum, shall meet or exceed the pressures rating of the
47 pipe which the fitting is connected, unless specifically indicated in the Drawings.

1

1 4. Fitting body types shall be as indicated below:
2

Nominal Diameter (inches)	Allowable Fitting Body Type
12" and Smaller	AWWA C153 (Compact Body) AWWA C110 (Full Body)
16" and Larger	AWWA C110 (Full Body)

3 5. Fittings Markings

4 a. Meet the minimum requirements of AWWA/ANSI C151/A21.51.

5 b. Minimum markings shall include:

- 6 1) "DI" or "Ductile" cast or metal stamped on each fitting
7 2) Applicable AWWA/ANSI standard for that the fitting
8 3) Pressure rating
9 4) Number of degrees for all bends
10 5) Nominal diameter of the openings
11 6) Year and country fitting was cast
12 7) Manufacturer's mark

13 6. Joints

14 a. Mechanical Joints with mechanical restraint

- 15 1) In accordance with AWWA/ANSI C111/A21.11 and applicable parts of
16 ANSI/AWWA C110/A21.10.
17 2) Minimum retainer gland rated working pressure:
18 a) Ductile Iron Pipe
19 (1) 3-inch – 16-inch, 350 psi
20 (2) 18-inch – 48-inch, 250 psi
21 b) PVC C900
22 (1) 3-inch – 12-inch, 305psi
23 c) Ratings are for water pressure and must include a minimum safety
24 factor of 2 to 1 in all sizes.
25 3) Retainer glands shall have specific designs for Ductile Iron and PVC and be
26 easily differentiated.
27 4) Gland body, wedges and wedge actuating components shall be cast from
28 Grade 65-45-12 ductile iron material in accordance with ASTM A536.
29 5) Mechanical joint restraint shall require conventional tools and installation
30 procedures as outlined in AWWA C600, while retaining full mechanical
31 joint deflection during assembly as well as allowing joint deflection after
32 assembly.
33 6) Proper actuation of the gripping wedges shall be ensured with torque
34 limiting twist off nuts.
35 7) A minimum of 6 wedges shall be required for 8-inch diameter PVC pipe.

36 b. Flanged Joints

- 37 1) AWWA/ANSI C115/A21.15, ASME B16.1, Class 125
38 2) Flange bolt circles and bolt holes in accordance with ASME B16.1, Class
39 125.
40 3) Field fabricated flanges are prohibited.

41 c. PVC Joint Harness

- 42 1) Restrainer

- 1 a) Manufactured for use with C900 PVC pipe bells.
- 2 b) Grade 65-45-12 ductile iron material in accordance with ASTM A536.
- 3 2) Restraining rods and bolts in accordance with Section 33 14 05.
- 4 3) Clamping bolts and nuts in accordance with flange bolt and nut
- 5 requirements as indicated in Section 33 14 05.
- 6 d. Restrained Flange Adapters
- 7 1) ASTM A536 and ANSI/AWWA C110/A21.10
- 8 2) Flange bolt circles and bolt holes in accordance with ASME B16.1, Class
- 9 125.
- 10 3) Field fabricated flanges are prohibited.
- 11 4) Minimum 2 to 1 Safety Factor
- 12 7. Exterior Coatings
- 13 a. All ductile iron fittings shall have an asphaltic coating, minimum of 1 mil thick,
- 14 on the exterior.
- 15 8. Interior Lining
- 16 a. Cement Mortar Lining
- 17 1) Line all Ductile Iron Fittings for potable water shall with a cement mortar
- 18 lining.
- 19 2) In accordance with AWWA/ANSI C104/A21.4, NSF 61, and 372.
- 20 b. Ceramic Epoxy or Epoxy Linings
- 21 1) Line all Ductile Iron Fittings for use in wastewater applications with a
- 22 ceramic epoxy or epoxy lining.
- 23 2) Apply lining at a minimum of 40 mils DFT.
- 24 3) Due to the tolerances involved, the gasket area and spigot end up to 6
- 25 inches back from the end of the spigot end must be coated with 6 mils
- 26 nominal, 10 mils maximum, using a Joint Compound as supplied by the
- 27 manufacturer.
- 28 a) Apply the joint compound by brush to ensure coverage.
- 29 b) Care should be taken that the joint compound is smooth without excess
- 30 buildup in the gasket seat or on the spigot ends.
- 31 c) Coat the gasket seat and spigot ends after the application of the lining.
- 32 4) Prepare surface in accordance with the manufacturer's recommendations.
- 33 5) Check thickness using a magnetic film thickness gauge in accordance with
- 34 the method outlined in SSPC PA 2.
- 35 6) Test the interior lining of all fittings for pinholes with a non-destructive
- 36 2,500-volt test.
- 37 a) Repair any defects prior to shipment.
- 38 7) Mark each fitting with the date of application of the lining system along
- 39 with its numerical sequence of application on that date and records
- 40 maintained by the applicator of his work.
- 41 8) For all Ductile Iron Fittings in wastewater service where the fitting has
- 42 been cut, coat the exposed surface with the touch-up material as
- 43 recommended by the manufacturer.
- 44 9) The touch-up material and the lining shall be of the same manufacturer.

45 D. Gaskets

- 46 1. Provide Gaskets in accordance with Section 33 14 05.

47 E. Isolation Flanges

- 1 1. In accordance with Section 33 01 12.
- 2

- 1 F. Bolts and Nuts
- 2 1. Mechanical Joints
- 3 a. Provide bolts and nuts in accordance with Section 33 14 05
- 4 2. Flanged Joints
- 5 a. In accordance with AWWA/ANSI C115/A21.15
- 6 b. Provide bolts and nuts in accordance with Section 33 14 05
- 7 G. Flange Coatings for buried Flange Connections
- 8 1. Provide Petrolatum Tape System in accordance with Section 33 14 05
- 9 H. Polyethylene Encasement
- 10 1. Polyethylene encase all buried Ductile Iron Pipe and Fittings as follows:
- 11 a. 12-inch and smaller
- 12 1) Inner Layer - 8 mil V-Bio polyethylene in accordance with AWWA/ANSI
- 13 C105/A21.5
- 14 2) Outer Layer - 4 mil high density cross-laminated (HDCL) polyethylene
- 15 encasement in accordance with AWWA/ANSI C105/A21.5 and ASTM
- 16 A674.
- 17 b. 16-inch and larger
- 18 1) 8 mil V-Bio polyethylene conforming to AWWA/ANSI C105/A21.5
- 19 2. Use only virgin polyethylene material.
- 20 3. Marking: At a minimum of every 2 feet along its length, the mark the polyethylene
- 21 film with the following information:
- 22 a. Manufacturer's name or trademark
- 23 b. Year of manufacturer
- 24 c. AWWA/ANSI C105/A21.5
- 25 d. Minimum film thickness and material type
- 26 e. Applicable range of nominal diameter sizes
- 27 f. Warning – Corrosion Protection – Repair Any Damage
- 28 4. Special Markings/Colors
- 29 a. Reclaimed water, perform one of the following:
- 30 1) Label polyethylene encasement with “RECLAIMED WATER”;
- 31 2) Provide purple polyethylene in accordance with the American Public
- 32 Works Association Uniform Color Code; or
- 33 3) Attach purple reclaimed water marker tape to the polyethylene wrap
- 34 b. Wastewater, perform one of the following:
- 35 1) Label polyethylene encasement with “WASTEWATER”;
- 36 2) Provide green polyethylene in accordance with the American Public Works
- 37 Association Uniform Color Code; or
- 38 3) Attach green sanitary sewer marker tape to the polyethylene wrap.
- 39

5. Minimum widths

Polyethylene Tube and Sheet Sizes for Push-On Joint Pipe and Fittings

Nominal Pipe Diameter (inches)	Min. Width – Flat Tube (inches)	Min. Width – Sheet (inches)
3	14	28
4	14	28
6	16	32
8	20	40
10	24	48
12	27	54
14	30	60
16	34	68
18	37	74
20	41	82
24	54	108
30	67	134
36	81	162
42	81	162
48	95	190
54	108	216
60	108	216
64	121	242

I. Utility Markers/Locators

1. Provide utility markers and locators in accordance with Section 33 05 97.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 INSTALLATION

A. General

1. Install pipe, fittings, specials, and appurtenances in accordance with this Section, AWWA C600, AWWA M41, and the pipe manufacturer's recommendations.
2. Lay pipe and fittings to the lines and grades indicated in the Drawings.
3. Excavate and backfill trenches in accordance with Section 33 05 05.
4. At the close of each operating day:

- 1 a. Keep the pipe clean and free of debris, dirt, animals, and trash – during and
- 2 after the laying operation.
- 3 b. Effectively seal the open end of the pipe using a gasketed night cap.
- 4 5. Embed Ductile Iron Pipe and Fittings in accordance with Section 33 05 05.
- 5 6. For installation of carrier pipe within casing, see Section 33 05 15.

6 B. Pipe Handling

- 7 1. Haul and distribute pipe and fittings at the project site.
- 8 2. Handle piping with care to avoid damage.
 - 9 a. Inspect each joint of pipe and reject or repair any damaged pipe prior to
 - 10 lowering into the trench.
 - 11 b. Do not handle the pipe in such a way that will damage the interior lining.
 - 12 c. Use only nylon ropes, slings, or other lifting devices that will not damage the
 - 13 surface of the pipe for handling the pipe.

14 C. Pipe Jointing

- 15 1. Mechanical Joints
 - 16 a. Bolt the follower ring into compression against the gasket with the bolts
 - 17 tightened down evenly then cross torqued in accordance with AWWA C600.
 - 18 b. Overstressing of bolts to compensate for poor installation practice will not be
 - 19 permitted.
- 20 2. Push-on Joints
 - 21 a. Install Push-on joints in accordance with AWWA/ANSI C111/A21.11.
 - 22 b. Wipe gasket seat inside the bell clean of all extraneous matter.
 - 23 c. Place the gasket in the bell in the position specified by the manufacturer.
 - 24 d. Apply a thin film of non-toxic vegetable soap lubricant to the inside of the
 - 25 gasket and the outside of the spigot prior to entering the spigot into the bell.
 - 26 1) Do not apply lubricant to the bell socket or the surface of the gasket in
 - 27 contact with the bell socket.
 - 28 e. When using a field cut plain end piece of pipe, refinish the field cut and scarf in
 - 29 accordance with AWWA C600.
- 30 3. Flanged Joints
 - 31 a. Use erection bolts and drift pins to make flanged connections.
 - 32 1) Do not use undue force or restraint on the ends of the fittings.
 - 33 2) Apply even and uniform pressure to the gasket.
 - 34 b. The fitting must be free to move in any direction while bolting.
 - 35 1) Install flange bolts with all bolt heads faced in one direction.
- 36 4. PVC Joint Harness
 - 37 a. Install joint harness in accordance with manufacturer requirements.
 - 38 b. Provide full 360-degree contact with restrainer and pipe.
 - 39 c. Do not distort the pipe when installing the restrainer.
- 40 5. Joint Deflection
 - 41 a. Deflect the pipe only when necessary to avoid obstructions or to meet the lines
 - 42 and grades and shown in the Drawings.
 - 43 b. In accordance with AWWA C600 Table 3.
 - 44 c. The maximum deflection allowed is 80 percent of that indicated in AWWA
 - 45 C600.
 - 46

1 D. Polyethylene Encasement Installation

2 1. Preparation

- 3 a. Remove all lumps of clay, mud, cinders, etc., on pipe surface prior to
4 installation of polyethylene encasement.
5 1) Prevent soil or embedment material from becoming trapped between pipe
6 and polyethylene.
7 b. Fit polyethylene film to contour of pipe to ensure a snug, but not tight,
8 encasement with minimum space between polyethylene and pipe.
9 1) Provide sufficient slack in contouring to prevent stretching polyethylene
10 where it bridges irregular surfaces, such as bell-spigot interfaces and bolted
11 joints or fittings, and to prevent damage to polyethylene due to backfilling
12 operations.
13 2) Secure overlaps and ends with adhesive tape and hold.
14 c. For installations below water table and/or in areas subject to tidal actions, seal
15 both ends of polyethylene tube with adhesive tape at joint overlap.

16 2. Tubular Type (Method A)

- 17 a. Cut polyethylene tube to length approximately 2 feet longer than pipe section.
18 b. Slip tube around pipe, centering it to provide 1-foot overlap on each adjacent
19 pipe section, and bunching it accordion-fashion lengthwise until it clears pipe
20 ends.
21 c. Lower pipe into trench and make up pipe joint with preceding section of pipe.
22 d. Make shallow bell hole at joints to facilitate installation of polyethylene tube.
23 e. After assembling pipe joint, overlap polyethylene tube, pull bunched
24 polyethylene from preceding length of pipe, slip it over end of the new length
25 of pipe and wrap until it overlaps joint at end of preceding length of pipe.
26 f. Secure overlap in place.
27 g. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel
28 of pipe, securing fold at quarter points.
29 h. Repair cuts, tears, punctures, or other damage to polyethylene.
30 i. Proceed with installation of next pipe in same manner.

31 3. Tubular Type (Method B)

- 32 a. Cut polyethylene tube to length approximately 1 foot shorter than pipe section.
33 b. Slip tube around pipe, centering it to provide 6 inches of bare pipe at each end.
34 c. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel
35 of pipe, securing fold at quarter points; secure ends.
36 d. Before making up joint, slip 3-foot length of polyethylene tube over end of
37 preceding pipe section, bunching it accordion-fashion lengthwise.
38 e. After completing joint, pull 3-foot length of polyethylene over joint,
39 overlapping polyethylene previously installed on each adjacent section of pipe
40 by at least 1 foot; make each end snug and secure.

41 4. Sheet Type

- 42 a. Cut polyethylene sheet to a length approximately 2 feet longer than piece
43 section.
44 b. Center length to provide 1-foot overlap on each adjacent pipe section, bunching
45 it until it clears the pipe ends.
46 c. Wrap polyethylene around pipe so that it circumferentially overlaps top
47 quadrant of pipe.
48 d. Secure cut edge of polyethylene sheet at intervals of approximately 3 feet.

- 1 e. Lower wrapped pipe into trench and make up pipe joint with preceding section
- 2 of pipe.
- 3 f. Make shallow bell hole at joints to facilitate installation of polyethylene.
- 4 g. After completing joint, overlap and secure ends.
- 5 h. Repair cuts, tears, punctures, or other damage to polyethylene.
- 6 i. Proceed with installation of next section of pipe in same manner.
- 7 5. Pipe-Shaped Appurtenances
- 8 a. Cover bends, reducers, offsets, and other pipe-shaped appurtenances with
- 9 polyethylene in same manner as pipe and fittings.
- 10 6. Odd-Shaped Appurtenances
- 11 a. When it is not practical to wrap valves, tees, crosses, and other odd-shaped
- 12 pieces in tube, wrap with flat sheet or split length polyethylene tube by passing
- 13 sheet under appurtenances and bringing it up around body.
- 14 b. Make seams by bringing edges together, folding over twice and taping down.
- 15 c. Tape polyethylene securely in place at the valve stem and at any other
- 16 penetrations.
- 17 7. Repairs
- 18 a. Repair any cuts, tears, punctures, or damage to polyethylene with adhesive tape
- 19 or with short length of polyethylene sheet or cut open tube, wrapped around
- 20 fitting to cover damaged area and secured in place.
- 21 8. Openings in Encasement
- 22 a. Provide openings for branches, service taps, blow-offs, air valves, and similar
- 23 appurtenances by making an X-shaped cut in polyethylene and temporarily
- 24 folding back film.
- 25 b. After appurtenance is installed, tape slack securely to appurtenance and repair
- 26 cut, as well as other damaged area in polyethylene with tape.
- 27 c. Service taps may also be made directly through polyethylene, with any
- 28 resulting damaged areas being repaired as described above.
- 29 9. Junctions between Wrapped and Unwrapped Pipe:
- 30 a. Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped,
- 31 extend polyethylene wrap to cover adjacent pipe for distance of at least 3 feet.
- 32 b. Secure end with circumferential turns of tape.
- 33 c. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric
- 34 tape for minimum clear distance of 3 feet away from Cast or Ductile Iron Pipe.
- 35 E. Blocking
- 36 1. Install concrete blocking for all 24-inch and smaller fittings, at all bends, tees,
- 37 crosses, and plugs as indicated in the Drawings.
- 38 a. Blocking is not permitted for fittings 30-inch and larger.
- 39 2. Provide and install concrete in accordance with Sections 03 00 00 and 03 30 00.
- 40 3. Place the concrete blocking so as to rest against firm undisturbed trench walls,
- 41 normal to the thrust.
- 42 4. In no instance should the supporting area for each block be smaller than those
- 43 specified in Drawings. Each block shall be sufficient to withstand the thrust,
- 44 including water hammer, which may develop.

5. Each block shall rest on a firm, undisturbed foundation or trench bottom. If the Contractor encounters soil that appears to be different than that which was used to calculate the blocking according to the Drawings, the Contractor shall notify the Engineer prior to the installation of the blocking.

3.5 REPAIR

A. Patching

1. Excessive field-patching is not permitted of lining or coating.
2. Patching of lining or coating will be allowed where area to be repaired does not exceed 100 square inches and has no dimensions greater than 12 inches.
3. In general, there shall not be more than 1 patch on either the lining or the coating of any 1 joint of pipe or any 1 fitting.
4. Wherever necessary to patch the pipe or fittings:
 - a. Make patch with cement mortar as previously specified for interior joints.
 - b. Do not install patched pipe until the patch has been properly and adequately cured and approved for laying by the City.
5. Promptly remove rejected pipe or fittings from the site.

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL

A. Potable Water Mains

1. Hydrostatic testing of water mains:
 - a. Hydrostatically test the mains in accordance with Section 33 01 10.

B. Sewer Force Mains

1. Hydrostatic testing of sewer force mains:
 - a. Hydrostatically test the mains in accordance with Section 33 01 10.

C. Gravity Sewer Mains

1. Closed Circuit Television (CCTV) Inspection
 - a. Provide a Post-CCTV Inspection in accordance with Section 33 01 30.
2. Sewer Pipe Testing
 - a. Test pipe in accordance with Section 33 01 31.

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING

A. Potable Water Mains

1. Cleaning, disinfection, and bacteriological testing of water mains:
 - a. Clean, flush, pig, disinfect, and bacteriological test the mains in accordance with Section 33 01 10.

B. Sewer Force Mains

1. Cleaning of sewer force mains:
 - a. Clean the mains in accordance with Section 33 01 32.

- 1 C. Gravity Sewer Mains
- 2 1. Cleaning of sewer mains
- 3 a. Clean the mains in accordance with Section 33 01 32.

4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

5 **3.12 PROTECTION [NOT USED]**

6 **3.13 MAINTENANCE [NOT USED]**

7 **3.14 ATTACHMENTS [NOT USED]**

8 **END OF SECTION**

9

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

10

- 1 4) Excavation
- 2 5) Hauling
- 3 6) Disposal of excess material
- 4 7) Furnishing, placement and compaction of embedment
- 5 8) Furnishing, placement and compaction of backfill
- 6 9) Clay Dams
- 7 10) Thrust restraint
- 8 11) Gaskets
- 9 12) Clean-up
- 10 13) Cleaning
- 11 14) Disinfection
- 12 15) Testing
- 13 2. PVC Gravity Sewer Pressure Pipe
- 14 a. Measurement
- 15 1) Measured horizontally along the ground surface from center line to center
- 16 line of fitting, manhole, or appurtenance of PVC Pressure Pipe installed.
- 17 b. The work performed and materials furnished in accordance with this item and
- 18 measured as provided under “Measurement” will be paid for at the unit price bid
- 19 per linear foot for “PVC Gravity Sewer Pressure Pipe” installed for:
- 20 1) Various sizes.
- 21 2) Various types of backfill.
- 22 c. The price bid shall include:
- 23 1) Furnishing and installing PVC Pressure Pipe as specified by the Drawings
- 24 2) Utility Markers/Locators
- 25 3) Pavement removal
- 26 4) Excavation
- 27 5) Hauling
- 28 6) Disposal of excess material
- 29 7) Furnishing, placement and compaction of embedment
- 30 8) Furnishing, placement and compaction of backfill
- 31 9) Clay Dams
- 32 10) Gaskets
- 33 11) Clean-up
- 34 12) Cleaning
- 35 13) Testing

36 1.3 REFERENCES

- 37 A. Abbreviations and Acronyms
- 38 1. PVC – Polyvinyl Chloride
- 39 B. Reference Standards
- 40 1. Reference standards cited in this Section refer to the current reference standard
- 41 published at the time of the latest revision date logged at the end of this Section
- 42 unless a date is specifically cited.
- 43 2. American Association of State Highway and Transportation Officials (AASHTO).
- 44 3. ASTM International (ASTM):
- 45 a. D1784, Standard Specification for Rigid Poly(Vinyl-Chloride) (PVC)
- 46 Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

- 1 b. D3139, Standard Specification for Joints for Plastic Pressure Pipes Using
- 2 Flexible Elastomeric Seals.
- 3 4. American Water Works Association (AWWA):
- 4 a. M23, PVC Pipe – Design and Installation.
- 5 5. American Water Works Association/American National Standards Institute
- 6 (AWWA/ANSI):
- 7 a. C600, Installation of Ductile-Iron Water Mains and their Appurtenances.
- 8 b. C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipes and
- 9 Fittings for Water.
- 10 c. C900, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 IN
- 11 through 60 IN, for Water Transmission and Distribution.
- 12 6. NSF International (NSF):
- 13 a. 61, Drinking Water System Components – Health Effects.
- 14 b. 372, Drinking Water System Components – Lead Content.
- 15 7. Underwriters Laboratories, Inc. (UL).
- 16 a. 1285, Standard for Pipe and Couplings, Polyvinyl Chloride (PVC), and Oriented
- 17 Polyvinyl Chloride (PVCO) for Underground Fire Service

18 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

19 **1.5 SUBMITTALS**

- 20 A. Submittals shall be in accordance with Section 01 33 00.
- 21 B. All submittals shall be approved by the City prior to delivery.

22 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 23 A. Product Data
- 24 1. For PVC Pressure Pipe that is used for water distribution or wastewater gravity
- 25 mains, including:
- 26 a. PVC Pressure Pipe
- 27 b. Manufacturer
- 28 c. Dimension Ratio
- 29 d. Joint Types
- 30 2. Restraint
- 31 a. Retainer glands
- 32 b. Thrust harnesses
- 33 c. Any other means of restraint
- 34 3. Gaskets
- 35 B. Certificates
- 36 1. Furnish an affidavit certifying the PVC Pressure Pipe meets the provisions of this
- 37 Section, all inspections have been made, and all tests have been performed in
- 38 accordance with AWWA C900.

39 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

40 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

41

1 **1.9 QUALITY ASSURANCE**

2 A. Qualifications

3 1. Manufacturers

- 4 a. Finished pipe shall be the product of 1 manufacturer for each size, unless
5 otherwise approved by the City.
6 1) Change orders, specials, and field changes may be provided by a different
7 manufacturer upon City approval.
8 b. Pipe manufacturing operations shall be performed under the control of the
9 manufacturer.
10 c. Furnish all pipe in accordance with AWWA C900.

11 **1.10 DELIVERY, STORAGE, AND HANDLING**

12 A. Delivery and Acceptance Requirements

- 13 1. Pipe manufactured more than 2 years prior to installation date will not be accepted
14 by the City.

15 B. Storage and Handling Requirements

- 16 1. Secure and maintain a location to store the material in accordance with Section 01
17 66 00.
18 2. Store and handle in accordance with the guidelines as stated in AWWA M23.
19 a. When long-term storage (more than 2-months) with exposure to direct sunlight
20 is unavoidable, cover PVC pipe with an opaque material and provide adequate
21 air circulation above and around the pipe as required to prevent excessive heat
22 accumulation.

23 **1.11 FIELD CONDITIONS [NOT USED]**

24 **1.12 WARRANTY [NOT USED]**

25 **PART 2 - PRODUCTS**

26 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

27 **2.2 MATERIALS**

28 A. Manufacturers

29 1. Manufacturer List

- 30 a. Diamond Plastics
31 b. JM Eagle
32 c. Northern Pipe Products
33 d. North American Pipe
34 e. Certa-Lok by CertainTeed

- 35 2. Substitution requests for manufacturers not indicated above shall be processed in
36 accordance with Section 01 25 00.

37 B. Pipe

- 38 1. Manufactured in accordance with AWWA C900.
39 2. Pipe for potable water shall be in accordance with NSF 61 and 372.

- 1 3. Pipe shall be approved by the Underwriter’s Laboratories, in accordance with UL
- 2 1285.
- 3 4. Pipe shall have a lay length of 20 feet except for special fittings or closure pieces
- 4 necessary to comply with the Drawings.
- 5 5. The pipe material shall be PVC, meeting the requirements of ASTM D1784, with a
- 6 cell classification of 12454.
- 7 6. Pipe shall be colored blue for potable water applications. Pipe shall be colored
- 8 green for sanitary sewer applications. Pipe shall be colored purple for reuse water
- 9 applications.
- 10 7. Outside diameters must be equal to those of cast iron and ductile iron pipes.
- 11 8. The following minimum Dimension Ratio’s apply:
- 12

Application	Diameter (inch)	Min Pressure Class (psi)
Potable Water	4 through 12	DR 14
Pressure Rated Gravity Sewer Main	14 through 24	DR 18

- 13 9. Pipe Markings
- 14 a. Meet the minimum requirements of AWWA C900. Minimum pipe markings
- 15 shall be as follows and shall be applied at intervals of not more than 5 feet:
- 16 1) Manufacturer’s name or trademark and production run record or lot code
- 17 2) Nominal pipe size in inches and outer diameter base
- 18 3) Dimension Ratio
- 19 4) Pressure class
- 20 5) Hydrostatic integrity test pressure on all standard length hydrostatic-tested
- 21 pipe
- 22 6) AWWA C900
- 23 7) Mark of certifying agency for pipe intended for potable-water service or if
- 24 not intended for potable water “NOT FOR POTABLE USE”
- 25 8) For deflectable joints, the maximum allowable axial joint deflection in
- 26 degrees

C. Pressure and Deflection Design

- 27
- 28 1. Base pipe design on trench conditions and design pressure class specified in the
- 29 Drawings. Pipe shall be designed in accordance with the methods indicated in
- 30 AWWA M23 for trench construction, using the following parameters:
- 31 a. Unit Weight of Fill (w) = 130 pcf
- 32 b. Live Load = AASHTO HS 20
- 33 c. Trench Depth = 12 feet minimum or as indicated in Drawings
- 34 d. Maximum E’ = 1,000 max
- 35 e. Deflection Lag Factor = 1.0
- 36 f. Working Pressure (P_w) = 150 psi
- 37 g. Surge Allowance (P_s) = 100 psi minimum
- 38 h. Test Pressure =
- 39 1) No less than 1.25 times the stated working pressure (187 psi minimum) of
- 40 the pipeline measured at the highest elevation along the test section.

- 1 2) No less than 1.5 times the stated working pressure (225 psi minimum) at
- 2 the lowest elevation of the test section.
- 3 i. Maximum Calculated Deflection = 3 percent
- 4 j. Restrained Joint Safety Factor (SF) = 1.5
- 5 k. Maximum Joint Deflection = 100 percent of the manufacturer's
- 6 recommendations.
- 7 2. Verify trench depths after existing utilities are located.
- 8 a. Accommodate vertical alignment changes required because of existing utility or
- 9 other conflicts by an appropriate change in pipe design depth.
- 10 b. In no case shall pipe be installed deeper than its design allows.
- 11 3. Provisions for Thrust
- 12 a. Mechanically restrain all bends, tees, plugs, or other fittings with retainer glands
- 13 in accordance with Section 33 14 10.
- 14 b. Restrained joints, where required, shall be used for a sufficient distance from
- 15 each side of the bend, tee, plug, valve, or other fitting to resist thrust which will
- 16 be developed at the design pressure of the pipe. For the purpose of thrust the
- 17 following shall apply:
- 18 1) Calculate valves as dead ends.
- 19 2) Design pressure shall be greater than both the pressure class of the pipe and
- 20 the internal pressure (P_i).
- 21 3) Restrain joints with the following:
- 22 a) External mechanical joint restraint system in accordance with Section
- 23 33 14 10; or
- 24 b) Certa-Lok by CertainTeed restrained joint system.
- 25 c. The Pipe Manufacturer shall verify the length of pipe with restrained joints to
- 26 resist thrust in accordance with the Drawings and the following:
- 27 1) Calculate the weight of the earth (W_e) as the weight of the projected soil
- 28 prism above the pipe, for unsaturated soil conditions.
- 29 2) Soil density = 110 pcf (maximum value to be used), for unsaturated soil
- 30 conditions
- 31 3) In locations where ground water is encountered, reduce the soil density to
- 32 its buoyant weight for the backfill below the water table.
- 33 a) Reduce the coefficient of friction to 0.25.
- 34 4. Joints
- 35 a. Joints shall be gasket, bell and spigot, and push-on type in accordance with
- 36 ASTM D3139.
- 37 b. Since each pipe manufacturer has a different design for push-on joints, gaskets
- 38 shall be part of a complete pipe section and purchased as such.
- 39 c. Lubricant must be non-toxic and NSF approved for potable water applications.
- 40 5. Detectable Markers
- 41 a. Provide detectable markers in accordance with Section 33 05 97.

42 **2.3 ACCESSORIES [NOT USED]**

43 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION [NOT USED]**

5 **3.4 INSTALLATION**

6 A. General

- 7 1. Install pipe, fittings, specials, and appurtenances in accordance with this Section,
8 AWWA C600, AWWA C605, AWWA M23, and the pipe manufacturer's
9 recommendations.
- 10 2. Lay pipe to the lines and grades indicated in the Drawings.
- 11 3. Excavate and backfill trenches in accordance with Section 33 05 05.
- 12 4. At the close of each operating day:
- 13 a. Keep the pipe clean and free of debris, dirt, animals, and trash – during and after
14 the laying operation.
- 15 b. Effectively seal the open end of the pipe using a gasketed night cap.
- 16 5. Embed pipe in accordance with Section 33 05 05.
- 17 6. Installation of PVC pipe within casing is only permitted with restrained joints.

18 B. Pipe Handling

- 19 1. Haul and distribute pipe at the project site.
- 20 2. Handle piping with care to avoid damage.
- 21 a. Inspect each joint of pipe and reject or repair any damaged pipe prior to
22 lowering into the trench.
- 23 b. Use only nylon ropes, slings, or other lifting devices that will not damage the
24 surface of the pipe for handling the pipe.

25 C. Pipe Jointing

- 26 1. Mechanical Joints
- 27 a. Install mechanical joints in accordance with Section 33 14 10.
- 28 2. Push-on Joints
- 29 a. Install push-on joints as defined in AWWA C900.
- 30 b. Wipe gasket seat inside the bell clean of all extraneous matter.
- 31 c. Place the gasket in the bell in the position specified by the manufacturer.
- 32 d. Apply a thin film of non-toxic vegetable soap lubricant to the inside of the
33 gasket and the outside of the spigot prior to entering the spigot into the bell.
- 34 e. Assemble the pipe joint by sliding the lubricated spigot end into the gasketed
35 bell end to the reference mark on the spigot.
- 36 f. When using a field cut plain end piece of pipe, refinish the field cut to conform
37 to AWWA C605.
- 38 3. Joint Deflection
- 39 a. Deflect the pipe only when necessary to avoid obstructions or to meet the lines
40 and grades shown in the Drawings.
- 41 b. Joint deflection shall not exceed 100 percent of the manufacturer's
42 recommendation.

1 D. Detectable Metallic Tape Installation

- 2 1. See Section 33 05 97.

3 **3.5 REPAIR [NOT USED]**

4 **3.6 RE-INSTALLATION [NOT USED]**

5 **3.7 FIELD QUALITY CONTROL**

6 A. Potable Water Mains

- 7 1. Hydrostatic testing of water mains:
8 a. Hydrostatically test the mains in accordance with Section 33 01 10.

9 B. Gravity Sewer Mains

- 10 1. Closed Circuit Television (CCTV) Inspection
11 a. Provide a Post-CCTV Inspection in accordance with Section 33 01 30.
12 2. Sewer Pipe Testing
13 a. Test pipe in accordance with Section 33 01 31.

14 **3.8 SYSTEM STARTUP [NOT USED]**

15 **3.9 ADJUSTING [NOT USED]**

16 **3.10 CLEANING**

17 A. Potable Water Mains

- 18 1. Cleaning, disinfection, and bacteriological testing of water mains:
19 a. Clean, flush, pig, disinfect, and bacteriological test the mains in accordance with
20 Section 33 01 10.

21 B. Gravity Sewer Mains

- 22 1. Cleaning of Sewer Mains
23 a. Clean the mains in accordance with Section 33 01 32.

24 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

25 **3.12 PROTECTION [NOT USED]**

26 **3.13 MAINTENANCE [NOT USED]**

27 **3.14 ATTACHMENTS [NOT USED]**

28 **END OF SECTION**

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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SECTION 33 14 14
HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. HDPE Pipe 1-inch and 2-inch for potable water services.
 - 2. HDPE Pipe 4-inch through 60-inch for water distribution.
 - 3. HDPE Pipe 4-inch through 12-inch for gravity sanitary sewer.
 - 4. HDPE Pipe 4-inch through 60-inch for sanitary sewer force mains and reuse applications.
- B. Deviations from this City of Denton Standard Specification:
 - 1. None.
- C. Related Specification Sections include but are not limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 33 01 10 – Cleaning and Acceptance Testing of Water and Sewer Force Mains.
 - 4. Section 33 01 32 – Cleaning of Sewer Mains.
 - 5. Section 33 01 30 – Closed Circuit Television (CCTV) Inspection.
 - 6. Section 33 01 31 – Sewer and Manhole Testing.
 - 7. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.
 - 8. Section 33 05 97 – Utility Markers/Locators.
 - 9. Section 33 14 05 – Bolts, Nuts and Gaskets.
 - 10. Section 33 14 10 – Ductile Iron Pipe and Fittings.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. HDPE Water Service Line
 - a. Measurement
 - 1) This item is considered subsidiary to New Water Service installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item are subsidiary to the unit price bid per each water service installed.
 - 2. HDPE Pressure Pipe
 - a. Measurement
 - 1) Measured horizontally along the ground surface from center line to center line of fitting, manhole, or appurtenance of HDPE Pressure Pipe installed.
 - b. Payment

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “HDPE Pressure Pipe” installed for:
 - a) Various sizes.
 - b) Various types of backfill.
 - c. The price bid shall include:
 - 1) Furnishing and installing HDPE Pipe as specified by the Drawings
 - 2) Utility Markers/Locators
 - 3) Pavement Removal
 - 4) Excavation
 - 5) Hauling
 - 6) Disposal of excess material
 - 7) Furnishing, placement, and compaction of embedment
 - 8) Furnishing, placement, and compaction of backfill
 - 9) Clay Dams
 - 10) Fusion of joints
 - 11) HDPE fittings
 - 12) Ductile Iron Fittings with Restraint (if required)
 - 13) Bolts and nuts
 - 14) Clean-up
 - 15) Cleaning
 - 16) Disinfection (for potable)
 - 17) Testing
3. HDPE Gravity Pipe
- a. Measurement
 - 1) Measured horizontally along the ground surface from center line to center line of fitting, manhole, or appurtenance of HDPE Gravity Pipe installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per linear foot for “HDPE Gravity Pipe” installed for:
 - a) Various sizes.
 - b) Various types of backfill.
 - c. The price bid shall include:
 - 1) Furnishing and installing HDPE Pipe as specified by the Drawings
 - 2) Utility Markers/Locators
 - 3) Pavement Removal
 - 4) Excavation
 - 5) Hauling
 - 6) Disposal of excess material
 - 7) Furnishing, placement, and compaction of embedment
 - 8) Furnishing, placement, and compaction of backfill
 - 9) Clay Dams
 - 10) Fusion of joints
 - 11) HDPE fittings
 - 12) Clean-up
 - 13) Cleaning
 - 14) Testing

1 **1.3 REFERENCES**

2 A. Abbreviations and Acronyms

- 3 1. HDPE – High Density Polyethylene

4 B. Reference Standards

- 5 1. Reference standards cited in this Section refer to the current reference standard
6 published at the time of the latest revision date logged at the end of this Section
7 unless a date is specifically cited.
- 8 2. ASTM International (ASTM):
- 9 a. D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR)
10 Based on Controlled Outside Diameter.
 - 11 b. D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings
12 Materials.
 - 13 c. F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and
14 Fittings.
 - 15 d. F1290, Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings.
 - 16 e. D3261, Standard Specifications for Butt Heat Fusion Polyethylene (PE) Plastic
17 Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - 18 f. F714, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR)
19 Based on Outside Diameter.
 - 20 g. F2164: Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure
21 Pipeline Systems Using Hydrostatic Pressure.
- 22 3. American Water Works Association (AWWA):
- 23 a. C901, Polyethylene (PE) Pressure Pipe and Tubing, 3/4-inch through 3-inch,
24 for Water Service.
 - 25 b. C906, Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for
26 Water Distribution.
 - 27 c. M55, PE Pipe Design and Installation.
- 28 4. NSF International (NSF) (for use in potable applications):
- 29 a. 61, Drinking Water System Components – Health Effects.
 - 30 b. 372, Drinking Water System Components – Lead Content.

31 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

32 **1.5 SUBMITTALS**

33 A. Submittals shall be in accordance with Section 01 33 00.

34 B. All submittals shall be approved by the City prior to delivery.

35 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

36 A. Qualifications

- 37 1. Submit manufacturer and butt fusion welder qualifications in accordance with
38 Article 1.9 and the following:
- 39 a. Documentation that each Fusion Technician has met requirements for joining
40 proficiency for each type of fusion joint performed by the Fusion Technician
41 under this specification.

- 1 b. Documentation of conformance with this Section and applicable standards,
2 including written documentation regarding any intended variance from this
3 Section and applicable standards. This will include fusion joint warranty
4 information and recommended project specific fusion parameters, including
5 criteria logged and recorded by data logger.
- 6 2. The following AS-RECORDED DATA is required from the Contractor and/or
7 Fusion Provider:
 - 8 a. Fusion reports for each fusion joint performed on the project, including joints
9 that were rejected. Submittals of the Fusion Technician's joint reports are
10 required as requested by the Owner or Engineer. Specific requirements of the
11 Fusion Technician's joint report shall include:
 - 12 1) Pipe or fitting size and DR or pressure class rating
 - 13 2) Fusion equipment size and identification
 - 14 3) Fusion Technician Identification
 - 15 4) Job Identification Number
 - 16 5) Fusion Number
 - 17 6) Fusion joining parameters
 - 18 7) Ambient Temperature
- 19 B. Product Data
 - 20 1. Manufacturer
 - 21 2. Nominal pipe diameter
 - 22 3. Pressure Rating
 - 23 4. Standard Dimension ratio (DR)
 - 24 5. Cell classification
 - 25 6. Laying lengths
- 26 C. Shop Drawings
 - 27 1. HDPE Pipe for water distribution or sanitary sewer force mains for 24-inch and
28 greater diameters:
 - 29 a. Wall thickness design calculations sealed by a Professional Engineer Licensed
30 in Texas including:
 - 31 1) Working Pressure
 - 32 2) Surge Pressure
 - 33 3) Deflection
- 34 D. Certificates
 - 35 1. Furnish an affidavit certifying all HDPE pipe has been tested and is in accordance
36 with this Section and all ASTM and AWWA standards as listed herein.

37 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

38 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

39 **1.9 QUALITY ASSURANCE**

- 40 A. Qualifications
 - 41 1. Manufacturers
 - 42 a. Finished pipe shall be the product of 1 manufacturer for each size, unless
43 otherwise specified by the City.

- 1) Change orders, specials, and field changes may be provided by a different manufacturer upon City approval.
 - b. Pipe manufacturing operations shall be performed under the control of the manufacturer.
 - c. Certified copies of test reports required with each delivery, stating all pipe is in accordance with ASTM F714, ASTM D3350, ASTM D3035 as applicable.
2. Butt-Fusion Welding
 - a. Butt-fusion welding of pipe sections shall be performed by a fusion technician certified by the pipe manufacturer. Manufacturer's recommended practices shall be followed.
 - b. Each Fusion Technician performing butt fusion, saddle fusion, or electrofusion joints shall be qualified to make butt fusion joints in accordance with ASTM F2620/1290. Qualification shall have occurred not more than 12 months before performing fusion joining on site in accordance with this Section. Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F2620/1290 that are proved to be satisfactory by destructive testing in accordance with ASTM F2620/1290.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Secure and maintain a location to store the material in accordance with Section 01 66 00.
2. Store and handle in accordance with the guidelines as stated in AWWA M55.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Manufacturers

1. HDPE Pipe and Fittings
 - a. Performance Pipe
 - b. JM Eagle
 - c. Pipeline Plastics
 - d. ISCO Pipe
 - e. WL Plastics
2. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

B. HDPE Pipe

1. Pipe and Fittings
 - a. As a minimum the following pipe classes apply. The Drawings or the pressure and deflection design criteria may require a higher wall thickness, but in no case should the pipe classes be less than the following:

1

Type of Use	Min Pipe Class
Potable Service Lines	DR-9
Potable Distribution	DR-11
Force Main	DR-13.5
Gravity Sewer	DR-17
Pipe Bursting Method	DR-11

2

3

b. Material

4

1) Extra High Molecular Weight, High Density Polyethylene PE 4710, Cell Class PE445474C with colored striping the entire length of pipe in accordance with AWWA C901 or AWWA C906.

5

6

7

a) Striping shall be Cell Class PE445474E.

8

b) Cell Classifications are to be in accordance with ASTM D3350.

9

2) Homogeneous throughout and free of:

10

a) Abrasion, cutting, or gouging of the outside surface extending to more than 10 percent of the wall thickness in depth

11

b) Cracks

12

c) Kinking

13

d) Flattening

14

e) Holes

15

f) Blisters

16

g) Other defects

17

c. All pipe shall be color coded for the intended service. The color coding shall be permanently co-extruded stripes on the pipe outside surface as part of the pipe's manufacturing process. Painting HDPE pipe to accomplish color coding is not permitted. Color coding shall be as follows:

18

19

20

21

1) Sewer – green

22

2) Water – blue

23

3) Reuse – purple

24

d. Pipe with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10 percent of the wall thickness, shall not be used and shall be removed from the construction site.

25

26

27

28

e. Pipe and fittings shall be uniform in color, opacity, density, and other physical properties.

29

30

f. Pipe Markings

31

1) In accordance with ASTM D3350

32

2) Minimum pipe markings shall be as follows:

33

34

a) Intervals uniformly at 6-inch

35

b) Manufacturer's Name or Trademark and production record

36

c) Nominal pipe size

37

d) ASTM or Dimension Ratio (DR) designation

38

e) Cell classification

39

f) Seal of testing agency that verified the suitability of the pipe

40

g. Dimension Classification

41

1) Potable and force main applications shall be Ductile Iron Pipe Size (DIPS/DIOD).

42

- 1 2) 1-inch and 2-inch potable water service lines shall be of copper tube size
- 2 (CTS) and in accordance with all AWWA C901 standards.
- 3 3) All other uses may be Iron Pipe Size (IPS).
- 4 2. Connections
- 5 a. Use only manufactured fittings in accordance with ASTM D3261
- 6 b. HDPE fabricated fittings shall have pressure class ratings not less than the
- 7 pressure class rating of the pipe to which they are joined.
- 8 1) For pressure applications, a minimum pressure rating of 200 psi is required
- 9 for all fittings.
- 10 3. Tracer Wire/Detectable Metallic Tape in accordance with Section 33 05 97.
- 11 4. Polyethylene Repair Clamp
- 12 a. Smith-Blair Full Circle Clamp Style 228 or 263.
- 13 b. Should any other mechanical restraints be required, they shall be in accordance
- 14 with Sections 33 14 05 and 33 14 10.

15 **2.3 ACCESSORIES [NOT USED]**

16 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

17 **PART 3 - EXECUTION**

18 **3.1 INSTALLERS [NOT USED]**

19 **3.2 EXAMINATION [NOT USED]**

20 **3.3 PREPARATION [NOT USED]**

21 **3.4 INSTALLATION**

22 **A. General**

- 23 1. Install pipe, fittings, specials, and appurtenances in accordance with this Section
- 24 and the pipe manufacturer's recommendations.
- 25 2. Lay pipe to the lines and grades as indicated in the Drawings.
- 26 3. Excavate and backfill trenches in accordance with Section 33 05 05.
- 27 4. Embed pipe in accordance with Section 33 05 05.

28 **B. Pipe Handling**

- 29 1. Haul and distribute pipe and fittings at the project site.
- 30 2. Handle piping with care to avoid damage.
- 31 a. Inspect each joint of pipe and reject or repair any damaged pipe prior to
- 32 lowering into the trench.
- 33 b. Use only nylon ropes, slings, or other lifting devices that will not damage the
- 34 surface of the pipe for handling the pipe.
- 35 3. At the close of each operating day:
- 36 a. Keep the pipe clean and free of debris, dirt, animals, and trash – during and
- 37 after the laying operation.
- 38 b. Effectively seal the open end of the pipe using a gasketed night cap.

39 **C. Pipe Joining**

- 1 1. Join pipe in accordance with ASTM F2620.
- 2 2. Operators must be certified by the manufacturer to use the fusion equipment.
- 3 3. Follow the time and temperature recommendations of the manufacturer.
- 4 4. Joints shall be stronger than the pipe itself, be properly aligned, and contain no gaps
- 5 or voids.
- 6 5. Remove the internal bead created by the thermo butt-fusion welding process (for
- 7 sizes smaller than 8-inch). The internal bead shall be removed using equipment
- 8 specifically designed for this application. After the bead is cut from the pipe joint
- 9 the scrap bead shall be removed from the pipe.
- 10 a. For trenchless installations, the external bead may be required to be removed as
- 11 directed by City.
- 12 6. Each fusion joint shall be recorded and logged by an electronic monitoring device
- 13 (data logger) connected to the fusion machine that shall register and/or record the
- 14 parameters required by the manufacturer and these specifications. Data not logged
- 15 by the data logger shall be logged manually and be included in the Fusion
- 16 Technician's joint report.
- 17 D. Tracer Wire/Detectable Metallic Tape Installation in accordance with Section 33 05 97.
- 18

19 **3.5 REPAIR**

- 20 A. Repair any damaged pipe, fittings, specials, and appurtenances in accordance with this
- 21 Section and the pipe manufacturer's recommendations. Faulty fusion joints must be
- 22 removed and remade.

23 **3.6 RE-INSTALLATION [NOT USED]**

24 **3.7 FIELD QUALITY CONTROL**

- 25 A. Potable Water Mains
- 26 1. Hydrostatic testing:
- 27 a. Hydrostatically test the mains in accordance with Section 33 01 10.
- 28 B. Sewer Force Mains
- 29 1. Hydrostatic testing:
- 30 a. Hydrostatically test the mains in accordance with Section 33 01 10.
- 31 C. Gravity Sewer Mains
- 32 1. Closed Circuit Television (CCTV) Inspection
- 33 a. Provide a Post-CCTV Inspection in accordance with Section 33 01 30.
- 34 2. Sewer Pipe Testing
- 35 a. Test pipe in accordance with Section 33 01 31.

36 **3.8 SYSTEM STARTUP [NOT USED]**

37 **3.9 ADJUSTING [NOT USED]**

38 **3.10 CLEANING**

- 39 A. Potable Water Mains

- 1 1. Cleaning, disinfection, and bacteriological testing of water mains:
- 2 a. Clean, flush, pig, disinfect, and bacteriological test the mains in accordance
- 3 with Section 33 01 10.
- 4

- 1 B. Sewer Force Mains
- 2 1. Cleaning of sewer force mains
- 3 a. Clean the mains in accordance with Section 33 01 32.
- 4 C. Gravity Sewer Mains
- 5 1. Cleaning of sewer mains:
- 6 a. Clean the mains in accordance with Section 33 01 32.

7 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

8 **3.12 PROTECTION [NOT USED]**

9 **3.13 MAINTENANCE [NOT USED]**

10 **3.14 ATTACHMENTS [NOT USED]**

11 **END OF SECTION**

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Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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1 **SECTION 33 14 17**
2 **WATER SERVICES 1-INCH AND 2-INCH**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Lead-free 1-inch to 2-inch water service lines from the water main to the right-of-way,
6 fittings and water meter boxes complete in place, as shown on the Drawings, and
7 specified in this Section for:

- 8 1. New Water Service
- 9 2. New Bored Water Service
- 10 3. New Water Service (City Performed)
- 11 4. Private Water Service

12 B. Deviations from this City of Denton Standard Specification:

- 13 1. None.

14 C. Related Specification Sections include but are not limited to:

- 15 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the
16 Contract.
- 17 2. Division 1 – General Requirements.
- 18 3. Section 33 01 10 – Cleaning and Acceptance Testing of Water Mains.
- 19 4. Section 33 05 05 – Utility Trench Excavation, Embedment and Backfill.
- 20 5. Section 33 05 97 – Utility Markers/Locators.
- 21 6. Section 33 14 14 – High Density Polyethylene (HDPE) Pipe.
- 22 7. Section 33 14 25 – Connection to Existing Water Mains.

23 **1.2 PRICE AND PAYMENT PROCEDURES**

24 A. Measurement and Payment

- 25 1. New Water Service
- 26 a. Measurement
- 27 1) Measurement for this item shall be per each new “Water Service” complete
28 in place from the tap of the main to the installation of the meter box and
29 associated appurtenances where the service line is installed by open cut
30 construction.
- 31 b. Payment
- 32 1) The work performed and materials furnished in accordance with this item
33 and measured as provided under “Measurement” will be paid for at the unit
34 price bid per each “Water Service” installed for:
 - 35 a) Various sizes.
- 36 c. The price bid shall include:
 - 37 1) Furnishing and installing New Service Line as specified by the Drawings
 - 38 2) Utility Markers/Locators
 - 39 3) Submitting product data

- 1 4) Tapping saddle
- 2 5) Corporation stop
- 3 6) Angle stop
- 4 7) Fittings
- 5 8) Service line installed by open cut
- 6 9) Connection to meter
- 7 10) Meter Box and Lid
- 8 11) Temporary lighting
- 9 12) Traffic Control associated with connection
- 10 13) Plating of open trenches
- 11 14) Pavement removal
- 12 15) Excavation
- 13 16) Hauling
- 14 17) Disposal of excess material
- 15 18) Furnishing, placing, and compaction of embedment
- 16 19) Furnishing, placing, and compaction of backfill
- 17 20) Surface restoration
- 18 21) Clean-up
- 19 22) Disinfection
- 20 23) Testing
- 21 2. New Bored Water Service
- 22 a. Measurement
- 23 1) Measurement for this item shall be per each new “Bored Water Service”
- 24 complete in place from the tap of the main to the installation of the meter
- 25 box and associated appurtenances where the service line is installed by
- 26 directional drilling.
- 27 b. Payment
- 28 1) The work performed and materials furnished in accordance with this item
- 29 and measured as provided under “Measurement” will be paid for at the unit
- 30 price bid per each “Water Service” installed for:
- 31 a) Various sizes.
- 32 c. The price bid shall include:
- 33 1) Furnishing and installing New Service Line as specified by the Drawings
- 34 2) Submitting product data
- 35 3) Tapping saddle
- 36 4) Corporation stop
- 37 5) Angle stop
- 38 6) Fittings
- 39 7) Service line installed by directional drilling
- 40 8) Connection to meter
- 41 9) Meter Box and Lid
- 42 10) Temporary lighting
- 43 11) Traffic Control associated with connection
- 44 12) Plating of open trenches
- 45 13) Pavement removal
- 46 14) Excavation
- 47 15) Hauling
- 48 16) Disposal of excess material
- 49 17) Furnishing, placing, and compaction of embedment

- 1 18) Furnishing, placing, and compaction of backfill
- 2 19) Surface restoration
- 3 20) Clean-up
- 4 21) Disinfection
- 5 22) Testing
- 6 3. New Water Service (City Performed)
- 7 a. Measurement
- 8 1) Measurement for this item shall be per each connection completed.
- 9 b. Payment
- 10 1) The work performed and the materials furnished in accordance with this
- 11 item shall be paid for at the unit price bid per each "Water Service (City
- 12 Performed)" installed for:
- 13 a) Various sizes.
- 14 c. The price bid shall include all aspects of making the connection including, but
- 15 not limited to:
- 16 1) Preparing submittals (if necessary)
- 17 2) Exploratory excavation (as needed)
- 18 3) Coordination and notification
- 19 4) Remobilization
- 20 5) Temporary lighting
- 21 6) Traffic Control associated with connection
- 22 7) Plating of open trenches
- 23 8) Pavement removal
- 24 9) Plating of open trenches
- 25 10) Excavation
- 26 11) Hauling
- 27 12) Disposal of excess material
- 28 13) Clean-up
- 29 14) Surface restoration
- 30 15) Disinfection
- 31 16) Testing
- 32 d. The price bid shall not include the following:
- 33 1) Fees paid to City to perform connection in accordance with City
- 34 Development Code 35.21.8 Tapping Fees will be the responsibility of the
- 35 Contractor.
- 36 4. Private Water Service Relocation
- 37 a. Measurement
- 38 1) Measurement for this item shall be per linear foot of Private Service
- 39 relocation complete in place from the meter box to a connection to the
- 40 existing service line on private property.
- 41 b. Payment
- 42 1) The work performed in conjunction with Private Service Line installation
- 43 where the meter and meter boxes are moved more than 5 feet in any
- 44 direction from centerline of existing meter location and materials furnished
- 45 in accordance with the item and measured as provided under
- 46 "Measurement" will be paid for at the unit price bid per linear foot of
- 47 "Private Water Service" performed for:
- 48 a) Various service sizes.

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- 1 c. The price bid shall include:
- 2 1) Obtaining required permit(s)
- 3 2) Obtaining Right of Entry
- 4 3) Submitting product data
- 5 4) Private service line
- 6 5) Fittings
- 7 6) Backflow preventer, check valve, and isolation valve relocation, if
- 8 applicable
- 9 7) Connection to existing private service line
- 10 8) Pavement removal and replacement
- 11 9) Temporary lighting
- 12 10) Traffic Control associated with connection
- 13 11) Plating of open trenches
- 14 12) Excavation
- 15 13) Hauling
- 16 14) Disposal of excess material
- 17 15) Furnishing, placing, and compaction of embedment and backfill
- 18 16) Surface restoration
- 19 17) Clean-up
- 20 18) Cleaning
- 21 19) Disinfection
- 22 20) Testing

23 1.3 REFERENCES

24 A. Reference Standards

- 25 1. Reference standards cited in this Section refer to the current reference standard
- 26 published at the time of the latest revision date logged at the end of this Section,
- 27 unless a date is specifically cited.
- 28 2. ASTM International (ASTM):
- 29 a. A48, Standard Specification for Gray Iron Castings.
- 30 b. A536, Standard Specification for Ductile Iron Castings.
- 31 c. B88, Standard Specification for Seamless Copper Water Tube.
- 32 d. B98, Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes.
- 33 e. C131, Standard Specification for Resistance to Degradation of Small-Size
- 34 Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- 35 f. C150, Standard Specification for Portland Cement.
- 36 g. C330, Standard Specification for Lightweight Aggregates for Structural
- 37 Concrete.
- 38 h. C857 (RL), Standard Practice for Minimum Structural Design Loading for
- 39 Underground Precast Concrete Utility Structures
- 40 i. D883, Standard Terminology Relating to Plastics.
- 41 j. D1693, Standard Test Method for Environmental Stress-Cracking of Ethylene
- 42 Plastics
- 43 3. American Water Works Association (AWWA):
- 44 a. C700, Cold-Water Meters - Displacement Type, Bronze Main Case.
- 45 b. C800, Underground Service Line Valves and Fittings.
- 46 c. C901, Polyethylene (PE) Pressure Pipe and Tubing, 3/4-inch through 3-inch,
- 47 for Water Service.

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- 1 4. NSF International (NSF):
- 2 a. 61, Drinking Water System Components - Health Effects.
- 3 b. 372, Drinking Water System Components – Lead Content.
- 4 5. Reduction of Lead in Drinking Water Act
- 5 a. Public Law 111-380 (P.L. 111-380)
- 6 6. General Services Administration (GSA):
- 7 a. RR-F-621E, Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

8 **1.4 ADMINISTRATIVE REQUIREMENTS**

9 A. Scheduling

- 10 1. Provide advance notice for service interruption to property owner in accordance
- 11 with Section 01 35 13.
- 12 2. Service interruptions may only occur during normal business hours from Monday
- 13 through Friday, unless otherwise approved by the City.

14 **1.5 SUBMITTALS**

15 A. Submittals shall be in accordance with Section 01 33 00.

16 B. All submittals shall be approved by the City prior to delivery.

17 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

18 A. Product Data, if applicable:

- 19 1. Tapping Saddle
- 20 2. Corporation Stop
- 21 3. Angle Stop
- 22 4. Service Line
- 23 5. Meter Box
- 24 6. Meter Box Lid

25 B. Certificates and Test Reports

- 26 1. Prior to shipment of any Water Service components, the manufacturer shall submit
- 27 the following:
- 28 a. A Certificate of Adequacy of Design stating the components furnished comply
- 29 with all regulatory requirements identified in this Section including:
- 30 1) The Reduction of Lead in Drinking Water Act (P.L. 111-380)
- 31 2) AWWA C800
- 32 3) NSF 61 and 372

33 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

34 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

35 **1.9 QUALITY ASSURANCE**

36 A. Qualifications

- 37 1. Manufacturers
- 38 a. In accordance with AWWA C800, NSF 61 and 372, the Reduction of Lead in
- 39 Drinking Water Act, and this Section.

1 **1.10 DELIVERY, STORAGE, AND HANDLING**

2 A. Storage and Handling Requirements

- 3 1. Protect parts such that no damage or deterioration will occur during a prolonged
4 delay from the time of shipment until installation is completed and the units and
5 equipment are ready for operation.
6 2. Protect all equipment and parts against any damage during a prolonged period at the
7 site.
8 3. Prevent plastic and similar brittle items from being directly exposed to sunlight or
9 extremes in temperature.
10 4. Secure and maintain a location to store the material in accordance with Section 01
11 66 00.

12 **1.11 FIELD CONDITIONS [NOT USED]**

13 **1.12 WARRANTY [NOT USED]**

14 **PART 2 - PRODUCTS**

15 **2.1 CITY-FURNISHED**

16 A. When tapping fees are paid for City to perform the work, City shall furnish all fittings,
17 service lines, and other appurtenances from the main to the meter box.

18 B. Water meters for various sizes.

19 **2.2 EQUIPMENT, PRODUCT TYPES, MATERIALS**

20 A. Manufacturers

21 1. Manufacturer List

- 22 a. Water Service Tapping Saddle (Brass Double Strap with CC Threads)
23 1) Mueller/BR2B,
24 2) Ford Meter Box/202B
25 b. Corporations Valves
26 1) Mueller/P15008N, P25008N (for 1" Line) 1": Brass, CC Inlet Threads &
27 Pack Joint Filling
28 2) Ford Meter Box/F1000NL, FB1000NL (for 1" Line) Key or Ball Type
29 3) Mueller/E25009N (for 2" Line) 2": Brass, CC Inlet Threads & Pack Joint
30 Fitting
31 4) Ford Meter Box/FBNL1000NL (for 2" Line) Ball type, NSF 372 compliant
32 c. Angle Meter Valves
33 1) Mueller/P24258N (for 1" Line) Brass, Angle Meter with Pack Jointing &
34 Lock Wing
35 2) Ford Meter Box/BA43NL (for 1" Line) Ball type
36 3) Mueller/P24276N (for 2" Line)
37 4) Ford Meter Box/BFA43NL (for 2" Line)

38 2. Water Meter Box/Can

- 39 a. Unpaved areas:
40 1) 3/4": Bass & Hays/34B
41 2) 1": Bass & Hays/548A

- 1 3) 1 1/2" & 2": Bass & Hays/55A
2 b. Paved areas (not requiring H-20 loading):
3 1) 3/4": Bass & Hays/ P34PD18
4 2) 1": Bass & Hays/ P55PD18
5 3) 1 1/2" & 2": Bass & Hays/ P55PD18
6 c. Paved areas (H-20 loading):
7 1) 3/4" and 1": Old Castle B1324
8 2) 1 1/2" & 2": Old Castle B1730
9 3. Substitution requests for manufacturers or models not indicated above shall be
10 processed in accordance with Section 01 25 00.
11 4. The services and appurtenances shall be new and the product of a manufacturer
12 regularly engaged in the manufacturing of services and appurtenances having
13 similar service and size.
14 B. Materials/Design Criteria
15 1. Service Lines
16 a. Type K Copper Tubing per ASTM B88.
17 1) Furnish in the annealed conditions, unless otherwise specified in the
18 Contract Documents.
19 2) Copper is required for use crossing gas station sites and other sites where
20 hydrocarbon is present in the soil.
21 b. HDPE pipe and fittings
22 1) In accordance with AWWA C901 and Section 33 14 14.
23 2) Tracer wire
24 a) Continuous, insulated TW, THW, THWN, or HMWPE insulated
25 copper, 10 gauge or thicker wire for pipeline location purposes by
26 means of an electronic line tracer.
27 2. Service Couplings
28 a. Fitting Ends
29 1) Pack joints with external clamp and CC thread dimensions in accordance
30 with AWWA C800.
31 2) Provide coupling nuts with a machined bearing skirt of a length equal to the
32 tubing outer diameter (O.D.).
33 b. Provide with hexagonal wrench grip compatible with coupling size.
34 c. Provide lead-free service couplings in accordance with the Reduction of Lead
35 in Drinking Water Act.
36 3. Brass Fittings
37 a. Pack joint type for copper service line.
38 b. Compression, grip joint, or quick joint fittings are only allowed for HDPE
39 service lines. Stainless steel stiffener shall be used on all compression fittings.
40 4. Corporation stops
41 a. Provide brass castings per AWWA C800 for:
42 1) Bodies
43 2) Plugs
44 3) D washers
45 4) Bottom nuts
46 b. Machining and Finishing of Surfaces

- 1) Provide 1 3/4 inch per foot or 0.1458 inch per inch \pm 0.007 inch per inch taper of the seating surfaces for the key and body.
- 2) Reduce large end of the tapered surface of the key in diameter by chamfer or turning for a distance that will bring the largest end of the seating surface of the key into the largest diameter of the seating surface of the body.
- 3) Relieve taper seat in the body on the small end.
- 4) Extend small end of the key there-through to prevent the wearing of a shoulder and facilitate proper seating of key.
- 5) Design key, key nut, and washer such that if the key nut is tightened to failure point, the stem end of the key shall not fracture.
- 6) Design nut and stem to withstand a turning force on the nut of at least 3 times the necessary effort to properly seat the key without failure in any manner.
- 7) Port through corporation stop shall be full size to eliminate turbulence in the flow way.
- 8) Design stop for rotation about the axis of the flow passageway inside the following minimum circles in order to properly clear the tapping machine:
 - a) Two 7/8-inch for 1-inch corporation stops
 - b) Four 15/16-inch for 2-inch corporation stops
- c. Provide lead-free corporation stops in accordance with the Reduction of Lead in Drinking Water Act.
5. Straight Adapters
 - a. Brass castings and threads in accordance with AWWA C800.
 - b. Lead-free in accordance with the Reduction of Lead in Drinking Water Act.
6. Three Part Copper Unions
 - a. Brass castings and threads in accordance with AWWA C800.
 - b. Lead-free in accordance with the Reduction of Lead in Drinking Water Act.
7. Straight Meter Couplings
 - a. Brass castings in accordance with AWWA C800.
 - b. Threads in accordance with AWWA C700.
 - c. Tailpiece with outside iron pipe thread
 - d. Chamfer corners on threaded end of meter nut.
 - e. Machine inside and outside of tailpiece.
 - f. Lead-free in accordance with the Reduction of Lead in Drinking Water Act.
8. Branch Connections
 - a. Brass castings in accordance with AWWA C800.
 - b. Inlet and outlet connections in accordance with AWWA C800.
 - c. Lead-free in accordance with the Reduction of Lead in Drinking Water Act.
9. Service Saddles
 - a. Brass castings in accordance AWWA C800.
 - 1) Free of porosity with sharp edges removed
 - 2) Form to fit firmly against side of maximum diameter of water main with approximately 180 degrees wrap around.
 - 3) Outlet
 - a) Design outlet boss for no thread distortion by bending moments.
 - b) Tapped for taper threaded corporation stop conforming to AWWA C800.
 - b. Straps

- 1) In accordance with ASTM B98.
 - 2) Form flat to fit uniformly against the wall of the water main.
 - 3) Double straps required
 - 4) Rod diameter not less than 5/8 inch flattened to 1 inch on one side.
 - 5) Threaded 5/8 inch (11-NC-2A) for a distance such that 1/2 inch remains after clamp is fully tightened on the pipe
 - 6) Chamfer strap ends to protect the starting threads.
 - 7) Threads shall be full and free from shear.
 - 8) 4-inch and larger pipe in accordance with Section 33 14 25.
- c. Nuts
- 1) Bronze material
 - a) Same material as straps.
 - 2) Dimensions equal to or larger than heavy hexagon nuts.
 - 3) Tapped 5/8 inch (11-NC-2B).
- d. Gaskets
- 1) Neoprene rubber material
 - 2) Cemented to saddle and positioned to facilitate installation
10. Brass Flanged Angle Valve
- a. For 1-inch and 2-inch services
 - b. Brass castings in accordance with AWWA C800
 - c. Locking wing and pack joint fitting
 - d. Valve Body with integral outlet flange and inlet wrenching flat
 - e. Key and body fit together by turning key and reaming body
 - 1) Key with O-ring seal seat at the upper end
 - 2) Lap key and body seat in accordance with corporation stop requirements of this Section.
 - 3) The outlet flange shall contain an O-ring seat or a uniform flat drop-in flange gasket surface.
 - 4) Drop-in flange gasket surface shall contain gasket retaining grooves milled circular about the axis of the flange.
 - 5) The size of the outlet flange and the diameter and spacing of the bolt holes in accordance with AWWA C700.
 - 6) The flange on 2-inch angle valves shall be double drilled to permit connection to 1 1/2 -inch meters.
 - 7) The inlet port of the valve shall be tapered in accordance with AWWA C800 taper pipe thread.
 - 8) The key cap shall include a wrenching tee marked with a raised or recessed arrow to show whether the valve is open or closed.
 - 9) Valve Assembly (main body, key, key cap)
 - a) Brass material in accordance with AWWA C800.
 - b) O-ring seal on the top of the key between the key and body seat
 - c) Key cap shall complete the assembly by attaching to key by means of a strong bronze pin with phosphor bronze spring washer(s) depressed between key cap and the top of the valve main body.
 - d) Provide with padlock wings for locking the valve in closed position.
 - e) Uniform application of cold-water valve grease between the body and the key
 - f) Capable of being easily opened and stopping lugs

- g) The waterway through the valve shall be smooth and rounded for minimum pressure loss and free of burrs or fins.
 - h) Strong, well designed, neat in appearance, water-tight and entirely adequate for the intended purpose.
 - i) Either a high-quality rubber drop-in gasket or an O-ring seal required depending on the manufacturer's flange seal surface design choice.
- f. Lead-free in accordance with the Reduction of Lead in Drinking Water Act.

11. Meter Boxes:

a. Materials:

- 1) Galvanized Steel
 - a) Coated cast gray iron, ASTM A48 CL35B
- 2) Polymer, black polyethylene material in accordance with ASTM D883 and ASTM D1693.
 - a) Minimum wall thickness of 3/8-inch throughout, free of blowing agents or foaming plastics
 - b) Body shall be black throughout, blended at the time of manufacture, and have a molded recycled emblem with a minimum of 35 percent Post Industrial/ Pre-Consumer Recycled Content- verified with a Leed Product Documentation.
 - c) Tensile strength greater than 1700 pounds per square inch (psi).
 - d) Smooth edges and corners such that the unit can be handled safely without gloves.
 - e) Exterior free from seams or parting lines.
 - f) Have crush resistant ribbing along the outside of the box.
 - g) Have a flange around the lid opening to help prevent settling and aide in adjustment to grade.
 - h) Not to be installed in roadway – designed to withstand loading in non-deliberate and incidental traffic only.
- 3) Concrete
 - a) Frame of No. 6 gauge wire welded closed
 - b) Type I or Type II Portland cement, in accordance with ASTM C150, portioned with lightweight aggregate, in accordance with ASTM C330
 - (1) Percentage of wear not to exceed 40 per ASTM C131
 - (2) Minimum 28-day compressive strength of 3,000 psi
 - (3) Be designed in accordance with ASTM C857

b. Other Requirements:

- 1) Placed in unpaved areas primarily or other areas not requiring H-20 loading. Concrete meter boxes with ductile iron lids are only required when H-20 loading is necessary.
- 2) Withstand a minimum 15,000 pounds vertical load
- 3) Withstand a minimum 400 pounds sidewall load.
- 4) Pipe holes measuring a minimum of 2-1/2" x 3-1/4".
- 5) Standard Sizes:
 - a) For unpaved areas:
 - (1) 3/4-inch: 18-inch Depth x 18-inch Diameter
 - (2) 1-inch: 18-inch Depth x 24-inch Diameter
 - (3) 1-1/2 & 2-inch: 18-inch Depth x 28-inch Diameter
 - b) For paved areas (not requiring H-20 loading):
 - (1) 3/4-inch: 18-inch Depth x 18-inch Diameter

- 1 (2) 1-inch: 18-inch Depth x 30-inch Diameter
- 2 (3) 1-1/2 & 2-inch: 18-inch Depth x 30-inch Diameter
- 3 c) For paved areas (H-20 loading) Concrete Meter Box:
- 4 (1) 3/4-inch and 1-inch: working area not less than 10-inches x 16-
- 5 inches, 12 inches high
- 6 (2) 1-1/2 & 2-inch: working area not less than 15-inches x 26-1/2-
- 7 inches, 12 inches high

8 12. Meter Box Lid

9 a. General Requirements:

- 10 1) Solid throughout with reinforcing ribs.
- 11 2) Bear the Manufacturer's IS (name or logo) and Country of Origin.
- 12 3) Designed both with and without AMI receptacles
- 13 4) Molded tread-plate
- 14 5) Seat securely and evenly inside the meter box and shall not overlap the top
- 15 edge of the meter box.
- 16 6) Molded pick bar for use by meter reading tool.
- 17 7) Automated Meter Infrastructure (AMI) snap locking slide mounts for
- 18 number of meters/endpoints associated with meter box. Caps for AMI
- 19 receptacle shall be UV resistant.
- 20 8) Have an opening to accept the AMI end-point. Opening shall accommodate
- 21 an endpoint with a 1-7/8 inches diameter.
- 22 9) Have recessed AMI end point area, to alleviate a trip hazard, centered over
- 23 AMI slide mount. Recess area should be 4-1/2 inches in diameter and 3/8"
- 24 deep.
- 25 10) Have built-in anti-flotation devices.

26 b. Cast Iron or Ductile Iron Lid Requirements:

- 27 1) Lids for Concrete Meter Boxes shall be constructed out of a cast iron and in
- 28 accordance with RR-F-621E.
- 29 2) Should Ductile Iron be used, provide in accordance with ASTM A536
- 30 3) Withstand a minimum vertical load of 15,000 pounds
- 31 4) Coat castings with a bituminous emulsified asphalt unless otherwise
- 32 specified in the Contract Documents, ground smooth, and cleaned with shot
- 33 blasting, to get a uniform quality free from strength defects and distortions.
- 34 5) Within industry standard dimensions of $\pm 1/16$ inch per foot.
- 35 6) Provide a plug inserted in to the AMI receptacle to avoid water entering
- 36 through opening until the AMI receptacle is used
- 37 7) Minimum of 1-3/4 inches thick at reinforcing ribs.
- 38 8) Casting weights may vary ± 5 percent from drawing weight per industry
- 39 standards.
- 40 9) Polymer lids are not allowed.

41 13. Service Line Marker/Tracer Wire

- 42 a. In accordance with Section 33 05 97 – Utility Markers/Locators
- 43 b. End of service line shall have 3-inch-wide, 5 mil blue vinyl tape set at 6" above
- 44 ground for locating prior to meter box installation.

45 **2.3 ACCESSORIES [NOT USED]**

46 **2.4 SOURCE QUALITY CONTROL**

47 A. Tests and Inspections

- 1 1. At the City's option, the manufacturer shall be required to provide certification
2 records showing conformance of materials, design and testing to this Section.
- 3 2. Perform test procedures in accordance with AWWA C800.
4 a. In the event that a chosen valve fails the City's hydrostatic test, the cost of the
5 test shall be at the expense of the supplier.
6 b. Proof testing of the remainder of the valves shall be at the cost and
7 responsibility of the supplier.
8 c. These tests will be the basis of acceptance or rejection of the remainder of the
9 shipment by the City.
- 10 3. The City reserves the right to select products at random for testing. The failure of
11 materials to conform to the applicable Section may result in the rejection of the
12 entire shipment.

13 **B. Marking**

- 14 1. Service saddle castings shall be clearly marked by letters and numerals cast thereon
15 showing:
16 a. Manufacturer's name
17 b. Type
18 c. Size of Pipe

19 **PART 3 - EXECUTION**

20 **3.1 INSTALLERS**

- 21 A. A licensed plumber is required for installations on the outlet side of the service meter.

22 **3.2 EXAMINATION [NOT USED]**

23 **3.3 PREPARATION [NOT USED]**

24 **3.4 INSTALLATION**

25 **A. General**

- 26 1. City will perform all tapping connections to the existing water system. The fees
27 charged to perform this work shall be paid for in accordance with the published
28 City tapping fees.
- 29 2. Water meter installation is performed by the City.
- 30 3. Install Water Services and appurtenances in accordance with AWWA C800.
- 31 4. Install Water Service Lines where shown on Drawings.
- 32 5. Install services at a minimum depth of 36 inches below final grade/proposed top of
33 curb, unless otherwise specified in the Contract Documents.
- 34 6. Perform leak tests in accordance with Section 33 01 10.
- 35 7. Replace existing 3/4-inch Service Lines with 1-inch new Service Line, tap, and
36 corporation.
- 37 8. Install replaced or relocated services with the service main tap and service line
38 being in line with the service meter, unless otherwise directed by the City.
- 39 9. Excavate, embed and backfill trenches in accordance with Section 33 05 05.

1 B. Handling

- 2 1. Haul service lines and fittings at the project site and handle with care to avoid
3 damage.
4 a. Inspect each segment of Service Line and reject or repair any damaged pipe
5 prior to lowering into the trench.
6 b. Do not handle the pipe in such a way that will damage the pipe.
7 2. At the close of each operating day:
8 a. Keep the pipe clean and free of debris, dirt, animals and trash – during and after
9 the laying operation.
10 b. Effectively seal the open end of the pipe using a gasketed night cap.

11 C. Service Line Installation

12 1. Service Taps

- 13 a. Tap Assemblies (when installed by contractor on unpressurized line)
14 1) Consist of corporation stop with iron to copper connection attached to:
15 a) Copper tubing or HDPE line terminating in accordance with the City's
16 Standard Detail
17 b) May be required adjacent to gate valves
18 c) Install as shown on the Drawings
19 d) Included in the unit price bid for installing gate valve or other
20 appurtenances, as required.
21 2) Chlorination and testing purposes
22 a) No separate payment will be made for taps required for testing and
23 chlorination.

24 2. Installation of Water Services

- 25 a. Connect to tap and install Service Line in accordance with City Details.
26 b. For HDPE services, install tracer wire in accordance with this Section.
27 c. Install meter box in accordance with City Details.
28 1) Adjustment of Service Line to proper meter placement height shall be
29 considered as part of Meter Box installation.

30 3. Trenching

- 31 a. Provide a trench with sufficient width to allow for 2 inches of granular
32 embedment on either side of the Service Line which shall be compacted to 95-
33 percent of Standard Proctor density.

34 4. Bored Services

- 35 a. Services shall be bored utilizing a pilot hole having a diameter 1/2 inch to 3/4
36 inches larger than the service line
37 b. Installation shall be directional drill only, and no other methods are permitted.

38 5. Arrangement

- 39 a. Arrange corporation stops, branches, angle stops, meter spuds, meter boxes and
40 other associate appurtenances as shown in the City Detail.
41 b. Water meter installation is performed by the City.

42 6. Service Marker

- 43 a. When Meter Box is not installed immediately subsequent to service installation:
44 1) Attach strip of blue vinyl tape to angle stop, fastening at the end of the
45 service and extending through the backfill approximately 6 inches above
46 ground at the Meter Box location.
47 b. Installation of service taps only:

- 1) Attach strip of blue vinyl tape to the corporation stop or plug, extending upward and normal to the main through the backfill at the adjacent trench edge to at least 6 inches above ground to flag the tap location.
- 7. Corporation stops
 - a. Fully open corporation stop prior to backfill.
- 8. Tracer Wire (HDPE Services Only)
 - a. Install on top of service line along the entire length of the pipe.
 - 1) Do not wrap tracer wire around service line.
 - b. Ensure tracer wire extends a minimum of 12 inches into meter box.
 - c. Secure tracer wire to service line every 5 feet with tape.
 - d. Splice sections of wire together using splice caps and waterproof seals. Twisting the wires together is not allowed.

3.5 REPAIR

A. Tracer Wire

- 1. Where tracer wire insulation is damaged repair with electrical tape.

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL

A. Field Tests and Inspections

- 1. Check each Water Service installation for leaks and full flow through the angle stop at the time the main is tested in accordance with Section 33 01 10.
- 2. Tracer wire testing
 - a. Contractor shall demonstrate that the tracer wire is continuous and unbroken through the entire run of the service by showing full signal conductivity (including splices) when energizing the wire in the presence of City.
 - b. If the wire is broken, the Contractor shall repair or replace it. Service installation will not be accepted until the tracer wire passes a continuity test.

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

34

35 **END OF SECTION**

Revision Log

DATE	NAME	SUMMARY OF CHANGE

1

- 14) Furnishing, placement, and compaction of embedment
- 15) Furnishing, placement, and compaction of backfill
- 16) Clean-up
- 17) Cleaning
- 18) Disinfection
- 19) Testing
- 2. Cut-in Gate Valve
 - a. Measurement
 - 1) Measured per each “Cut-in Gate Valve” installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each “Cut-in Gate Valve” installed for:
 - a) Various sizes.
 - c. The price bid shall include:
 - 1) Furnishing and installing Gate Valves as specified by the Drawings
 - 2) System dewatering
 - 3) Connections to existing pipe materials
 - 4) Valve box
 - 5) Valve nut extension
 - 6) Valve vault and appurtenances (for 24-inch and larger gate valves)
 - 7) Integral bypass (30-inch only)
 - 8) Petrolatum tape for connections to flanges
 - 9) 2-inch risers (for 24-inch and larger gate valves)
 - 10) Isolation kits
 - 11) Polyethylene encasement
 - 12) Pavement removal
 - 13) Excavation
 - 14) Hauling
 - 15) Disposal of excess material
 - 16) Furnishing, placement, and compaction of embedment
 - 17) Furnishing, placement, and compaction of backfill
 - 18) Clean-up
 - 19) Cleaning
 - 20) Disinfection
 - 21) Testing

1.3 REFERENCES

A. Reference Standards

- 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
- 2. American Association of State Highway and Transportation Officials (AASHTO).
- 3. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
- 4. American Iron and Steel Institute (AISI).

- 1 5. ASTM International (ASTM):
 - 2 a. A48, Standard Specification for Gray Iron Castings.
 - 3 b. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi
4 Tensile Strength.
 - 5 c. A536, Standard Specification for Ductile Iron Castings.
 - 6 d. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and
7 Steel.
- 8 6. American Water Works Association/American National Standards Institute
9 (AWWA/ANSI):
 - 10 a. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 11 b. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and
12 Fittings.
 - 13 c. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron
14 Threaded Flanges.
 - 15 d. C509, Resilient-Seated Gate Valves for Water Supply Service.
 - 16 e. C515, Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
 - 17 f. C550, Protective Interior Coatings for Valves and Hydrants.
 - 18 g. C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 IN
19 through 60 IN, for Water Transmission and Distribution.
- 20 7. NSF International (NSF):
 - 21 a. 61, Drinking Water System Components - Health Effects.
 - 22 b. 372, Drinking Water System Components – Lead Content.

23 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

24 **1.5 SUBMITTALS**

- 25 A. Submittals shall be in accordance with Section 01 33 00.
- 26 B. All submittals shall be approved by the City prior to delivery.

27 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

28 A. Product Data

- 29 1. Resilient Seated (Wedge) Gate Valve
 - 30 a. Pressure rating
 - 31 b. Coating system
 - 32 c. Dimensions, weights, material list, and detailed drawings
 - 33 d. Joint type
 - 34 e. Maximum torque recommended by the manufacturer for the valve size
- 35 2. Polyethylene encasement and tape
- 36 3. Thrust Restraint
 - 37 a. Retainer glands
 - 38 b. Thrust harnesses
 - 39 c. Any other means
- 40 4. Instructions for field repair of fusion bonded epoxy coating
- 41 5. Gaskets

42 B. Certificates

1. Furnish an affidavit certifying all Resilient Seated (Wedge) Gate Valves meet the provisions of this Section, all inspections have been made and that all tests have been performed in accordance with AWWA C509 or AWWA C515.
2. Furnish an affidavit certifying Resilient Seated (Wedge) Gate Valve manufacturer has 5 years experience manufacturing Resilient Seated Gate Valves of similar service and size with experience record.
3. Furnish an affidavit certifying Resilient Seated (Wedge) Gate Valve manufacturer owns or controls any foreign factory/foundry that supplies valve casings and can certify that the Resilient Seated (Wedge) Gate Valve manufacturer is in control of quality control at the foreign factory/foundry.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers
 - a. Valves 16-inch and larger shall be the product of 1 manufacturer for each project.
 - 1) Change orders, specials, and field changes may be provided by a different manufacturer upon City approval.
 - b. For valves less than 16-inch, each valve size shall be the product of 1 manufacturer, unless approved by the City.
 - 1) Change orders, specials, and field changes may be provided by a different manufacturer upon City approval.
 - c. Valves shall be in accordance with AWWA C509 or AWWA C515.
 - d. For valves equipped with a bypass, the bypass valve must be of the same manufacturer as the main valve.
 - e. Resilient Seated Gate Valves shall be new.
 - f. Resilient Seated Gate Valve Manufacturer shall not have less than 5 years of successful experience manufacturing Resilient Seated Gate Valves of similar service and size and be able to demonstrate an experience record that is satisfactory to the City.
 - 1) Experience record will be thoroughly investigated by the City, and acceptance will be at the sole discretion of the City.
 - g. Casings for Resilient Seated Gate Valve, such as valve body, wedge, and bypass, that are not manufactured within the United States of America, shall be manufactured by factories/foundries that are owned or controlled (partial ownership) such that the Resilient Seated Gate Valve Manufacturer can control and guarantee quality at the foreign factory/foundry.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Protect all parts so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

2. Protect all equipment and parts against any damage during a prolonged period at the site.
3. Protect the finished surfaces of all exposed flanges with wooden blank flanges.
4. Protect finished iron or steel surfaces not painted to prevent rust and corrosion.
5. Prevent plastic and similar brittle items from being directly exposed to sunlight or extremes in temperature.
6. Secure and maintain a location to store the material in accordance with Section 01 66 00.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Manufacturers

1. Gate Valves
 - a. Mueller – A-2362 (AWWA C509) – Sizes 4” – 12”
 - b. Mueller – A-2361 (AWWA C515) – Sizes 14” – 30”
 - c. US Pipe – A-USP2 (AWWA C509) – Sizes 4” – 12”
 - d. US Pipe – A-USP1 (AWWA C515) – Sizes 14” – 30”
 - e. M&H Valve – Style 4067 (AWWA C509) – Sizes 4” – 12”
 - f. M&H Valve – Style 7000 (AWWA C515) – Sizes 14” – 30”
 - g. Clow Valve – Model 2639 (AWWA C509) – Sizes 4” – 12”
 - h. Clow Valve – Model 2638 (AWWA C515) – Sizes 14” – 30”
 - i. American Flow Control – Series 2500 (AWWA C515) – Sizes 14” – 30”
2. Valve Boxes
 - a. Tyler Union – 6850
 - b. Bass & Hays – 2436S
 - c. EJ - 8550
3. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

B. Description

1. Regulatory Requirements
 - a. Valves shall be new and in accordance with AWWA C509, AWWA C515 and this Section.
 - b. All valve components in contact with potable water shall conform to the requirements of NSF 61 and 372.

C. Materials

1. Valve Body
 - a. Valve body: Ductile iron per ASTM A536
 - b. Flanged ends: Furnish in accordance with AWWA/ANSI C115/A21.15.

- 1 c. Mechanical Joints: Furnish with outlets in accordance with AWWA/ANSI
2 C111/A21.11.
- 3 d. Valve interior and exterior surfaces: Fusion bonded epoxy coated, minimum 5
4 mils, in accordance with AWWA C550
- 5 e. Buried valves: Provide with polyethylene encasement in accordance with
6 AWWA/ANSI C105/A21.5.
- 7 1) Polyethylene encasement: Furnish in accordance with Section 33 14 10.
- 8 2. Wedge (Gate)
- 9 a. Resilient wedge: Rated at 250 psig cold water working pressure
- 10 b. 1 piece, fully encapsulated with a permanently bonded EPDM rubber.
- 11 3. Bypass
- 12 a. For 30-inch gate valves an integrally cast bypass on the body of the valve is
13 required.
- 14 1) For vertically oriented valves, orient the bypass on the same side of the gate
15 valve as the spur gear to allow operation of both valves from the vault
16 opening.
- 17 2) For horizontally oriented valves, orient the bypass opposite the spur/bevel
18 gear, and cast in the base of the valve.
- 19 3) The bypass shall be a minimum 2-inch in size.
- 20 4. Gate Valve Bolts and Nuts
- 21 a. Bonnet, Stuffing Box and Gear Box - Hex head bolt, and hex nut:
- 22 1) Buried Service – AISI 304 stainless steel
- 23 2) Non-buried Service
- 24 a) 4-inch through 12-inch valves – Steel ASTM A307 Gr. B, Zinc Plate
25 per ASTM B633, SC3
- 26 b) 16-inch and larger – AISI 304 stainless steel
- 27 5. Bolts and Nuts
- 28 a. Mechanical Joints
- 29 a) Provide bolts and nuts in accordance with Section 33 14 05.
- 30 b. Flanged Ends
- 31 1) In accordance with AWWA C115 or AWWA C207 depending on pipe
32 material.
- 33 2) Provide bolts and nuts in accordance with Section 33 14 05.
- 34 3) Provide flanged isolation kits when connecting to buried steel or concrete
35 pressure pipe in accordance with Section 33 01 12.
- 36 6. Joints
- 37 a. Valves: flanged, mechanical-joint, or any combination of these as specified on
38 the Drawings or in the project Specifications
- 39 1) Flanged-joints: AWWA/ANSI C115/A21.15, ASME B16.1, Class 125
- 40 a) Flange bolt circles and bolt holes in accordance with ASME B16.1,
41 Class 125.
- 42 b) Field fabricated flanges are prohibited.
- 43 2) Steel or concrete pressure pipe
- 44 a) Use flange-joints unless otherwise specified in the Contract
45 Documents.
- 46 3) Ductile Iron or PVC pressure pipe

- 1 a) Use mechanical joints with mechanically restrained retainer glands in
2 accordance with Section 33 14 05, unless otherwise specified in the
3 Contract Documents.
- 4 7. Operating Nuts
5 a. Supply for buried service valves
6 b. 1-15/16-inch square at the top, 2-inch at the base, and 1-3/4-inch high
7 c. Cast an arrow showing the direction of opening with the word "OPEN" on the
8 operating nut base.
9 d. To open, the operating nut shall be turned to the left (counter-clockwise)
10 direction.
11 1) Paint nut black per AWWA specifications
12 e. Connect the operating nut to the shaft with a shear pin that prevents the nut
13 from transferring torque to shaft or gear box that exceeds the manufacturer's
14 recommended torque.
15 f. Furnish handwheel operators for non-buried service or when shown in the
16 Drawings.
- 17 8. Gearing
18 a. Gate valves 24-inch and larger: Equip with a spur gear.
19 b. Spur gears for horizontally mounted valves are not allowed.
20 c. The spur gear shall be designed and supplied by the manufacturer of the valve
21 as an integral part of the gate valve.
- 22 9. Gaskets
23 a. Provide gaskets in accordance with Section 33 14 05.
- 24 10. Valve Stem
25 a. Provide valves with non-rising stem.

26 2.3 ACCESSORIES

- 27 A. Provide the following accessories as part of the gate valve installation:
28 1. Extension Stem: Provide a keyed solid extension stem of sufficient length to bring
29 the operating nut up to within 1 foot of the surface of the ground, when the
30 operating nut on the gate valve is 3 feet or more beneath the surface of the ground.
31 a. Extension stems are not required on City stock orders.
32 b. Do not bolt or attach extension stem to the valve-operating nut.
33 c. Provide extension stem of cold rolled steel with a cross-sectional area of 1
34 square inch, fitting loosely enough to allow deflection.
- 35 2. Furnish joint components such as gaskets, glands, lubricant, bolts, and nuts in
36 sufficient quantity for assembly of each joint.
- 37 3. Cast iron valve boxes and covers for buried service gate valves
38 a. Each valve box for 4-inch through 20-inch valves shall be 2-piece, 5 1/4-inch
39 shafts, screw type, consisting of a top section and a bottom section.
40 b. Design valve box covers to be easily removed to provide access to valve
41 operating nut.
42 c. Design valve box covers to stay in position and resist damage under AASHTO
43 HS 20 traffic loads.
44 d. Cast each cover with the word "WATER", "RECLAIMED", or "SEWER" in
45 raised letters on the upper surface.

- 1 e. Cast iron valve boxes and covers shall be in accordance with ASTM A48, Class
- 2 35B.
- 3 1) Valve box covers shall be round for potable water applications and square
- 4 for reclaimed water applications.
- 5 f. Box extension material shall be AWWA C900 PVC or ductile iron.

6 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

7 **PART 3 - EXECUTION**

8 **3.1 INSTALLERS [NOT USED]**

9 **3.2 EXAMINATION [NOT USED]**

10 **3.3 PREPARATION [NOT USED]**

11 **3.4 INSTALLATION**

12 A. General

- 13 1. Install all valves in vertical position when utilized in normal pipeline installation.
- 14 2. Place valves at line and grade as indicated on the Drawings.
- 15 3. Install polyethylene encasement installation in accordance with Section 33 14 10.

16 **3.5 REPAIR [NOT USED]**

17 **3.6 RE-INSTALLATION [NOT USED]**

18 **3.7 FIELD QUALITY CONTROL**

19 A. Field Inspections

- 20 1. Before acceptance of the installed valve, allow City to operate the valve.
- 21 a. City will be assessing the ease of access to the operating nut within the valve
- 22 box and ease of operating the valve from a fully closed to fully opened position.
- 23 b. If access and operation of the valve meet the City's criteria, valve will be
- 24 accepted as installed.
- 25 2. All buried flanges require City inspection prior to installation of embedment and
- 26 backfill.

27 B. Non-Conforming Work

- 28 1. If access and operation of the valve or its appurtenances does not meet City's
- 29 criteria, Contractor will remedy the situation until it meets City's criteria, at
- 30 Contractor's expense.

- 1 **3.8 SYSTEM STARTUP [NOT USED]**
- 2 **3.9 ADJUSTING [NOT USED]**
- 3 **3.10 CLEANING [NOT USED]**
- 4 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 5 **3.12 PROTECTION [NOT USED]**
- 6 **3.13 MAINTENANCE [NOT USED]**
- 7

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

1 **SECTION 33 14 25**
2 **CONNECTION TO EXISTING WATER MAINS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Connection to existing water mains to include, but not limited to:
7 a. Extending from an existing water main (dead-end).
8 b. Installing a tapping sleeve and valve (City performed).
9 c. Cutting in a fitting for a branch connection.

10 B. Deviations from City of Denton Standards:

- 11 1. None.

12 C. Related Specification Sections include but are not limited to:

- 13 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
14 Contract.
15 2. Division 1 - General Requirements.
16 3. Section 33 01 10 – Cleaning and Acceptance Testing of Water Mains.
17 4. Section 33 05 05 – Utility Trench Excavation, Embedment and Backfill.
18 5. Section 33 05 98 – Location of Existing Utilities.
19 6. Section 33 14 10 – Ductile Iron Pipe and Fittings.

20 **1.2 PRICE AND PAYMENT PROCEDURES**

21 A. Measurement and Payment

- 22 1. Connection to an existing unpressurized water main that does not require the City to
23 take part of the water system out of service
24 a. Measurement
25 1) This item is considered subsidiary to the water pipe being installed.
26 b. Payment
27 1) The work performed and the materials furnished in accordance with this
28 item are subsidiary to the unit price bid per linear foot of water pipe
29 complete in place, and no other compensation will be allowed.
30 2. City Performed connection to an existing pressurized water main by tapping sleeve
31 and valve
32 a. Measurement
33 1) Measurement for this item shall be per each connection completed.
34

- 1 b. Payment
- 2 1) The work performed and the materials furnished in accordance with this
- 3 item shall be paid for at the unit price bid per each “City Performed
- 4 Connection to Existing Water Main with tapping sleeve and valve”
- 5 installed for:
- 6 a) Various sizes of connecting main.
- 7 b) Various sizes of existing water distribution main.
- 8 c. The price bid shall include all aspects of making the connection including, but
- 9 not limited to:
- 10 1) Preparing submittals (if necessary)
- 11 2) Exploratory excavation (as needed)
- 12 3) Coordination and notification
- 13 4) Remobilization
- 14 5) Temporary lighting
- 15 6) Traffic Control associated with connection
- 16 7) Pavement removal
- 17 8) Plating of open trenches
- 18 9) Excavation
- 19 10) Hauling
- 20 11) Disposal of excess material
- 21 12) Connecting to City-installed tapping sleeve and valve
- 22 13) Clean-up
- 23 14) Cleaning
- 24 d. Tapping Fees associated with the City performing the connection to the water
- 25 main are paid for separately in accordance with City Development Code
- 26 35.21.8 Tapping Fees.
- 27 3. Connection to an existing water main requiring a shutdown of some part of the
- 28 water system
- 29 a. Measurement
- 30 1) Measurement for this item shall be per each connection completed.
- 31 b. Payment
- 32 1) The work performed and the materials furnished in accordance with this
- 33 item shall be paid for at the unit price bid per each “Connection to Existing
- 34 Water Main with Shutdown” installed for:
- 35 a) Various sizes of existing water distribution main.
- 36 c. The price bid shall include all aspects of making the connection including, but
- 37 not limited to:
- 38 1) Preparing submittals
- 39 2) Dewatering
- 40 3) Exploratory excavation (as needed)
- 41 4) Coordination and notification
- 42 5) Remobilization
- 43 6) Temporary lighting
- 44 7) Polyethylene encasement
- 45 8) Make-up pieces
- 46 9) Linings
- 47 10) Traffic Control associated with connection
- 48 11) Pavement removal
- 49 12) Plating of open trenches

- 1 13) Excavation
- 2 14) Hauling
- 3 15) Disposal of excess material
- 4 16) Clean-up
- 5 17) Cleaning
- 6 18) Disinfection
- 7 19) Testing

8 **1.3 REFERENCES**

9 A. Definitions

- 10 1. Exploratory Excavation - Involves the removal of surface soil, sometimes in several
- 11 locations, to verify the underground infrastructure or for the purpose of obtaining
- 12 information on subsurface conditions.
- 13 a. The City may perform exploratory excavation to locate pipe connections in
- 14 accordance with Section 33 05 98.

15 B. Reference Standards

- 16 1. Reference standards cited in this Section refer to the current reference standard
- 17 published at the time of the latest revision date logged at the end of this Section
- 18 unless a date is specifically cited.
- 19 2. American Water Works Association (AWWA):
- 20 a. C206, Field Welding of Steel Water Pipe.
- 21 3. NSF International (NSF):
- 22 a. 61, Drinking Water System Components – Health Effects.
- 23 b. 372, Drinking Water System Components – Lead Content.

24 **1.4 ADMINISTRATIVE REQUIREMENTS**

25 A. City performed connections shall only be performed where specifically indicated in the

26 Drawings.

27 B. Pre-installation Meetings

- 28 1. Required for any connections to an existing City water distribution system main
- 29 that requires a shutdown of some part of the water system.
- 30 2. May also be required for connections that involve shutting water service off to
- 31 certain critical businesses/operations, dictated at the City's discretion.
- 32 3. Schedule a pre-installation meeting a minimum of 2 weeks prior to proposed time
- 33 for the work to occur.
- 34 4. Contractor, City Inspector, and Water Utility Representative(s) are required to
- 35 attend meeting.
- 36 5. At the meeting:
- 37 a. Review work procedures as submitted and any adjustments made for current
- 38 field conditions.
- 39 b. Verify that all valves and plugs to be used have adequate thrust restraint or
- 40 blocking.
- 41 c. Schedule a test shutdown with the City.
- 42 d. Schedule the date for the connection to the existing system.

43 C. Scheduling

1

- 1 1. Schedule work to make all connections to existing water mains:
 - 2 a. During the period from November 1 through April 30, unless otherwise
 - 3 approved by the City.
 - 4 1) Connections that require water shut-downs on water mains 16-inches and
 - 5 larger are not permitted from May 1 through October 31.
 - 6 b. During normal business hours from Monday through Friday, unless otherwise
 - 7 approved by the City.
- 8 2. Schedule City Valve Crew by 1:00 P.M. a minimum of 1 business day prior to
- 9 planned disruption to the existing water system.
 - 10 a. In the event that other water system activities do not allow the existing main to
 - 11 be dewatered at the requested time, schedule work to allow the connection at an
 - 12 alternate time acceptable to the City.
 - 13 1) If water main cannot be taken out of service at the originally requested
 - 14 time, coordination will be required with the City to discuss rescheduling
 - 15 and compensation for mobilization.
 - 16 2) No additional payment will be provided if the schedule was altered at the
 - 17 Contractor's request.

18 **1.5 SUBMITTALS**

- 19 A. Submittals shall be in accordance with Section 01 33 00.
- 20 B. All submittals shall be approved by the City prior to delivery.

21 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 22 A. Submittals
 - 23 1. Provide a detailed sequence of work for 16-inch or larger connections which
 - 24 require shutdowns (critical connections may be required at smaller sizes per City
 - 25 discretion) that includes:
 - 26 a. Results of exploratory excavation
 - 27 b. Dewatering
 - 28 c. Procedure for connecting to the existing water main
 - 29 d. Time period for completing work from when the water is shut down to when
 - 30 the main is back in service
 - 31 e. Testing and repressurization procedures
 - 32 2. Welders that are assigned to work on connection to concrete cylinder or steel pipe
 - 33 must be certified and provide Welding Certificates, upon request, in accordance
 - 34 with AWWA C206.
 - 35 3. Completed City of Denton Standard Shutdown Authorization Request Form.
 - 36 a. Blank form will be provided by City Water Department upon request.

37 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

38 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

39 **1.9 QUALITY ASSURANCE**

- 40 A. All valve components in contact with potable water shall be in accordance with NSF 61
- 41 and NSF 372.

- 1 B. In accordance with the reduction of lead in Drinking Water Act, any product designed
2 for dispensing potable water shall meet both the NSF 61 and NSF 372 test standards via
3 third-party testing and certification.

4 **1.10 DELIVERY, STORAGE, AND HANDLING**

5 A. Storage and Handling Requirements

- 6 1. Protect parts so that no damage or deterioration occurs during a prolonged delay
7 from the time of shipment until installation is completed.
8 2. Protect all equipment and parts against any damage during a prolonged period at the
9 site.
10 3. Protect the finished surfaces of all exposed flanges using wooden flanges
11 4. Protect finished iron or steel surfaces not painted to prevent rust and corrosion.
12 5. Prevent plastic and similar brittle items from being exposed to direct sunlight and
13 extremes in temperature.
14 6. Secure and maintain a location to store the material in accordance with Section 01
15 66 00.

16 **1.11 FIELD CONDITIONS [NOT USED]**

17 **1.12 WARRANTY [NOT USED]**

18 **PART 2 - PRODUCTS**

19 **2.1 CITY-FURNISHED**

- 20 A. City to furnish all tapping sleeves and valves, for City performed connections.

21 **2.2 MATERIALS**

- 22 A. For a connection to an existing unpressurized water main that does not require the City
23 to shut down the water system, meet the requirements of this Section, Section 33 01 10,
24 and Section 33 14 10.

25 **2.3 ACCESSORIES [NOT USED]**

26 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

27 **PART 3 - EXECUTION**

28 **3.1 INSTALLERS [NOT USED]**

29 **3.2 EXAMINATION**

30 A. Verification of Conditions

- 31 1. Verify existing water main is as depicted in the Drawings and that the location is
32 suitable for a connection to the existing water main.
33 a. If exploratory excavation is needed, excavate, and backfill trench in accordance
34 with 33 05 05.

2. Verify all equipment and materials are available on-site prior to the shutdown of the existing main.
3. Verify all notices and coordination with the City has taken place.
4. Water mains shall be completed, tested, and authorized for connection to the existing system in accordance with Section 33 01 10.

3.3 PREPARATION [NOT USED]

3.4 INSTALLATION

A. General

1. Upon disruption/shutdown of the existing water main, continue work until the connection is complete and the existing water main is back in service.
2. City will perform all tapping sleeve and valve connections to the existing water system. The fees charged to perform this work shall be paid for in accordance with the published City tapping fees.

B. Procedure

1. Connection to an existing unpressurized water main that does not require the City to take part of the water system out of service (Contractor Performed):
 - a. Expose the proposed connection point in accordance with Section 33 05 05.
 - b. Verify the existing water main is suitable for the proposed connection.
 - c. Remove existing dead-end plug/cap on the water main in order to make the connection.
 - d. Place trench foundation and bedding in accordance with 33 05 05.
 - e. Prevent embedment, backfill, soil, water, or other debris from entering the water main.
 - f. Establish thrust restraint as provided for in the Drawings.
 - g. Clean and disinfect the water main associated with the connection in accordance with Section 33 01 10. This includes the length of pipe from the point of connection, back to the existing valve.
 - h. Place embedment to the top of the pipe zone.
 - i. Request City Valve Crew re-pressurize the water main.
 - j. Directionally flush the connection in accordance with Section 33 01 10.
 - k. Request City Valve Crew open all remaining valves.
2. Connection to an existing pressurized water main by tapping sleeve and valve where the City performs the tap:
 - a. Expose the proposed connection point in accordance with Section 33 05 05.
 - b. Verify the existing water main is suitable for the proposed connection.
 - c. Coordinate with City a minimum of 2 weeks in advance to have City install the tapping sleeve and valve.
 - d. Place trench foundation and bedding in accordance with 33 05 05.
 - e. Prevent embedment, backfill, soil, water, or other debris from entering the water main.
 - f. Connect new line to City-installed tapping sleeve and valve.
 - g. Place embedment to the top of the pipe zone.
 - h. Request City Valve Crew open all remaining valves.
3. Connection to an existing water main that requires a shutdown of some part of the water system (Contractor Performed):

- 1 a. Verify with City all required equipment and materials are on the site as
- 2 necessary to perform the connection.
- 3 b. Expose the proposed connection point in accordance with Section 33 05 05.
- 4 c. Dewater the existing water line so the chlorinated water is not unlawfully
- 5 discharged.
- 6 d. Maintain the water that may bleed from existing valves or plugs during
- 7 installation within the work area to a reasonable level.
- 8 1) Control the water in such a way that it does not interfere with the proper
- 9 installation of the connection or create a discharge of chlorinated water.
- 10 e. Dechlorinate any discharged, chlorinated water in accordance with Section 33
- 11 01 10.
- 12 f. Cut and remove existing water main to make the connection.
- 13 g. Verify the existing water main is suitable for the proposed connection.
- 14 h. Install required connection.
- 15 i. Place trench foundation and bedding in accordance with 33 05 05.
- 16 j. Prevent embedment, backfill, soil, water, or other debris from entering the
- 17 water main.
- 18 k. Establish thrust restraint as provided for in the Drawings.
- 19 l. Clean and disinfect the water main associated with the connection in
- 20 accordance with Section 33 01 10.
- 21 m. Place embedment to the top of the pipe zone.
- 22 n. Request City Valve Crew re-pressurize the water main.
- 23 o. Directionally flush the connection in accordance with Section 33 01 10.
- 24 p. Request City Valve Crew open all remaining valves.
- 25

26 **3.5 REPAIR [NOT USED]**

27 **3.6 RE-INSTALLATION [NOT USED]**

28 **3.7 FIELD QUALITY CONTROL [NOT USED]**

29 **3.8 SYSTEM STARTUP [NOT USED]**

30 **3.9 ADJUSTING [NOT USED]**

31 **3.10 CLEANING [NOT USED]**

32 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

33 **3.12 PROTECTION [NOT USED]**

34 **3.13 MAINTENANCE [NOT USED]**

35 **3.14 ATTACHMENTS [NOT USED]**

36 **END OF SECTION**

37

Revision Log

DATE	NAME	SUMMARY OF CHANGE

1

SECTION 33 14 40
FIRE HYDRANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dry-barrel fire hydrants with 5-1/4-inch main valve for use with potable water mains.

B. Deviations from this City of Denton Standard Specification:

1. None.

C. Related Specification Sections include but are not limited to:

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 - General Requirements.
3. Section 33 05 05 – Utility Trench Excavation, Embedment and Backfill.
4. Section 33 14 10 – Ductile Iron Pipe and Fittings.
5. Section 33 14 20 – Resilient Seated Gate Valve.
6. Section 33 14 25 – Connection to Existing Water Mains.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Fire Hydrant Assembly

a. Measurement

- 1) Measured per each “Fire Hydrant Assembly” installed.

b. Payment

- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each “Fire Hydrant Assembly” installed.

c. The price bid shall include:

- 1) Furnishing and installing Fire Hydrant Assembly as specified by the Drawings
- 2) Dry-barrel fire hydrant assembly from base to operating nut
- 3) Extension barrel and stem
- 4) Adjusting hydrant to appropriate height
- 5) 6-inch lead line
- 6) 6-inch isolation valve
- 7) Painting
- 8) Pavement Removal
- 9) Excavation
- 10) Freight, loading, unloading, and handling
- 11) Disposal of excess material
- 12) Furnish, placement, and compaction of embedment

- 13) Furnish, placement, and compaction of backfill
 - 14) Blocking, braces, and rest
 - 15) Clean up
 - 16) Disinfection
 - 17) Testing
2. City Installed Fire Hydrant Assembly, on an Existing Water Main
- a. Measurement
 - 1) Measured per each “City Installed Fire Hydrant Assembly” installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each “City Installed Fire Hydrant Assembly” installed.
 - c. The price bid shall include:
 - 1) Preparing submittals (if necessary)
 - 2) Exploratory excavation (as needed)
 - 3) Coordination and notification
 - 4) City Performed connection to an existing pressurized water main by tapping sleeve and valve, in accordance with Section 33 14 25, including:
 - a) Remobilization
 - b) Temporary lighting
 - c) Traffic control associated with connection
 - d) Pavement removal
 - e) Plating of open trenches
 - f) Excavation
 - g) Hauling
 - h) Disposal of excess material
 - i) Clean-up
 - j) Cleaning
 - d. Tapping Fees associated with the City performing the connection to the water main are paid for separately in accordance with City Development Code 35.21.8 Tapping Fees.

1.3 REFERENCES

A. Definitions

- 1. Base: The lateral connection to the fire hydrant lead; also called a shoe.

B. Reference Standards

- 1. Reference standards cited in this Section refer to the current reference standard published at the time of the latest revision date logged at the end of this Section unless a date is specifically cited.
- 2. American Water Works Association (AWWA):
 - a. M17, Installation, Field Testing, and Maintenance of Fire Hydrants.
- 3. American National Standards Institute (ANSI)/American Water Works Association (AWWA):
 - a. C502, Dry-Barrel Fire Hydrants.

- 1 4. NSF International
- 2 a. 61, Drinking Water System Components – Health Effects.
- 3 b. 372, Drinking Water System Components – Lead Content.
- 4 5. National Fire Protection Association (NFPA)
- 5 a. 1963, Standard for Fire Hose Connections.
- 6 6. Underwriters Laboratories, Inc. (UL)
- 7 a. 246, Hydrants for Fire-Protection Service.
- 8 7. Factory Mutual (FM)
- 9 a. Class Number 1510, Approval Standard for Fire Hydrant (Dry Barrel Type) for
- 10 Private Fire Service.

11 **1.4 ADMINISTRATIVE REQUIREMENTS**

- 12 A. City performed fire hydrant installation and connections shall only be performed where
- 13 specifically indicated in the Drawings.

14 **1.5 SUBMITTALS**

- 15 A. Submittals shall be in accordance with Section 01 33 00.
- 16 B. All submittals shall be approved by the City prior to delivery.

17 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 18 A. Product Data
- 19 1. Dry-Barrel Fire Hydrant stating:
- 20 a. Main valve opening size
- 21 b. Nozzle arrangement and sizes
- 22 c. Operating nut size
- 23 d. Operating nut operating direction
- 24 e. Working pressure rating
- 25 f. Component assembly and materials
- 26 g. Coatings and Finishes

27 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

28 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

29 **1.9 QUALITY ASSURANCE**

- 30 A. Qualifications
- 31 1. Manufacturers
- 32 a. Dry-Barrel Fire Hydrants shall be the product of 1 manufacturer.
- 33 1) Change orders, specials, and field changes may be provided by a different
- 34 manufacturer upon City approval.
- 35 2. Provide Dry-Barrel Fire Hydrants in accordance with AWWA C502, UL 246, and
- 36 FM 1510.

37 **1.10 DELIVERY, STORAGE, AND HANDLING**

- 38 A. Storage and Handling Requirements

1. Store and handle in accordance with the guidelines as stated in AWWA C502 and AWWA Manual M17.
2. Protect all parts so no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.
3. Protect all equipment and parts against any damage during a prolonged period at the site.
4. Protect the finished surfaces of all exposed flanges with wooden blank flanges.
5. Protect finished iron or steel surfaces not painted to prevent rust and corrosion.
6. Prevent plastic and similar brittle items from being directly exposed to sunlight or extremes in temperature.
7. Secure and maintain a location to store the material in accordance with Section 01 66 00.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS

- A. City to furnish all fire hydrants, lead lines, isolation valves, and tapping sleeves for City installed fire hydrant assemblies.

2.2 MATERIALS

A. Manufacturers

1. Manufacturer List
 - a. Mueller – Super Centurion A-423
 - b. US Pipe – Sentinel 250
 - c. M&H – Style 129
2. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

B. Description

1. Regulatory Requirements
 - a. Provide Dry-Barrel Fire Hydrants that meet or exceed the latest revisions of AWWA C502 and meet or exceed the requirements of this Section.
 - b. All Dry-Barrel Fire Hydrant components in contact with potable water shall be in accordance with the requirements of NSF 61 and NSF 372.

C. Performance / Design Criteria

1. Capacities
 - a. Rated working pressure of 250 psi or greater.
2. Design Criteria
 - a. Operating Nut
 - 1) 1-1/4-inch Pentagon nut
 - 2) Open by turning the operating nut to the left (counter-clockwise)

- 1 a) Clearly marked with the operating direction and an arrow with the word
- 2 "OPEN".
- 3 3) Provide weather shield with operating nut.
- 4 b. Main Valve
- 5 1) Minimum 5-1/4-inch opening
- 6 2) Compression type
- 7 a) Opening against pressure
- 8 b) Closing with pressure
- 9 c. Nozzles
- 10 1) 'T' shape, 3 nozzle arrangement
- 11 2) Nozzle sizes, threads, and configuration in accordance with NFPA 1963
- 12 a) Hose nozzles
- 13 (1) 2 x 2-1/2-inch (nominal size of connection)
- 14 (a) 180 degrees apart
- 15 (b) Thread Designation 2.5-7.5 NH (NFPA 1963)
- 16 b) Pumper nozzle
- 17 (1) 4-1/2-inch (nominal size of connection)
- 18 (a) Thread Designation 4.5-4 NH (NFPA 1963)
- 19 d. Hydrant Barrel Configuration
- 20 1) Upper barrel
- 21 2) Breakable flange and stem
- 22 a) To be installed above ground at the connection to the upper barrel
- 23 3) Extension barrel (if needed) and lower barrel
- 24 a) Extension barrel and stem
- 25 (1) Lengthen in 6-inch increments
- 26 e. Drain Valve
- 27 1) Non-corrodible material
- 28 2) Spring operated drain valves are not allowed
- 29 D. Function
- 30 1. Drain Valve
- 31 a. Drain fire hydrant barrels when main valve is closed.
- 32 E. Materials
- 33 1. Furnish materials in accordance with AWWA C502.
- 34 2. Dry-Barrel Fire Hydrant Assembly
- 35 a. Internal parts
- 36 1) Threads
- 37 a) Provide operating thread designed to avoid metal such as iron or steel
- 38 threads against iron or steel parts.
- 39 2) Stem
- 40 a) Stem Nuts
- 41 (1) Bronze
- 42 (a) Grades in accordance with AWWA C502
- 43 b) Where required, groove and seal stem with O-rings.
- 44 3. Provide crushed rock for placement around base in accordance with Section 33 05
- 45 05.
- 46 F. Finishes

- 1
 - 2
 - 3
 - 4
1. Primer Materials
 - a. Furnish primer materials for Dry-Barrel Fire Hydrants in accordance with AWWA C502.

1 2. Finish Materials

2 a. Dry-Barrel Fire Hydrant

3 1) Exterior

4 a) Above grade

5 (1) Furnish exterior coating for above grade Dry-Barrel Fire Hydrant
6 assembly components in accordance with AWWA C502.

7 (2) Barrel:

8 (a) Silver for public fire hydrants

9 (b) Red for private fire hydrants

10 (3) Weather Shield, Pumper Nozzle Cap, and Hose Nozzle Caps:

11 (a) 1,500 gpm and greater – Blue

12 (b) 1,000 gpm to less than 1,500 gpm – Green

13 (c) Less than 1,000 gpm - Orange

14 (d) All private hydrants – Red

15 **2.3 ACCESSORIES**

16 A. 6-inch Lead Line:

17 1. Provide PVC Pressure Pipe with restrained joints for leads longer than 1 pipe joint,
18 in accordance with Section 33 14 11, unless otherwise stated in the drawings.

19 B. 6-inch Isolation Valve:

20 1. Provide flange by mechanical joint resilient seated gate valve in accordance with
21 Section 33 14 20.

22 C. Polyethylene Encasement

23 1. Provide polyethylene encasement in accordance with Section 33 14 10.

24 D. Embedment

25 1. Provide crushed rock and filter fabric for fire hydrant embedment, in accordance
26 with Section 33 05 05.

27 2. Provide utility sand embedment for fire hydrant lead line, in accordance with
28 Section 33 05 05.

29 E. Backfill

30 1. Provide same backfill as water main for fire hydrant lead line, in accordance with
31 Section 33 05 05.

32 **2.4 SOURCE QUALITY CONTROL**

33 A. Tests and Inspections

34 1. Testing and inspection of Dry-Barrel Fire Hydrants in accordance with AWWA
35 C502.

36 B. Markings

37 1. Provide each Dry-Barrel Fire Hydrant marked in accordance with AWWA C502.

38 **PART 3 - EXECUTION**

39 **3.1 INSTALLERS [NOT USED]**

1 **3.2 EXAMINATION [NOT USED]**

2 **3.3 PREPARATION [NOT USED]**

3 **3.4 INSTALLATION**

4 A. General

- 5 1. Install in accordance with AWWA Manual of Water Supply Practice M17,
6 manufacturer's recommendations, and as specified in the Drawings.
- 7 2. Provide vertical installation with braces, rest, and blocking in accordance with City
8 Standard Details.
- 9 3. Excavate and backfill trenches in accordance with 33 05 05.
- 10 4. Embed Dry-Barrel Fire Hydrant assemblies in accordance with 33 05 05.
 - 11 a. At the location of the weep holes, wrap barrel with polyethylene encasement
12 and crushed rock with filter fabric to prevent dirt and debris from entering the
13 fire hydrant.
- 14 5. Install polyethylene encasement in accordance with the applicable portion of
15 Section 33 14 10.
- 16 6. Install class 'A' concrete blocking and rest in accordance with Sections 03 00 00,
17 03 30 00, and as specified in the Drawings.
- 18 7. Place a minimum 1/3 cubic yard of crushed rock around the base, in accordance
19 with AWWA Manual of Water Supply Practice M17, to allow drain outlets to
20 operate.
 - 21 a. Extend the crushed rock 6 inches above the drain outlets and a minimum of 1
22 foot on all sides of the fire hydrant base.
- 23 8. Install fire hydrant lead line with a maximum cover of 7 feet.
 - 24 a. Cover is measured vertically from the invert at the fire hydrant base to ground
25 elevation.
 - 26 b. Fittings may be used along fire lead line to ensure minimum and maximum
27 cover requirements are met.
- 28 9. Remove and dispose of pumper and hose nozzle chains.

29 B. City Installed Fire Hydrant Assembly on an Existing Water Main

- 30 1. Expose the proposed connection point in accordance with Section 33 05 05.
- 31 2. Verify the existing pipeline is suitable for the proposed connection.
- 32 3. Coordinate with City a minimum of 2 weeks in advance of proposed fire hydrant
33 assembly installation.
- 34 4. Provide access to the City to install proposed fire hydrant assembly and water main
35 connection.

36 **3.5 REPAIR [NOT USED]**

37 **3.6 RE-INSTALLATION [NOT USED]**

38 **3.7 FIELD QUALITY CONTROL**

39 A. Field Inspections

1. The Dry-Barrel Fire Hydrant and assembly shall perform as intended with no deformation, leaking, or damage of any kind for the pressure ranges indicated.
2. Provide City the opportunity to inspect and operate the hydrant to ensure the fire hydrant was installed in accordance with AWWA Manual of Water Supply Practice M17. This includes but is not limited to:
 - a. Hydrants are installed as plumb as possible.
 - b. Pumper outlet nozzle faces the street.
 - c. Outlet nozzles are sufficiently high above the ground to allow for attachment of hoses and operation of a hydrant wrench with no obstructions preventing the use of hydrant or hindering removal of outlet nozzle caps.
 - d. Foreign matter is removed from hydrant.
 - e. Operation of nozzles and operating nut are not obstructed.
 - f. Drain valve is not obstructed or plugged and drains fire hydrant barrel.
3. Keep fire hydrant wrapped or covered until the water line and hydrant is placed in service.

B. Non-Conforming Work

1. If access and operation of the Dry-Barrel Fire Hydrant or its appurtenances does not meet the criteria of the AWWA M17, the Contractor will remedy the situation criteria at the Contractor's expense.

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

28

1 **SECTION 33 31 10**
2 **FIBERGLASS REINFORCED PIPE FOR GRAVITY SANITARY SEWERS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Fiberglass Reinforced Pipe 18-inch and larger for gravity sanitary sewer
7 applications.

8 B. Deviations from this City of Denton Standard Specification:

- 9 1. None.

10 C. Related Specification Sections include but are not limited to:

- 11 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the
12 Contract.
13 2. Division 1 - General Requirements.
14 3. Section 33 01 30 – Closed Circuit Television (CCTV) Inspection.
15 4. Section 33 01 31 – Sewer and Manhole Testing.
16 5. Section 33 01 32 – Cleaning of Sewer Mains.
17 6. Section 33 05 05 – Utility Trench Excavation, Embedment, and Backfill.
18 7. Section 33 05 15 – Installation of Carrier Pipe in Casing or Tunnel Liner Plate.
19 8. Section 33 05 97 – Utility Markers/Locators.
20 9. Section 33 31 16 – Sanitary Sewer Service Connections and Service Line.

21 **1.2 PRICE AND PAYMENT PROCEDURES**

22 A. Measurement and Payment

23 1. Fiberglass Reinforced Pipe

24 a. Measurement

- 25 1) Measured horizontally along the surface from center line to center line of
26 the manhole or appurtenance.

27 b. Payment

- 28 1) The work performed and materials furnished in accordance with this item
29 and measured as provided under “Measurement” will be paid for at the unit
30 price bid per linear foot for “Fiberglass Reinforced Pipe” installed for:

- 31 a) Various sizes.
32 b) Various types of backfill.

33 c. The price bid shall include:

- 34 1) Furnishing and installing Fiberglass Sewer Pipe as specified by the
35 Drawings
36 2) Utility Markers/Locators
37 3) Pavement Removal
38 4) Excavation
39 5) Hauling

- 1 6) Disposal of excess material
- 2 7) Furnishing, placement, and compaction of embedment
- 3 8) Furnishing, placement, and compaction of backfill
- 4 9) Clay Dams
- 5 10) Fittings
- 6 11) Gaskets
- 7 12) Clean-up
- 8 13) Cleaning
- 9 14) Testing

10 **1.3 REFERENCES**

11 A. Abbreviations and Acronyms

- 12 1. FRP – Fiberglass Reinforced Pipe

13 B. Reference Standards

- 14 1. Reference standards cited in this Section refer to the current reference standard
- 15 published at the time of the latest revision date logged at the end of this Section
- 16 unless a date is specifically cited.
- 17 2. ASTM International (ASTM):
- 18 a. D3236, Standard Test Method for Apparent Viscosity of Hot Melt Adhesives
- 19 and Coating Materials.
- 20 b. D3262, Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced
- 21 Thermosetting-Resin) Sewer Pipe.
- 22 c. D3681, Standard Test Method for Chemical Resistance of "Fiberglass" (Glass-
- 23 Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition.
- 24 d. D3839, Standard Guide for Underground Installation of “Fiberglass” (Glass-
- 25 Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings.
- 26 e. D4161, Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced
- 27 Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- 28 f. F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic
- 29 Pipe.
- 30 3. American Water Works Association (AWWA):
- 31 a. M45, Fiberglass Pipe Design.

32 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

33 **1.5 SUBMITTALS**

- 34 A. Submittals shall be in accordance with Section 01 33 00.
- 35 B. All submittals shall be approved by the City prior to delivery.

36 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

37 A. Product Data

- 38 1. Manufacturer
- 39 2. Manufacturer Number (identifies factory, location, and date manufactured.)
- 40 3. Nominal Diameter
- 41 4. Beam load
- 42 5. Laying lengths

- 1 6. ASTM designation
- 2 B. Shop Drawings
- 3 1. For Fiberglass Reinforced Pipe 24-inch diameter and larger:
- 4 a. Pipe details
- 5 b. Joint details
- 6 c. Miscellaneous items to be furnished and fabricated for the pipe
- 7 d. Dimensions
- 8 e. Tolerances
- 9 f. Wall thickness
- 10 g. Properties and strengths
- 11 h. Pipe calculations
- 12 1) Calculations confirming the pipe will handle anticipated loading signed and
- 13 sealed by a Professional Engineer Licensed in Texas.

14 C. Certificates

- 15 1. Furnish an affidavit certifying Fiberglass Reinforced Pipe has been tested and is in
- 16 accordance with this Section and ASTM D3262.

17 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

18 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

19 **1.9 QUALITY ASSURANCE**

20 A. Qualifications

- 21 1. Manufacturers
- 22 a. Finished pipe shall be the product of 1 manufacturer for each size per project.
- 23 b. Pipe manufacturing operations shall be performed under the control of the
- 24 manufacturer.
- 25 c. All pipe furnished shall be in accordance with this Section and ASTM D3262.

26 **1.10 DELIVERY, STORAGE, AND HANDLING**

27 A. Delivery

- 28 1. Provide adequate strutting during transport to prevent damage to the pipe, fittings,
- 29 and appurtenances.

30 B. Storage and Handling Requirements

- 31 1. Gravity pipe shall be stored and handled in accordance with the manufacturer's
- 32 guidelines.
- 33 2. Secure and maintain a location to store the material in accordance with
- 34 Section 01 66 00.

1 **1.11 FIELD CONDITIONS [NOT USED]**

2 **1.12 WARRANTY [NOT USED]**

3 **PART 2 - PRODUCTS**

4 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

5

1 **2.2 MATERIALS**

2 **A. Manufacturers**

3 1. Manufacturer List

- 4 a. HOBAS Pipe
- 5 b. Flowtite

- 6 2. Substitution requests for manufacturers or models not indicated above shall be
- 7 processed in accordance with Section 01 25 00.

8 **B. Performance / Design Criteria**

9 1. Pipe

- 10 a. Fiberglass pipe shall be designed, manufactured, and tested in accordance with
- 11 ASTM D3262 and AWWA M45.

- 12 b. Design pipe for service loads that include:

- 13 1) External groundwater and earth loads
- 14 2) Jacking/pushing loads
 - 15 a) The allowable jacking/pushing capacity shall not exceed 40 percent of
 - 16 the ultimate compressive strength or the maximum allowable
 - 17 compressive strength recommended by the manufacturer, whichever is
 - 18 less.

- 19 3) Traffic loads

- 20 4) Practical considerations for handling, shipping, and other construction
- 21 operations

- 22 c. Pipe design shall be based on trench conditions in accordance with AWWA
- 23 M45 using the following parameters:

- 24 1) Unit Weight of Fill (W) = 130 pounds per cubic foot

- 25 2) Live Load:

- 26 a) Cooper E-80 for railroad crossings
- 27 b) AASHTO HS-20 for all other installations

- 28 3) Trench Depth = As indicated on the Drawings

- 29 4) Deflection Lag Factor (D_l) = 1.0

- 30 5) Bedding Coefficient (K_x) = 0.10

- 31 6) Maximum Calculated Deflection:

- 32 a) $\Delta x = 3$ Percent

- 33 7) Soil Reaction Modulus (E'): less than or equal to 1,000 psi

- 34 d. Where the pipe requires additional external support to achieve the specified
- 35 maximum deflection, the Contractor and pipe supplier will be required to
- 36 furnish alternate methods for pipe embedment.

- 37 1) No additional compensation will be made to the Contractor by the Owner
- 38 where this method is required.

- 39 e. Designed under the supervision of a Professional Engineer licensed in the State
- 40 of Texas, who shall seal and sign the design.

- 41 f. Standard lay length of 20 feet, except for special fittings or closure pieces
- 42 necessary to comply with the Drawings.

- 43 g. Drawings or deflection design may require a higher pipe stiffness, but in no
- 44 case should the pipe stiffness be less than 46 psi.

- 45 h. Accommodate vertical alignment changes required because of existing utility or
- 46 other conflicts by an appropriate change in pipe design depth.

- 47 i. In no case shall pipe be installed deeper than its design allows.

1

- 1 2. Dimensional Tolerances
- 2 a. Inside diameter
- 3 1) Maximum 1/8 inch variance from the nominal inside diameter allowed.
- 4 b. Roundness
- 5 1) Difference between major and minor outside diameters not to exceed 0.1
- 6 percent of the nominal outside or 1/4 inch, whichever is less.
- 7 c. Wall thickness
- 8 1) Provide minimum single point thickness no less than 98 percent of stated
- 9 design thickness.
- 10 d. End Squareness
- 11 1) Provide pipe ends square to pipe axis with maximum tolerance of 1/8 inch.
- 12 e. Fittings
- 13 1) Provide tolerance of angle of elbow and angle between main and leg of wye
- 14 or tee to ± 2 degrees.
- 15 2) Provide tolerance of laying length of fitting to ± 2 inches.
- 16 C. Materials
- 17 1. Resin Systems
- 18 a. Only use polyester resin system with proven history of performance in this
- 19 particular application.
- 20 2. Glass Reinforcements
- 21 a. Use reinforcing glass fibers of highest quality commercial grade E-glass
- 22 filaments with binder and sizing compatible with impregnated resins to
- 23 manufacture components.
- 24 3. Fillers
- 25 a. Silica sand or other suitable materials may be used.
- 26 b. Use 98 percent silica with maximum moisture content of 0.2 percent.
- 27 4. Resin Additives
- 28 a. Not to detrimentally affect the performance of the product.
- 29 5. Internal liner resin
- 30 a. Suitable for service as sewer pipe.
- 31 b. Highly resistant to exposure to sulfuric acid produced by biological activity
- 32 from hydrogen sulfide gases.
- 33 c. In accordance with ASTM D3681.
- 34 6. Gaskets
- 35 a. Supply from approved gasket manufacturer in accordance with ASTM F477
- 36 and suitable for service intended.
- 37 b. Affix to pipe by means of suitable adhesive or install in a manner to prevent
- 38 from rolling out of pre-cut groove in pipe or sleeve coupling.
- 39 c. Provide the following gaskets in potentially contaminated areas.
- 40 1) Petroleum (diesel, gasoline) – Viton
- 41 2) Other contaminants – Manufacturer recommendation
- 42 7. Couplings
- 43 a. Field connect pipe with fiberglass sleeve couplings that utilize elastomeric
- 44 sealing gaskets as sole means to maintain joint water tightness.
- 45

- 1 8. Joints
- 2 a. In accordance with ASTM D4161
- 3 9. Pipe markings in accordance with ASTM D3236. Minimum pipe markings shall
- 4 be as follows:
- 5 a. Manufacturer
- 6 b. Manufacturer Number (identifies factory, location, date manufactured, shift,
- 7 and sequence)
- 8 c. Nominal diameter
- 9 d. Beam load
- 10 e. Laying length
- 11 f. ASTM designation
- 12 10. Connections
- 13 11. Use only manufactured fittings in accordance with Section 33 31 16
- 14 12. Detectable Metallic Tape in accordance with Section 33 05 97.

15 **2.3 ACCESSORIES [NOT USED]**

16 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

17 **PART 3 - EXECUTION**

18 **3.1 INSTALLERS [NOT USED]**

19 **3.2 EXAMINATION [NOT USED]**

20 **3.3 PREPARATION [NOT USED]**

21 **3.4 INSTALLATION**

22 A. General

- 23 1. Install pipe, fittings, specials, and appurtenances in accordance with this Section,
- 24 AWWA M45, ASTM D3839, and with the pipe manufacturer's recommendations.
- 25 2. Lay pipe to the lines and grades as indicated in the Drawings.
- 26 3. Excavate and backfill trenches in accordance with Section 33 05 05.
- 27 4. Embed pipe in accordance with Section 33 05 05.
- 28 5. Installation of carrier pipe within casing in accordance with Section 33 05 15.

29 B. Pipe Handling

- 30 1. Haul and distribute pipe and fittings at the project site.
- 31 2. Handle pipe with care to avoid damage.
 - 32 a. Inspect each joint of pipe and reject or repair any damaged pipe prior to
 - 33 lowering into the trench.
 - 34 b. Use only nylon ropes, slings, or other lifting devices that will not damage the
 - 35 surface of the pipe for handling pipe.
- 36 3. At the close of each operating day:
 - 37 a. Keep the pipe clean and free of debris, dirt, animals, and trash – during and
 - 38 after the laying operation.
 - 39 b. Effectively seal the open end of the pipe using a gasketed night cap.

1

- 1 C. Pipe Jointing
- 2 a. Clean dirt and foreign material from the gasketed socket and the spigot end.
- 3 b. Assemble pipe joint by sliding the lubricated spigot end into the gasketed bell
- 4 end to the reference mark.
- 5 c. Install such that identification marking on each joint are oriented upward toward
- 6 the trench opening.
- 7 d. When making connection to manhole, use an elastomeric seal or flexible boot to
- 8 facilitate a seal.

9 D. Connection Installation in accordance with Section 33 31 16.

10 E. Detectable Metallic Tape Installation in accordance with Section 33 05 97.

11 **3.5 REPAIR**

12 A. Repair in accordance with manufacturer's recommendations.

13 **3.6 RE-INSTALLATION [NOT USED]**

14 **3.7 FIELD QUALITY CONTROL**

15 A. Gravity Sewer Mains

- 16 1. Closed Circuit Television (CCTV) Inspection
- 17 a. Provide a Post-CCTV Inspection in accordance with Section 33 01 30.
- 18 2. Sewer Pipe Testing
- 19 a. Test pipe in accordance with Section 33 01 31.

20 **3.8 SYSTEM STARTUP [NOT USED]**

21 **3.9 ADJUSTING [NOT USED]**

22 **3.10 CLEANING**

23 A. Gravity Sewer Mains

- 24 1. Cleaning of sewer mains
- 25 a. Clean the mains in accordance with Section 33 01 32.

26 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

27 **3.12 PROTECTION [NOT USED]**

28 **3.13 MAINTENANCE [NOT USED]**

29 **3.14 ATTACHMENTS [NOT USED]**

30

1

END OF SECTION

2

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

3

- 1 3) Pavement removal
- 2 4) Excavation
- 3 5) Hauling
- 4 6) Disposal of excess material
- 5 7) Furnishing, placement, and compaction of embedment
- 6 8) Furnishing, placement, and compaction of backfill
- 7 9) Clay Dams
- 8 10) Gaskets
- 9 11) Clean-up
- 10 12) Cleaning
- 11 13) Testing
- 12 2. PVC Gravity Sewer Pressure Pipe
- 13 a. Measurement
- 14 1) Measured horizontally along the surface from center line to center line of
- 15 the manhole, or appurtenance.
- 16 b. Payment
- 17 1) The work performed and materials furnished in accordance with this item
- 18 and measured as provided under “Measurement” will be paid for at the unit
- 19 price bid per linear foot for “PVC Gravity Sewer Pressure Pipe” installed
- 20 for:
- 21 a) Various sizes.
- 22 b) Various backfills.
- 23 c. The price bid shall include:
- 24 1) Furnishing and installing PVC Gravity Sewer Pressure Pipe with joints as
- 25 specified by the Drawings
- 26 2) Utility Markers/Locators
- 27 3) Pavement removal
- 28 4) Excavation
- 29 5) Hauling
- 30 6) Disposal of excess material
- 31 7) Furnishing, placement, and compaction of embedment
- 32 8) Furnishing, placement, and compaction of backfill
- 33 9) Clay Dams
- 34 10) Clean-up
- 35 11) Cleaning
- 36 12) Testing

37 **1.3 REFERENCES**

- 38 A. Abbreviations and Acronyms
- 39 1. PVC – Polyvinyl Chloride
- 40 B. Reference Standards
- 41 1. Reference standards cited in this Section refer to the current reference standard
- 42 published at the time of the latest revision date logged at the end of this Section,
- 43 unless a date is specifically cited.
- 44 2. American Association of State Highway and Transportation (AASHTO).
- 45 3. ASTM International (ASTM):

- a. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - b. D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - c. D2412, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
 - d. D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - e. D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - f. F679, Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
4. Texas Administration Code:
- a. Chapter 217, (30 TAC §217), Design Criteria for Sewerage System.

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the City prior to delivery.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Product data sheet
 - 2. Manufacturer
 - 3. Nominal pipe diameter
 - 4. Standard dimension ratio (SDR)
 - 5. Cell classification
 - 6. Laying lengths
- B. Certificates
 - 1. Furnish an affidavit certifying the PVC Gravity and Pressure Rated Gravity Sewer Pipe has been air and deflection tested and is in accordance with this Section and ASTM D3034, ASTM F679, or ASTM D2241.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers
 - a. Finished pipe shall be the product of 1 manufacturer for each size per project, unless otherwise approved by the City.
 - 1) Change orders, specials, and field changes may be provided by a different manufacturer upon City approval.

- b. Pipe manufacturing operations shall be performed under the control of the manufacturer.
- c. Furnish Gravity Sewer Pipe in accordance with ASTM D3034 (4-inch through 15-inch) and ASTM F679 (18-inch through 27-inch).
- d. Furnish Pressure Rated Gravity Sewer Pipe in accordance with ASTM D2241 (8-inch through 12-inch).

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements

- 1. Pipe manufactured more than 2 years prior to installation date will not be accepted by the City.

B. Storage and Handling Requirements

- 1. Gravity pipe shall be stored and handled in accordance with the manufacturer's guidelines.
- 2. Protect pipe from UV exposure.
 - a. When long-term storage (more than 2-months) with exposure to direct sunlight is unavoidable, cover PVC pipe with an opaque material and provide adequate air circulation above and around the pipe as required to prevent excessive heat accumulation.
- 3. Secure and maintain a location to store the material in accordance with Section 01 66 00.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Manufacturers

- 1. Manufacturer List
 - a. 4-inch through 15-inch (ASTM D3034)
 - 1) Diamond Plastics
 - 2) JM Eagle/Ring-Tite
 - 3) Northern Pipe Products
 - 4) North American Pipe
 - b. 18-inch through 24-inch (ASTM F679)
 - 1) Diamond Plastics
 - 2) JM Eagle
 - 3) North American Pipe
 - c. 8-inch through 12-inch (ASTM D2241) pressure rated sewer pipe
 - 1) Diamond Plastics
 - 2) JM Eagle
 - 3) Vinyltech Green Pipe
 - 4) North American Pipe

- 1
 - 2
 - 3
2. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

B. Performance / Design Criteria

1. Pipe

- a. Designed in accordance with 30 TAC §217.
- b. Design in accordance with ASTM D3034 for 4-inch through 15-inch gravity pipe, ASTM F679 for 18-inch through 24-inch gravity pipe, and ASTM D2241 for 8-inch through 12-inch pressure rated gravity pipe.
- c. PVC Gravity Sanitary Sewer Pipe shall be approved by the Underwriters Laboratories, Inc.
- d. Assume a standard lay length of 14 feet and 20 feet except for special fittings or closure pieces necessary to comply with the Drawings.
- e. PVC in accordance with ASTM D1784, with a cell classification of 12454 or 12364.
- f. The following Standard Dimension Ratio's apply:

Application	Diameter (inch)	Min Performance Designation
Sewer Service	4 through 6	SDR 35/PS46
Gravity Sewer Main (< 15-ft bury depth)	8 through 24	SDR 35/PS46
Gravity Sewer Main (≥ 15-ft bury depth)	8 through 24	SDR 26/PS115
Pressure Rated Gravity Sewer Main (All depths)	8 through 12	SDR 26/PR160

g. Deflection Design

- 1) Base pipe design on pipe stiffness, soil stiffness, and load on the pipe.
- 2) Design pipe according to the Modified Iowa Formula as detailed by the Uni-Bell PVC Pipe Association in the Handbook of PVC Pipe, using the following parameters:
 - a) Unit Weight of Fill (w) = 130 pounds per cubic foot
 - b) Live Load = AASHTO HS 20
 - c) Trench Depth = 12 feet minimum, or as indicated in Drawings
 - d) Maximum (E') = 1,000 max
 - e) Deflection Lag Factor (DL) = 1.0
 - f) Bedding Factor constant (K) = 0.1
 - g) Mean radius of the pipe (r), inches, as indicated in Drawings
 - h) Marston's load per unit length (W), pounds per inch, calculate per Drawings
 - i) PVC modulus of elasticity (E) = 400,000 psi
 - j) Moment of inertia of pipe wall per unit length, (I) = $t^3/12$, (in⁴/in), per pipe type and size
 - (1) Where (t) = pipe thickness, inches
 - k) Maximum Calculated Deflection = 5 percent

- 1 h. Pipe Flotation: If the pipe is buried in common saturated soil (about 120 pounds
2 per cubic foot) with at least 1½ pipe diameters of cover, pipe is generally not
3 subject to flotation. If shallower, check groundwater flotation potential.
4 Flotation will occur if:

$$F_b > W_p + W_f + W_d$$

5
6
7
8 Where: F_b = buoyant force, pound per foot
9 W_p = empty pipe weight, pound per foot
10 W_f = weight of flooded soil, pound per foot
11 W_d = weight of dry soil, pound per foot
12

13 Values and formulas for the above variables can be obtained from the pipe
14 manufacturer and site-specific soil conditions.

- 15 i. Verify trench depths after existing utilities are located.
16 j. If vertical alignment changes due to an existing utility or other conflict, verify
17 whether change in required pipe design stiffness is required.
18 k. In no case shall pipe be installed deeper than its design allows.
- 19 2. Pipe markings
20 a. In accordance with ASTM D3034 and ASTM F679.
21 b. Minimum pipe markings shall be as follows:
22 1) Manufacturer's Name or Trademark and production record
23 2) Nominal pipe size
24 3) PVC cell classification
25 4) ASTM or Standard Dimension Ratio (SDR) designation or pipe stiffness
26 5) Seal of testing agency that verified the suitability of the pipe
- 27 3. Color
28 a. Pipe shall be green in color.
29 1) Any discoloration in the pipe shall be sufficient cause for rejection.
30 b. Fittings shall be green or white in color.
- 31 4. Joints
32 a. Joints shall be gasket, bell and spigot, push-on type in accordance with
33 ASTM D3212.
34 b. Since each pipe manufacturer has a different design for push-on joints; gaskets
35 shall be part of a complete pipe section and purchased as such.
- 36 5. Connections
37 a. Only use manufactured fittings.
38 b. In accordance with Section 33 31 16
- 39 6. Detectable Metallic Tape
40 a. In accordance with Section 33 05 97

41 2.3 ACCESSORIES [NOT USED]

42 2.4 SOURCE QUALITY CONTROL

- 43 A. Test pipe in accordance with ASTM D2412 assuming minimum pipe stiffness of 46 psi
44 at 5 percent deflection.

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION [NOT USED]**

5 **3.4 INSTALLATION**

6 A. General

- 7 1. Install pipe, specials, and appurtenances in accordance with this Section, Section 33
8 05 05, and the pipe manufacturer's recommendations.
9 2. Lay pipe to the lines and grades as indicated in the Drawings.
10 3. Excavate and backfill trenches in accordance with Section 33 05 05.
11 4. Embed PVC pipe in accordance with Section 33 05 05.

12 B. Pipe Handling

- 13 1. Haul and distribute pipe and fittings at the project site.
14 2. Handle piping with care to avoid damage.
15 a. Inspect each joint of pipe and reject or repair any damaged pipe prior to
16 lowering into the trench.
17 b. Use only nylon ropes, slings, or other lifting devices that will not damage the
18 surface of the pipe for handling the pipe.
19 3. At the close of each operating day:
20 a. Keep the pipe clean and free of debris, dirt, animals, and trash – during and after
21 the laying operation.
22 b. Effectively seal the open end of the pipe using a gasketed night cap.

23 C. Pipe Joint Installation

- 24 a. Clean dirt and foreign material from the gasketed socket and the spigot end.
25 b. Assemble pipe joint by sliding the lubricated spigot end into the gasketed bell
26 end to the reference mark.
27 c. Install such that identification marking on each joint are oriented upward toward
28 the trench opening.
29 d. When making connection to manhole, use an elastomeric seal or flexible boot to
30 facilitate a seal.

31 D. Connection Installation

- 32 1. In accordance with Section 33 31 16.

33 E. Detectable Metallic Tape Installation

- 34 1. In accordance with Section 33 05 97.

35 **3.5 REPAIR [NOT USED]**

36 **3.6 RE-INSTALLATION [NOT USED]**

37

1 **3.7 FIELD QUALITY CONTROL**

2 A. Gravity Sewer Mains

- 3 1. Closed Circuit Television (CCTV) Inspection
4 a. Provide a Post-CCTV Inspection in accordance with Section 33 01 30.
5 2. Sewer Pipe Testing
6 a. Test pipe in accordance with Section 33 01 31.

7 **3.8 SYSTEM STARTUP [NOT USED]**

8 **3.9 ADJUSTING [NOT USED]**

9 **3.10 CLEANING**

10 A. Gravity Sewer Mains

- 11 1. Cleaning of sewer mains
12 a. Clean the mains in accordance with Section 33 01 32.

13 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

14 **3.12 PROTECTION [NOT USED]**

15 **3.13 MAINTENANCE [NOT USED]**

16 **3.14 ATTACHMENTS [NOT USED]**

17 **END OF SECTION**

18

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

19

- 1 6) Plating of open trenches
- 2 7) Excavation
- 3 8) Hauling
- 4 9) Disposal of excess material
- 5 10) Wye connection to main
- 6 11) Fittings
- 7 12) Cleanout and cap with box
- 8 13) Surface restoration
- 9 14) Furnishing, placement, and compaction of embedment
- 10 15) Furnishing, placement, and compaction of backfill
- 11 16) Concrete encasement for deep services
- 12 17) Clean-up
- 13 2. New Bored Sewer Service
- 14 a. Measurement
- 15 1) Measurement for this Item shall be per each “Bored Sewer Service”
- 16 complete in place.
- 17 b. Payment
- 18 1) The work performed and materials furnished in accordance with this Item
- 19 will be paid for at the unit price bid per each “Sewer Service” installed for:
- 20 a) Various sizes.
- 21 b) Various materials.
- 22 c. The price bid shall include:
- 23 1) Furnishing and installing New Sanitary Sewer Service Line as specified by
- 24 the Drawings
- 25 2) Service line installed by directional drilling
- 26 3) Temporary lighting
- 27 4) Traffic Control associated with connection
- 28 5) Pavement removal
- 29 6) Plating of open trenches
- 30 7) Excavation
- 31 8) Hauling
- 32 9) Disposal of excess material
- 33 10) Wye connection to main
- 34 11) Fittings
- 35 12) Cleanout and cap with box
- 36 13) Surface restoration
- 37 14) Furnishing, placement, and compaction of embedment
- 38 15) Furnishing, placement, and compaction of backfill
- 39 16) Concrete encasement for deep services
- 40 17) Clean-up
- 41 3. New Sewer Service (City Performed)
- 42 a. Measurement
- 43 1) Measurement for this item shall be per each connection completed.
- 44 b. Payment
- 45 1) The work performed and the materials furnished in accordance with this
- 46 item shall be paid for at the unit price bid per each “Sewer Service (City
- 47 Performed)” installed for:
- 48 a) Various sizes of connecting lateral line.

- 1 b) Various sizes of existing sewer main.
- 2 c) Various materials.
- 3 c. The price bid shall include all aspects of making the connection including, but
- 4 not limited to:
- 5 1) Preparing submittals (if necessary)
- 6 2) Exploratory excavation (as needed)
- 7 3) Coordination and notification
- 8 4) Remobilization
- 9 5) Temporary lighting
- 10 6) Traffic Control associated with connection
- 11 7) Pavement removal
- 12 8) Plating of open trenches
- 13 9) Excavation
- 14 10) Hauling
- 15 11) Disposal of excess material
- 16 12) Clean-up
- 17 13) Cleaning
- 18 d. The price bid shall not include the following:
- 19 1) Fees paid to City to perform connection in accordance with City
- 20 Development Code 35.21.8 Tapping Fees will be the responsibility of the
- 21 Contractor.
- 22 4. Private Service Relocation
- 23 a. Measurement
- 24 1) Measured horizontally along the surface from center line to center line of
- 25 the fitting, manhole, or appurtenance.
- 26 b. Payment
- 27 1) The work performed and the materials furnished in accordance with this
- 28 item and measured as provided under “Measurement” will be paid for at the
- 29 unit price bid per linear foot for “Private Sewer Service” installed for:
- 30 a) Various sizes.
- 31 b) Various materials.
- 32 c. The price shall include:
- 33 1) Obtaining required Permit(s)
- 34 2) Obtaining Right of Entry
- 35 3) Performing relocation as specified in the Drawings
- 36 4) Excavation
- 37 5) Hauling
- 38 6) Disposal of excess material
- 39 7) Service Line - private side by plumber
- 40 8) Fittings
- 41 9) Furnishing, placement, and compaction of embedment
- 42 10) Furnishing, placement, and compaction of backfill
- 43 11) Clean-up
- 44 12) Surface restoration
- 45 5. Sanitary Sewer Mainline Cleanout
- 46 a. Measurement
- 47 1) Measurement for this item shall be per each “Sanitary Sewer Mainline
- 48 Cleanout” complete in place.

- 1 b. Payment
- 2 1) The work performed and materials furnished in accordance with this item
- 3 will be paid for at the unit price bid per each “Sanitary Sewer Mainline
- 4 Cleanout” installed for:
- 5 a) Various sizes.
- 6 b) Various materials.
- 7 c. The price bid shall include:
- 8 1) Furnishing and installing Sanitary Sewer Mainline Cleanout as specified by
- 9 the Drawings
- 10 2) Temporary lighting
- 11 3) Traffic Control associated with connection
- 12 4) Pavement removal
- 13 5) Plating of open trenches
- 14 6) Excavation
- 15 7) Hauling
- 16 8) Disposal of excess material
- 17 9) Wye connection to main
- 18 10) Fittings
- 19 11) Cleanout and cap with box
- 20 12) Surface restoration
- 21 13) Furnishing, placement, and compaction of embedment
- 22 14) Furnishing, placement, and compaction of backfill
- 23 15) Concrete encasement
- 24 16) Clean-up
- 25

26 **1.3 REFERENCES**

- 27 A. Reference Standards
- 28 1. Reference standards cited in this Section refer to the current reference standard
- 29 published at the time of the latest revision date logged at the end of this Section,
- 30 unless a date is specifically cited.
- 31 2. ASTM International (ASTM):
- 32 a. ASTM D3034, Standard Specification for Type PSM Poly (Vinyl Chloride)
- 33 (PVC) Sewer Pipe and Fittings.
- 34 b. ASTM C1173, Standard Specification for Flexible Transition Couplings for
- 35 Underground Piping Systems.
- 36 c. ASTM D1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic
- 37 Pipe, Schedules 40, 80 and 120.
- 38 d. ASTM D2321, Standard Practice for Underground Installation of
- 39 Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

40 **1.4 ADMINISTRATIVE REQUIREMENTS**

- 41 A. Scheduling
- 42 1. Provide advance notice for service interruption to property owner in accordance
- 43 with Section 01 35 13.
- 44 2. Service interruptions may only occur during normal business hours from Monday
- 45 through Friday, unless otherwise approved by the City.

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to delivery.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Product data shall include, if applicable:

- 6 1. Wye connection or saddle
- 7 2. Fittings (including type of cleanout)
- 8 3. Service line

9 B. Certificates

- 10 1. Furnish an affidavit certifying service line and fittings are in accordance with this
- 11 Section.

12 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

13 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

14 **1.9 QUALITY ASSURANCE [NOT USED]**

15 **1.10 DELIVERY, STORAGE, AND HANDLING**

16 A. Delivery and Acceptance Requirements

- 17 1. Pipe manufactured more than 2 years prior to installation date will not be accepted
- 18 by the City.

19 B. Storage and Handling Requirements

- 20 1. Pipe and other material shall be stored and handled in accordance with the
- 21 manufacturer's guidelines.
- 22 2. Protect pipe from UV exposure.
- 23 a. When long-term storage (more than 2-months) with exposure to direct sunlight
- 24 is unavoidable, cover PVC pipe with an opaque material and provide adequate
- 25 air circulation above and around the pipe as required to prevent excessive heat
- 26 accumulation.
- 27 3. Secure and maintain a location to store the material in accordance with Section 01
- 28 66 00.

29 **1.11 FIELD CONDITIONS [NOT USED]**

30 **1.12 WARRANTY [NOT USED]**

31 **PART 2 - PRODUCTS**

32 **2.1 CITY-FURNISHED**

- 33 A. When tapping fees are paid for City to perform the work, City shall furnish all fittings,
- 34 service lines, and cleanouts.

1 **2.2 EQUIPMENT, PRODUCT TYPES, MATERIALS**

2 A. Manufacturers

3 1. Manufacturer List

4 a. PVC Fittings

- 5 1) 4-inch through 15-inch (SDR35, SDR26) (ASTM D3034)
 - 6 a) Plastic Trends
 - 7 b) Multi Fittings
 - 8 c) North American Pipe
- 9 2) 8-inch through 12-inch (ASTM D2241) pressure rated sewer pipe
 - 10 a) North American Pipe
- 11 3) 18-inch through 24-inch (SDR35, SDR26) (ASTM F679)
 - 12 a) North American Pipe
 - 13 b) GPK
- 14 4) 14-inch through 24-inch (AWWA C900)
 - 15 a) North American Pipe
- 16 5) Flexible Pipe Adapter (ASTM C1173)
 - 17 a) GPK Indiana Seal Flexible Transition Couplings

18 2. Substitution requests for manufacturers or models not indicated above shall be
19 processed in accordance with Section 01 25 00.

20 3. The services and appurtenances shall be new and the product of a manufacturer
21 regularly engaged in the manufacturing of services and appurtenances having
22 similar service and size.

23 B. Materials/Design Criteria

24 1. Service Line and Fittings (including wye connections)

- 25 a. Service line pipe and fittings shall meet the requirements and be of the same
26 material as the corresponding main line pipe to which it is connected.
 - 27 1) PVC Pipe and Fittings
 - 28 a) City Right-of-Way
 - 29 (1) In accordance with Section 33 31 14 or 33 14 11.
 - 30 (2) Pipe shall be green in color. Any discoloration in the pipe shall be
31 sufficient cause for rejection.
 - 32 2) Private plumbing
 - 33 a) Schedule 40 in accordance with ASTM D1785.
 - 34 3) Ductile Iron Pipe and Fittings
 - 35 a) Lined with ceramic epoxy in accordance with Section 33 14 10.
 - 36 4) HDPE Pipe and Fittings
 - 37 a) In accordance with Section 33 14 14.

38 2. Service saddle

- 39 a. Only allowed when connecting a new service to an existing sanitary sewer main
- 40 b. Be a 1-piece prefabricated saddle, either polyethylene or PVC, with neoprene
41 gasket for seal against main
- 42 c. Use saddle to fit outside diameter of main
- 43 d. Use saddle with grooves to retain band clamps
- 44 e. Use at least 2 stainless steel band clamps for securing saddles to the main
- 45 f. "Inserta Tee" type service connections are only permitted on HDPE pipe.

46 3. Cleanout and Box

- 1 a. Unpaved Areas:
- 2 1) PVC cleanout lid
- 3 2) 18" x 14" Plastic meter box
- 4 3) Cast iron sewer lid
- 5 b. Paved Areas:
- 6 1) Cast iron sewer lid with O-ring and Two 1/2-inch stainless steel bolts
- 7 2) 7-1/2-inch cast iron stack
- 8 4. Coupling
- 9 a. For connections between new PVC pipe stub out and existing service line, use
- 10 rubber sleeve couplings with stainless steel double-band repair sleeves with
- 11 shear guard to connect to the line.
- 12 b. Follow manufacturer recommendations for other pipe materials.

13 **2.3 ACCESSORIES [NOT USED]**

14 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

15 **PART 3 - EXECUTION**

16 **3.1 INSTALLERS**

- 17 A. A licensed plumber is required for installations of the service line on private property.

18 **3.2 EXAMINATION [NOT USED]**

19 **3.3 PREPARATION [NOT USED]**

20 **3.4 INSTALLATION**

21 A. General

- 22 1. Install service line, fittings, and cleanouts in accordance with this Section, Section
- 23 33 05 05, and the pipe manufacturer's recommendations.

24 B. Handling

- 25 1. Haul and distribute service lines, fittings, and cleanouts at the project site and
- 26 handle with care to avoid damage.
- 27 a. Inspect each segment of service line and reject or repair any damaged pipe
- 28 prior to lowering into the trench.
- 29 2. Do not handle the pipe in such a way that will damage the pipe.

30 C. Service Line

- 31 1. Lay service line at a minimum grade of 2 percent, as shown on City Standard
- 32 details, or at lines and grades as indicated in the Drawings.
- 33 2. If service line is installed by bore as an alternative to open cut, the cost associated
- 34 with open cut installation, such as pavement removal, trenching, embedment,
- 35 backfill, and pavement patch will not be included as part of the bore installation.
- 36 3. Excavate and backfill trenches in accordance with 33 05 05.
- 37 4. Embed pipe in accordance with 33 05 05.

38 D. Cleanout

- 1 1. Install out of traffic areas such as driveways, streets, and sidewalks whenever
2 possible.
- 3 a. When not possible, install cast iron cleanout stack and cap and reference the
4 City Standard Details.
- 5 E. Service line connection to main
- 6 1. For service connections, orient fitting wye or service saddle at the 10:00 or 2:00
7 position.
- 8 2. New service on new or replacement main
- 9 a. Determine location of service connections before main installation so the
10 service fittings can be installed during main installation.
- 11 b. Connect service line to main with a molded or fabricated wye fitting.
- 12 3. Reconnection to main after pipe enlargement
- 13 a. Tapping the existing main and installing a strap on wye connection may be
14 used.
- 15 b. Allow the new main to recover from imposed stretch before tapping and service
16 installation.
- 17 1) Follow manufacturer's recommendation for the length of time needed.
- 18 c. Extend service line from main to property line or easement line before
19 connecting to the existing service line.
- 20 4. New service on existing main
- 21 a. Connect service line to main with a molded or fabricated wye fitting if possible.
- 22 b. Tapping the existing main and installing a strap on wye connection may be
23 used.
- 24 F. Private Service Relocation
- 25 1. Requirements for the relocation of service line on private property:
- 26 a. A licensed plumber must be used to install service line on private property.
- 27 b. Obtain permit from City for work on private property.
- 28 c. Pay for any inspection or permit fees associated with work on private property.
- 29 d. Verify (by Exploratory Excavation of Existing Utilities) the elevations at the
30 building cleanout and compare to data on the Drawings before beginning
31 service installation.
- 32 e. Submit elevation information to the City inspector.
- 33 f. Verify the 2 percent slope installation requirement can be met.
- 34 1) If the 2 percent slope cannot be met, verify with the City that the line may
35 be installed at the lesser slope.

36 **3.5 REPAIR [NOT USED]**

37 **3.6 RE-INSTALLATION**

38 A. Service Relocation

- 39 1. All relocations that are not installed as designed or fail to meet the City code shall
40 be reinstalled at the Contractor's expense.

41 **3.7 FIELD QUALITY CONTROL**

42 A. Inspections

1 **1.4 ADMINISTRATIVE REQUIREMENTS**

2 A. Coordination

- 3 1. Schedule meeting with City to review sewer shutdown prior to replacing or
4 rehabilitating any facilities.
- 5 2. City reserves the right to delay schedule due to weather conditions or other
6 unexpected emergency within the sewer system.
- 7 3. Review bypass pumping arrangement or layout in the field with City prior to
8 beginning operations. Facilitate preliminary bypass pumping run with City staff
9 present to affirm the operation is satisfactory to the City.
- 10 4. After replacement or rehabilitation of facilities, coordinate the reestablishment of
11 sewer flow with City.
- 12 5. Provide onsite continuous monitoring during all bypass pumping operations using
13 one of the following methods:
- 14 a. Personnel on site, or
15 b. Portable SCADA equipment.

16 **1.5 SUBMITTALS**

17 A. Submittals shall be in accordance with Section 01 33 00.

18 B. All submittals shall be approved by the City prior to delivery.

19 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

20 A. For 15-inch and larger sewer mains, submit a detailed plan and description outlining all
21 provisions and precautions taken with regard to the handling of sewer flows.

- 22 1. Submit the plan to the City for approval a minimum of 14 days prior to
23 commencing work. Include the following details:
- 24 a. Schedule for installation and maintenance of the bypass pumping system
- 25 b. Staging areas for pumps
- 26 c. Pump sizes, capacity, number of each size, and power requirements
- 27 d. Calculations for static lift, friction losses, and velocity
- 28 e. Pump curves showing operating range and system head curves
- 29 f. Sewer plugging methods
- 30 g. Size, length, material, joint type, and method for installation of suction and
31 discharge piping
- 32 h. Method of noise control for each pump and/or generator, if required
- 33 i. Standby power generator size and location
- 34 j. Suction and discharge piping plan
- 35 k. Emergency action plan identifying the measures taken in the event of a pump
36 failure or sewer spill
- 37 l. Staffing plan for responding to alarm conditions identifying multiple contacts
38 by name and phone numbers (office, mobile)
- 39 m. A contingency plan to implement in the event the replacement or rehabilitation
40 has unexpected delays or problems

41 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

42 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

1 **1.9 QUALITY ASSURANCE [NOT USED]**

2 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

3 **1.11 FIELD CONDITIONS [NOT USED]**

4 **1.12 WARRANTY [NOT USED]**

5 **PART 2 - PRODUCTS**

6 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

7 **2.2 EQUIPMENT**

8 A. Pumping

- 9 1. Provide equipment that will convey the following:
- 10 a. City-provided flow data.
- 11 1) Full flow capacity of the sewer main, if data is not available
- 12 a) Calculate using Manning's equation assuming the following:
- 13 (1) Roughness coefficient, $n = 0.013$
- 14 2. Provide fully automatic self-priming pumps.
- 15 a. Foot-valves or vacuum pumps are not permitted for priming the system.
- 16 3. Pumps must be constructed to allow dry running for periods of time to account for
- 17 the cyclical nature of sewer flow.
- 18 4. Provide 1 stand-by pump for each size to be maintained on site. Place backup
- 19 pumps on line, isolated from the primary system by valve.
- 20 5. If multiple pumps are required to meet the flow requirements, provide the necessary
- 21 fittings and connections to incorporate multiple discharges.
- 22 6. Noise levels of the pumping system must follow the more stringent of the
- 23 requirements below:
- 24 a. City noise ordinance
- 25 b. No more the 65dB when measured at a distance of 300-ft from the source.
- 26 1) The noise level will be the average of sound level meter readings taken
- 27 consecutively at any given time from 4 or more diametrically opposite
- 28 positions measured at a distance of 300-ft from the source.
- 29 c. May be subject to special noise mitigation as required by the City.

30 B. Piping

- 31 1. Install pipes with joints which prevent the incident of flow spillage.

32 C. Plugs or Stop Logs

- 33 1. Plugs
- 34 a. Select a plug made for the size and potential pressure head that will be
- 35 experienced.
- 36 b. Provide an additional anchor, support, or bracing to secure plug when back
- 37 pressure is present.
- 38 c. Use accurately calibrated air pressure gauges for monitoring the inflation
- 39 pressure.

- 1 d. Place inflation gauge at location outside of confined space area. Keep the
- 2 inflation gauge and valve a safe distance from the plugs.
- 3 e. Never over inflate the plug beyond pressure rating.

4 **2.3 ACCESSORIES [NOT USED]**

5 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

6 **PART 3 - EXECUTION**

7 **3.1 INSTALLERS [NOT USED]**

8 **3.2 EXAMINATION [NOT USED]**

9 **3.3 PREPARATION**

- 10 A. Locate the bypass pipelines in the area to minimize disturbance to existing utilities.
- 11 Obtain approval from the City for use of locations.
- 12 B. Make preparations to comply with OSHA requirements when working in the presence
- 13 of sewer gases, oxygen-deficient atmospheres, and confined spaces.
- 14 C. Do not begin bypass preparation and operation until City approval of the submittals
- 15 requested in accordance with the requirements of this Section.

16 **3.4 INSTALLATION**

- 17 A. Install and operate pumping and piping equipment in accordance to the submittals
- 18 provided in accordance with the requirements of this Section.
- 19 B. Sewer flow stoppage
 - 20 1. Plugging
 - 21 a. Use confined space procedures and equipment during installation when
 - 22 necessary.
 - 23 b. Thoroughly clean the pipe before insertion of the plug.
 - 24 c. Insert the plug seal surface completely so it is fully supported by the pipe.
 - 25 d. Position the plug where there are not sharp edges or protrusions that may
 - 26 damage the plug.
 - 27 e. Use pressure gauges for measuring inflation pressures.
 - 28 f. Minimize upstream pressure head before deflating and removing.
- 29 C. Sewer flow control and monitoring
 - 30 1. Take precautions to ensure sewer flow operations do not cause flooding or damage
 - 31 to public or private property.
 - 32 a. The Contractor is responsible for any damage resulting from bypass pumping
 - 33 operations.
 - 34 2. Begin continual monitoring of the sewer system as soon as the sewer is plugged or
 - 35 blocked. Be prepared to immediately start bypass pumping if needed due to
 - 36 surcharge conditions.
 - 37 3. Sewer discharge may be into another sewer manhole, appropriate vehicle, or
 - 38 container only. Do not discharge sewer into an open environment such as an open
 - 39 channel or earthen holding facility.

- 1 4. Do not construct bypass facilities where vehicular traffic may travel over the
- 2 piping.
- 3 a. Provide details in the suction and discharge piping plan that accommodate both
- 4 the bypass facilities and traffic without disrupting either service.

5 **3.5 REPAIR [NOT USED]**

6 **3.6 RE-INSTALLATION [NOT USED]**

7 **3.7 FIELD QUALITY CONTROL**

8 A. Field Tests and Inspections

- 9 1. Perform leakage and pressure tests of the bypass pumping pipe and equipment
- 10 before actual operation begins. Have City on Site during tests.

11 **3.8 SYSTEM STARTUP [NOT USED]**

12 **3.9 ADJUSTING [NOT USED]**

13 **3.10 CLEANING [NOT USED]**

14 **3.11 CLOSEOUT ACTIVITIES**

- 15 A. Once plugging or blocking is no longer necessary, remove in such a way that permits
- 16 the sewer flow to slowly return to normal – preventing surge, surcharging, and major
- 17 downstream disturbance.

18 **3.12 PROTECTION [NOT USED]**

19 **3.13 MAINTENANCE [NOT USED]**

20 **3.14 ATTACHMENTS [NOT USED]**

21 **END OF SECTION**

22

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

23

24

1

- 1 c. The price bid shall include:
2 1) Furnishing and installing Reinforced Concrete Pipe as specified by the
3 Drawings
4 2) Hauling
5 3) Fittings
6 4) Joints
7 5) Gaskets
8 6) Dewatering
9 7) Excavation
10 8) Furnishing, placement and compaction of embedment
11 9) Furnishing, placement and compaction of backfill
12 10) Disposal of excess material
13 11) Connection to existing structures, pipes, and boxes
14 12) Plugs
15 13) Repair or replacing of materials
16 14) Clean-up
- 17 2. Reinforced Concrete Arch Pipe
18 a. Measurement
19 1) Measured per linear foot of Reinforced Concrete Pipe installed.
20 b. Payment
21 1) The work performed and materials furnished in accordance with this item
22 and measured as provided under “Measurement” will be paid for at the unit
23 price bid per linear foot for Reinforced Concrete Pipe installed for:
24 a) Various sizes.
25 b) Various classes (Class III through V).
- 26 c. The price bid shall include:
27 1) Furnishing and installing Reinforced Concrete Arch Pipe as specified by
28 the Drawings
29 2) Hauling
30 3) Fittings
31 4) Joints
32 5) Gaskets
33 6) Dewatering
34 7) Excavation
35 8) Furnishing, placement and compaction of embedment
36 9) Furnishing, placement and compaction of backfill
37 10) Disposal of excess material
38 11) Connection to existing structures, pipes, and boxes
39 12) Plugs
40 13) Repair or replacing of materials
41 14) Clean-up
- 42 3. Reinforced Concrete Elliptical Pipe
43 a. Measurement
44 1) Measured per linear foot of Reinforced Concrete Pipe installed.
45 b. Payment
46 1) The work performed, and materials furnished in accordance with this item
47 and measured as provided under “Measurement” will be paid for at the unit
48 price bid per linear foot for Reinforced Concrete Pipe installed for:

1

- 1 a) Various sizes.
- 2 b) Various classes (Class III through V).
- 3 c. The price bid shall include:
- 4 1) Furnishing and installing Reinforced Concrete Elliptical Pipe as specified
- 5 by the Drawings
- 6 2) Hauling
- 7 3) Fittings
- 8 4) Joints
- 9 5) Gaskets
- 10 6) Dewatering
- 11 7) Excavation
- 12 8) Furnishing, placement and compaction of embedment
- 13 9) Furnishing, placement and compaction of backfill
- 14 10) Disposal of excess material
- 15 11) Connection to existing structures, pipes, and boxes
- 16 12) Plugs
- 17 13) Repair or replacing of materials
- 18 14) Clean-up
- 19 4. Reinforced Concrete Box
- 20 a. Measurement
- 21 1) Measured per linear foot of Reinforced Concrete Box installed.
- 22 b. Payment
- 23 1) The work performed and materials furnished in accordance with this item
- 24 and measured as provided under "Measurement" will be paid for at the unit
- 25 price bid per linear foot for Reinforced Concrete Box installed for:
- 26 a) Various sizes.
- 27 b) Various classes (Class III through V).
- 28 c. The price bid shall include:
- 29 1) Furnishing and installing Reinforced Concrete Box as specified by the
- 30 Drawings
- 31 2) Curb less than 12 inches
- 32 3) Water
- 33 4) Loading
- 34 5) Unloading
- 35 6) Storing
- 36 7) Hauling
- 37 8) Handling of materials
- 38 9) Traffic control for all testing
- 39 10) Dewatering
- 40 11) Forms
- 41 12) Trial batches (as needed)
- 42 13) Materials and work needed for any corrective action
- 43 14) Concrete
- 44 15) Aggregate
- 45 16) Supplementary cementing materials
- 46 17) Concrete additives
- 47 18) Mixing
- 48 19) Placement of concrete
- 49 20) Finishing of concrete

- 1 21) Curing and curing compounds
- 2 22) Sawing
- 3 23) Joint sealant
- 4 24) Excavation
- 5 25) Furnishing, placement and compaction of embedment
- 6 26) Furnishing, placement and compaction of backfill
- 7 27) Disposal of excess material
- 8 28) Connection to existing structures, pipes, and boxes
- 9 29) Clean-up
- 10 5. RCB Extended Curb
- 11 a. Measurement
- 12 1) Measured per linear foot of RCB Extended Curb installed.
- 13 b. Payment
- 14 1) The work performed and materials furnished in accordance with this item
- 15 and measured as provided under “Measurement” will be paid for at the unit
- 16 price bid per linear foot for RCB Extended Curb installed for:
- 17 a) Various heights (1 through 5 FT).
- 18 b) Linear foot is measured along the span length of the single or multiple
- 19 box culvert length that the extended curb is needed.
- 20 c. The price bid shall include:
- 21 1) Furnishing and installing RCB Extended Curb as specified by the Drawings
- 22 2) Water
- 23 3) Loading
- 24 4) Unloading
- 25 5) Storing
- 26 6) Hauling
- 27 7) Handling of materials
- 28 8) Traffic control for all testing
- 29 9) Dewatering
- 30 10) Forms
- 31 11) Trial batches (as needed)
- 32 12) Materials and work needed for any corrective action
- 33 13) Concrete
- 34 14) Aggregate
- 35 15) Supplementary cementing materials
- 36 16) Concrete additives
- 37 17) Mixing
- 38 18) Placement of concrete
- 39 19) Finishing of concrete
- 40 20) Curing and curing compounds
- 41 21) Sawing
- 42 22) Connections
- 43 23) Fittings
- 44 24) Joints
- 45 25) Joint sealant
- 46 26) Excavation
- 47 27) Furnishing, placement and compaction of embedment
- 48 28) Furnishing, placement and compaction of backfill
- 49 29) Disposal of excess material

- 1 30) Connection to existing structures, pipes, and boxes
- 2 31) Clean-up
- 3 6. Corrugated Metal Pipe
- 4 a. Measurement
- 5 1) Measured per linear foot of Corrugated Metal Pipe installed.
- 6 b. Payment
- 7 1) The work performed and materials furnished in accordance with this item
- 8 and measured as provided under “Measurement” will be paid for at the unit
- 9 price bid per linear foot for Corrugated Metal Pipe installed for:
- 10 a) Various sizes.
- 11 c. The price bid shall include:
- 12 1) Furnishing and installing Corrugated Metal Pipe as specified by the
- 13 Drawings
- 14 2) Hauling
- 15 3) Fittings
- 16 4) Joints
- 17 5) Dewatering
- 18 6) Excavation
- 19 7) Furnishing, placement and compaction of embedment
- 20 8) Furnishing, placement and compaction of backfill
- 21 9) Disposal of excess material
- 22 10) Connection to existing structures, pipes, and boxes
- 23 11) Plugs
- 24 12) Repair or replacing of materials
- 25 13) Clean-up

26 1.3 REFERENCES

- 27 A. Abbreviations and Acronyms
- 28 1. CMP – Corrugated Metal Pipe
- 29 2. LRFD – Load Resistance Factor Design
- 30 3. PSI – Pounds per Square Inch
- 31 4. RCP – Reinforced Concrete Pipe
- 32 5. RCB – Reinforced Concrete Box
- 33 B. Definitions
- 34 1. Aluminized Steel Pipe=
- 35 a. If aluminized steel pipe is referenced in the Drawings or specifications,
- 36 aluminized steel pipe shall follow all requirements within this section for
- 37 Corrugated Metal Pipe.
- 38 2. RCB Curb and Extended Curb
- 39 a. Any curb shorter than 12 inches from the top of the box to the top of the curb
- 40 will be considered subsidiary to the RCB. Any curb taller than 12 inches will be
- 41 included under RCB Extended Curb.
- 42 C. Reference Standards
- 43 1. Reference standards cited in this Section refer to the current reference standard
- 44 published at the time of the latest revision date logged at the end of this Section
- 45 unless a date is specifically cited.

1

- 1 2. American Association of State Highway and Transportation Officials (AASHTO):
 - 2 a. AASHTO LRFD – AASHTO LRFD Bridge Design Specifications.
 - 3 b. M36, Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for
4 Sewers and Drains.
 - 5 c. M170, Standard Specification for Reinforced Concrete Culvert, Storm Drain,
6 and Sewer Pipe.
 - 7 d. M206, Standard Specification for Reinforced Concrete Arch Culvert, Storm
8 Drain, and Sewer Pipe.
 - 9 e. M207, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm
10 Drain, and Sewer Pipe.
 - 11 f. M259, Precast Reinforced Concrete Box Sections for Culverts, Storm Drains,
12 and Sewers.
 - 13 g. M273, Precast Reinforced Concrete Box Sections for Culverts, Storm Drains,
14 and Sewers with Less Than Two Feet of Cover Subjected to Highway
15 Loadings.
 - 16 h. M274, Standard Specification for Steel Sheet, Aluminum-Coated (Type 2), for
17 Corrugated Steel Pipe.
- 18 3. American Society for Testing and Materials (ASTM):
 - 19 a. ASTM A760, Standard Specification for Corrugated Steel Pipe, Metallic-
20 Coated for Sewers and Drains.
 - 21 b. ASTM A929, Standard Specification for Steel Sheet, Metallic-Coated by the
22 Hot-Dip Process for Corrugated Steel Pipe.
 - 23 c. ASTM C76, Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 24 d. ASTM C270, Standard Specification for Mortar for Unit Masonry.
 - 25 e. ASTM C443, Joints for Circular Concrete Sewer and Culvert Pipe Using
26 Rubber Gaskets.
 - 27 f. ASTM C506, Arch Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 28 g. ASTM C507, Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer
29 Pipe.
 - 30 h. ASTM C655, Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer
31 Pipe.
 - 32 i. ASTM C990, Standard Specification for Joints for Concrete Pipe, Manholes,
33 and Precast Box Sections Using Preformed Flexible Joint Sealants.
 - 34 j. ASTM C1433, Precast Reinforced Concrete Box Sections for Culverts, Storm
35 Drains and Sewers.
 - 36 k. ASTM C1577, Precast Reinforced Concrete Monolithic Box Sections for
37 Culverts, Storm Drains, and Sewers Designated According to AASHTO LRFD.
 - 38 l. ASTM C1619, Standard Specifications for Elastomeric Seals for Joining
39 Concrete Structures.
 - 40 m. ASTM C1677, Standard Specification for Joints for Concrete Box, Using
41 Rubber Gaskets.
- 42 4. Texas Department of Transportation (TxDOT) Departmental Material
43 Specifications (DMS):
 - 44 a. DMS-7310, Reinforced Concrete Pipe and Machine-Made Precast Concrete
45 Box Culvert Fabrication and Plant Qualification.

46 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

47

1 **1.5 SUBMITTALS**

2 A. Submittals shall be in accordance with Section 01 33 00.

3 B. All submittals shall be approved by the City prior to purchasing of materials.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Shop Drawings:

6 1. Product Data

7 a. Reinforced Concrete Pipe and Reinforced Concrete Box

8 1) Provide the following information on the product data submittal:

9 a) Product Type

10 b) Class of Concrete

11 c) Average length of pipe or box section

12 d) Type of jointing material used

13 e) Manufacturer recommendations for storage, handling, and installation
14 of pipe, boxes, and joints.

15 b. Corrugated Metal Pipe

16 1) Provide the following information on the product data submittal:

17 a) Manufacturer product sheet for pipe and jointing material used.

18 b) Manufacturer recommendations for storage, handling, and installation
19 of pipe and joints.

20 B. Information Submittals:

21 1. Certificates:

22 a. Provide the manufacturer's certificate of compliance providing their product
23 meets the physical testing requirements of this specification and DMS 7310 for
24 the materials referenced which may include, but are not limited to:

25 1) Concrete mix design and reinforcing

26 2) Reinforced concrete pipe

27 3) Reinforced concrete arch pipe

28 4) Reinforced concrete elliptical pipe

29 5) Reinforced concrete box

30 6) Jointing materials

31 7) Corrugated Metal pipe

32 2. Equipment Information

33 a. Submittal for all major equipment to include:

34 1) Equipment name and description

35 2) Size

36 3) Intended use

37 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

38 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

39 **1.9 QUALITY ASSURANCE [NOT USED]**

40 **1.10 DELIVERY, STORAGE, AND HANDLING**

41 A. Storage and Handling Requirements

- 1 1. Secure and maintain a location to store the material in accordance with Section 01
2 66 00.
- 3 2. General
- 4 a. Keep all pipes and boxes clean and drained during storage.
- 5 b. Transport, handle, and store pipe, boxes, and fittings as recommended by the
6 supplier or manufacturer.
- 7 c. Replace any pipe or box that is damaged during transport prior to installation at
8 no cost to the City.
- 9 3. Corrugated Metal Pipe
- 10 a. Handle the pipe in accordance with the recommendations of the National
11 Corrugated Steel Pipe Association.
- 12 4. Reinforced Concrete Pipe (RCP)
- 13 a. Markings
- 14 1) Mark each section of reinforced concrete pipe with the following
15 information:
- 16 a) Class of pipe
- 17 b) ASTM designation
- 18 c) Date of manufacture
- 19 d) Pipe size
- 20 e) Name or trademark of fabricator and plant location
- 21 f) Designated fabricator's approval stamp
- 22 g) Pipe to be used for jacking and boring (when applicable)
- 23 h) Designation "SR" for pipe meeting sulfate-resistant concrete plan
24 requirements (when applicable)
- 25 2) Clearly mark 1 end of each section during manufacturing or immediately
26 after for elliptical pipes.
- 27 3) For Non-Circular Pipes: Mark the pipe on the inside and outside of
28 opposite walls to show the location of the top or bottom of the pipe as it
29 should be installed.
- 30 5. Reinforced Concrete Box
- 31 a. Store and ship machine-made precast boxes in accordance with DMS-7310.
- 32 b. Markings:
- 33 1) Mark precast boxes with the following information:
- 34 a) Name or trademark of manufacturer
- 35 b) ASTM designation
- 36 c) Date of manufacture
- 37 d) Box size
- 38 e) Minimum and maximum fill heights
- 39 f) Designated fabricator's approval stamp
- 40 g) Boxes to be used for jacking and boring (when applicable)
- 41 h) Designation "SR" for boxes meeting sulfate-resistant concrete plan
42 requirements (when applicable)
- 43 2) Mark 1 end of each box section without lifting holes on the inside and
44 outside walls to indicate the top or bottom as it will be installed.
- 45 3) Indent markings into the box section or paint them on each box with
46 waterproof paint.
- 47 6. Pre-Formed Flexible Joint Sealants

- a. Store pre-formed flexible joint sealants in an area warmed naturally or artificially to above 70 degrees Fahrenheit in an approved manner when the atmospheric temperature is below 60 degrees Fahrenheit.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-SUPPLIED PRODUCTS [NOT USED]

2.2 MANUFACTURERS

A. Manufacturers

1. Reinforced Concrete Pipe RCP
 - a. Johnson County Pipe or approved equal.
2. Corrugated Metal Pipe (also known as Aluminized Steel Pipe)
 - a. Contech Engineered Solutions, ULTRA FLO or approved equal.
 - 1) Aluminized Steel Type 2 Spiral Rib, Corrugated Metal
3. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

B. Concrete (RCP and RCB):

1. Class C:
 - a. Provide Class C concrete in accordance with Section 03 00 00 with greater than 2 feet of cover.
2. Class S:
 - a. Provide Class S concrete in accordance with Section 03 00 00 with 0 to 2 feet of cover.
3. Machine-Made Precast:
 - a. Provide the class of concrete required based on available cover. Provide machine-made precast reinforced concrete box when possible in accordance with DMS-7310.
4. Cast-in-Place:
 - a. Provide the class of concrete required based on available cover. Conform to requirements in Section 03 30 00 and DMS-7310.
5. Formed Precast:
 - a. Not permitted for use.

C. Reinforcement (Cast-in-Place RCB):

1. Provide grade 60 steel reinforcing in accordance with Section 03 00 00.
2. Provide a minimum of 2 inches of cover on all reinforcing unless otherwise noted.

D. Reinforced Concrete Pipe (RCP):

1. Circular Pipe
 - a. In accordance with ASTM C76, ASTM C655, and AASHTO M170.
 - b. Provide circular pipe based on the classes specified in the Drawings and Table
 1. Provide the required class of pipe based on the pipe cover from:

- 1) Top of ground to top of pipe
- 2) Top of pavement to top of pipe
- c. If the Drawings do not show the correct pipe class based on cover, obtain written direction from the City prior to installing the pipe.

Table 1
Circular Pipe Class and D-Load

Pipe Class	D-Load	Minimum Pipe Cover (FT)
3 (III)	1,350	2
4 (IV)	2,000	1 to 2
5 (V)	3,000	Direct Traffic Loading (0 to 1)

- 2. Arch Pipe
 - a. In accordance with ASTM C506 and AASHTO M206.
 - b. Maintain a minimum 1-foot cover from top of ground or pavement to top of pipe.
 - c. Provide arch pipe design sizes in accordance with Table 2.

Table 2
Arch Pipe

Design Size	Equivalent Diameter (in.)	Rise (in.)	Span (in.)
1	18	13.5	22
2	21	15.5	26
3	24	18	28.5
4	30	22.5	36.25
5	36	26 – 5/8	43.75
6	42	31 – 5/16	51 – 1/8
7	48	36	58.5
8	54	40	65
9	60	45	73
10	72	54	88

- 3. Elliptical Pipe
 - a. In accordance with ASTM C507 and AASHTO M207
 - b. Maintain a minimum 1-foot cover from top of ground or pavement to top of pipe.
 - c. Provide elliptical pipe design sizes in accordance with Table 3.

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**Table 3
 Elliptical Pipe**

Design Size	Equivalent Diameter (in.)	Rise (in.)	Span (in.)
1	18	14	23
2	24	19	30
3	27	22	34
4	30	24	38
5	33	27	42
6	36	29	45
7	39	32	49
8	42	34	53
9	48	38	60
10	54	43	68

E. Reinforced Concrete Box (RCB)

1. In accordance with ASTM C1433, AASTHO M259, and AASTHO M273.
2. Lifting Holes:
 - a. Provide no more than 4 lifting holes in each section for precast boxes.
 - b. Lifting holes may be cast-in-place or drilled by manufacturer. Ensure no reinforcing has been cut.
 - c. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the box section.
 - d. Use lifting holes no larger than 3 inches in diameter.
 - e. Repair any spalled areas around lifting holes.
 - f. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs may be used.

F. Corrugated Metal Pipe (CMP)

1. When approved, provide corrugated metal pipe in accordance with Table 4.
2. Provide pipe in a circular shape in sizes ranging from 18 inch to 24 inch.
 - a. Provide reinforced concrete pipe for any pipe sizes larger than 24 inch.
3. Only circular steel pipe will be allowed. For arch or elliptical pipe, use reinforced concrete pipe.
4. Corrugated metal pipe is only permitted:
 - a. In locations where the existing driveway culvert is a steel pipe.
 - b. Within a developed site.
5. Steel pipe will not be approved for use:
 - a. Within the City's right-of-way
 - b. As a connection to City storm sewer infrastructure from an off-site system
 - 1) A minimum of 50 feet of reinforced concrete pipe is required to connect to a City storm system.
6. Provide any protective coating as required by the manufacturer.

Table 4
Specification for Corrugated Metal Pipe

Pipe Type	ASTM/AASHTO Specification
Aluminized Steel Type 2	ASTM A760/AASHTO M36 & ASTM 929/AASHTO M274
Circular, Spiral Rib	Type IR

G. Jointing Materials

1. Corrugated Metal Pipe

- a. Provide bands and joints in accordance with manufacturer’s recommendations for ULTRA-FLO Pipe.

2. Concrete Pipe and Box Joints and Fittings

- a. Use any of the following materials to make joints unless otherwise specified on the Drawings. Provide a manufacturer’s certificate of compliance for all jointing materials except mortar.

1) Rubber Gaskets:

- a) Type: ASTM C1619 Class A or C
b) Provide gaskets in accordance with the requirements of ASTM C443 for design of the pipe joints and permissible variations in dimensions.

2) Pre-Formed Flexible Joint Sealants:

- a) Used for sealing tongue-and-groove concrete pipe
b) Joint Characteristics:
(1) In accordance with the requirements of ASTM C990, and
(2) do not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strengths,
(3) are in extruded rope form, and
(4) are in accordance with the manufacturer’s recommendations for size and are large enough to properly seal the joint.
c) Protect joint sealant with a suitable wrapper that maintains the integrity of the jointing material when the wrapper is removed.

H. Cast Iron Frame and Cover

1. Provide a frame and cover marked “Storm Sewer” in accordance with Section 33 05 81.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections

1. Reinforced Concrete Pipe (RCP)

- a. Provide manufacturer certification the RCP has been tested in accordance with DMS-7310.

2. Reinforced Concrete Box Culverts (RCB)

a. Machine-Made Precast:

- 1) Provide manufacturer certification the RCB has been tested in accordance with DMS-7310.

b. Cast-In-Place:

- 1) Test cast-in-place RCB in accordance with Section 03 30 00 and Section 03 00 00.

1 B. Non-Conforming Materials

2 1. Reinforced Concrete Pipe (RCP)

- 3 a. Any individual section of pipe may be rejected if the pipe does not conform to
4 the conditions stated in the Annex of DMS-7310, Reinforced Concrete Pipe and
5 Machine-Made Precast Concrete Box Culvert Fabrication and Plant
6 Qualification.
7 b. Any individual section of pipe may be rejected if the City determines pipe has
8 excessive cracks, fractures, gouges, or any other surface deformations.

9 2. Reinforced Concrete Box (RCB)

- 10 a. Any individual section of box may be rejected if the City determines the box
11 has excessive cracks, fractures, gouges, or any other surface deformations.
12 b. Any individual section of box may be rejected if the following tolerance
13 requirements are not met.
14 1) General requirements:
15 a) In accordance with permissible variations listed in ASTM C1577
16 b) Sides do not vary from perpendicular to the top and bottom by more
17 than 0.5 inch when measure diagonally between opposite interior
18 corners.
19 2) Wall and Slab Thicknesses:
20 a) Verify all box wall and slab thicknesses match the thicknesses specified
21 in the Drawings.
22 b) Occasional deficiencies are allowed when the deficiencies are not
23 greater than 3/16 inch or 5% of the thickness, whichever is greater.
24 c) Wall and slab thicknesses greater than specified in the Drawings are
25 acceptable if the jointing is not affected.
26 3) Deviations from the above tolerances is not acceptable. Any box found to
27 be non-compliant will be removed and replaced at no cost to the City.

28 **PART 3 - EXECUTION**

29 **3.1 INSTALLERS [NOT USED]**

30 **3.2 EXAMINATION [NOT USED]**

31 **3.3 PREPARATION [NOT USED]**

32 **3.4 INSTALLATION**

33 A. Excavation, Shaping, Bedding, and Backfill

- 34 1. Perform excavation, shaping, bedding, and backfill in accordance with Section 33
35 05 05.
36 2. Take care when placing and compacting the backfill to avoid any movement of
37 storm water pipe and boxes or damage to the joints.
38 3. Do not use heavy earth-moving equipment to haul over the pipes or boxes until a
39 minimum of 4 feet of permanent or temporary compacted fill has been placed over
40 the structure unless otherwise specified in the Drawings or permitted in writing.
41

- 1 4. Corrugated Metal Pipe
- 2 a. The City and Contractor to visually inspect the inside periphery of the pipes for
- 3 local or unequal deformation caused by improper construction methods before
- 4 adding each new layer of loose backfill material.
- 5 b. Continue inspections until a minimum of 24 inches of cover is obtained.
- 6 c. Remove and replace any pipe the City considers deformed or non-conforming
- 7 at no cost to the City.

8 B. Jacking, Boring, or Tunneling

- 9 1. Jacking, boring, or tunneling is not recommended for installing storm sewer pipe or
- 10 boxes. Prior approval is required before any jacking, boring, or tunneling operation
- 11 begins.
- 12 2. If jacking, boring, or tunneling is required, provide a design based on the specific
- 13 installation conditions such as the soil conditions, installation methods, anticipated
- 14 deflection angles, and jacking stresses.
- 15 3. Provide design notes and Drawings signed and sealed by a Texas licensed
- 16 professional Engineer.
- 17 4. Additional Reinforced Concrete Box Requirements
- 18 a. In accordance with TxDOT Item 476.
- 19 b. The box ends must be square and no point should deviate more than 3/8 inch
- 20 from a plane placed on the end of the box that is perpendicular to the sides.
- 21 c. Wall and Slab Thickness:
- 22 1) Minimum thickness as specified in the Drawings
- 23 2) No greater than 0.5 inches than the thickness specified on the Drawings

24 C. Pipe Laying

- 25 1. General:
- 26 a. Where possible, install the pipe so that the top of pipe is below any pavement
- 27 subgrade, unless otherwise specified in the Drawings.
- 28 b. Maintain a minimum 0.5 percent slope unless otherwise shown on the
- 29 Drawings.
- 30 c. Start the laying of pipe on the bedding at the outlet end with the spigot or
- 31 tongue end pointing downstream.
- 32 d. Proceed towards the inlet end with the abutting sections properly matched true
- 33 to the established lines and grades specified in the Drawings.
- 34 e. Fit, match, and lay the pipe to form a smooth and uniform conduit.
- 35 f. Lower sections of pipe into the trench without damaging the pipe or disturbing
- 36 the bedding and the sides of the trench.
- 37 g. Carefully clean the ends of the pipe before the pipe is placed.
- 38 h. Prevent the earth or bedding material from entering the pipe as it is laid.
- 39 2. Reinforced Concrete Pipe
- 40 a. General:
- 41 1) Cut cross trenches in the foundation to allow the barrel of the pipe to rest
- 42 firmly on the bedding where bell-an-spigot pipe is used.
- 43 2) Cut cross trenches no more than 2 inches larger than the bell ends of the
- 44 pipe.
- 45 3) Lay multiple lines of reinforced concrete pipe with the centerlines of the
- 46 individual barrels parallel.

- 4) Use the clear distances between outer surfaces of adjacent pipes shown in Table 6 unless otherwise specified in the Drawings.
 - 5) Use the equivalent diameter from Table 2 or 3 for arch or horizontal elliptical pipe to determine the clear distance requirement in Table 5.
- b. Elliptical Pipe:
- 1) Lay the pipe so the markings for the top or bottom are not more than 5 degrees from the vertical plane through the longitudinal axis of the pipe.
 - 2) Remove and re-lay any pipe that is not in alignment or shows excessive settlement after laying at no cost to the City.

Table 5
Minimum Clear Distance Between RCP

Equivalent Diameter (Inches)	Minimum Clear Distance
18	9 inches
24	11 inches
30	1 foot, 1 inch
36	1 foot, 3 inches
42	1 foot, 5 inches
48	1 foot, 7 inches
54	1 foot, 11 inches
60 to 84 inches	2 feet

D. Corrugated Metal Pipe (CMP)

1. Coat any metal in joints that are not protected by galvanizing or aluminizing with an approved asphalt paint.
2. Use the clear distances between outer surfaces of adjacent pipes shown in Table 6 unless otherwise shown on the Drawings.

Table 6
Minimum Clear Distance Between CMP

Equivalent Diameter (Inches)	Minimum Clear Distance (Inches)
18	1 foot, 2 inches
21	1 foot, 3 inches
24	1 foot, 5 inches

E. Placement of Boxes

1. Where possible, place the box so the top of box is below any pavement subgrade, unless otherwise shown on the Drawings.
2. Maintain a minimum 0.5 percent slope unless otherwise specified in the Drawings.
3. Place the box sections in accordance with the Drawings.
4. Place material to be used between barrels as specified in the Drawings or as directed by the City.
5. Start laying the boxes on the bedding at the outlet end.
6. Proceed toward the inlet end with the abutting sections properly matched true to the established lines and grades specified in the Drawings.
7. Fit, match, and lay the boxes to form a smooth and uniform conduit.

- 1 8. Lower the box sections into the trench, for trench installations, without damaging
- 2 the box or disturbing the bedding and the sides of the trench.
- 3 9. Carefully clean the ends of the box before it is placed.
- 4 10. Prevent the earth or bedding material from entering the box as it is laid.
- 5 11. Remove and re-lay any box section that is not in alignment or shows excessive
- 6 settlement after laying at no cost to the City.

7 F. Jointing

- 8 1. Reinforced Concrete Pipe (RCP) and Concrete Box (RCB)
- 9 a. Provide an appropriate rolling device for conveyance through small-size pipe
- 10 structures.
- 11 b. Joints Sealed with Rubber Gaskets:
- 12 1) Make the joint assembly according to the recommendations of the gasket
- 13 manufacturer.
- 14 2) Make joints watertight when using rubber gaskets.
- 15 3) Backfill after the joint has been inspected and approved.
- 16 4) Reinforced Concrete Box (RCB)
- 17 a) Box joints for rubber gasketed material may be substituted for tongue
- 18 and groove joints.
- 19 b) Provide rubber gasket joints for RCB in accordance with the
- 20 requirements of ASTM C1677.
- 21 c. Joints Using Pre-Formed Flexible Joint Sealants:
- 22 1) Install pre-formed flexible joint sealants in accordance with the
- 23 manufacturer's recommendations.
- 24 2) Place the joint sealer so no dirt or other deleterious materials encounter the
- 25 joint sealing material.
- 26 3) Pull or push home the pipe with enough force to properly seal the joint.
- 27 4) Remove any joint material pushed out into the interior of the pipe that
- 28 would obstruct the flow.
- 29 5) Apply flexible joint sealants to the pipe joints immediately before placing
- 30 pipe in trench and connecting pipe to previously laid pipe.
- 31 6) Backfill after the joint as been inspected and approved.
- 32 2. Corrugated Metal Pipe (CMP)
- 33 a. General:
- 34 1) Provide field joints that maintain pipe alignment during construction and
- 35 prevent infiltration of side material during the life of the installation.
- 36 2) Install bands and joints in accordance with manufacturer's
- 37 recommendations.

38 G. Connections and Stub Ends

- 39 1. Reinforced Concrete Pipe (RCP)
- 40 a. Make connections of concrete pipe to existing pipes, pipe storm drains, or
- 41 storm drain appurtenances as specified in the Drawings.
- 42 b. Mortar or concrete the bottom of existing structures if necessary to eliminate
- 43 any drainage pockets created by the connections with a Type S mortar in
- 44 accordance with the requirements of ASTM C270.
- 45 c. Repair any damage to the existing structure resulting from making the
- 46 connections.

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- d. Make connections between concrete pipe and corrugated metal pipe with a suitable concrete collar and a minimum thickness of 4 inches.
- 1) Corrugated metal pipe is not permitted for use within the City's right-of-way unless otherwise specified in the Drawings or herein.

- 2) Prior to connecting to an existing CMP storm system:
 - a) Remove any existing corrugated metal pipe to the City's right-of-way.
 - b) Replace with an equivalent sized RCP.
 - e. Finish stub ends for connections to future work not shown on the Drawings by installing watertight plugs into the free end of the pipe. Plugs are considered subsidiary to the RCP unless a separate bid item is provided.
 - f. Fill lift holes with concrete, mortar, or precast concrete plugs after the pipe is in place.
2. Reinforced Concrete Box (RCB)
 - a. Make connections of boxes to existing boxes, pipes, drains, or drain appurtenances as specified in the Drawings.
 - b. Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections with a Type S mortar in accordance with the requirements of ASTM C270.
 - c. Connect boxes to any required headwalls, wingwalls, safety end treatments, riprap, or other structures as specified in the Drawings or as directed by the City. Connections will be considered subsidiary to the RCB.
 - d. Repair any damage to the existing structure resulting from making the connections.
 - e. Finish stub ends for connections to future work by installing watertight plugs into the free end of the box. Plugs are considered subsidiary to the RCB unless a separate bid item is provided.
 - f. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs may be used.
 3. Corrugated Metal Pipe (CMP)
 - a. Make connections of pipe to existing pipe or appurtenances as specified in the Drawings or as directed by the City.
 - b. Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections with a Type S mortar in accordance with the requirements of ASTM C270.
 - c. Insulate portions of aluminum pipe in contact with metal other than aluminum by a coating of material recommended by the manufacturer. Extend coating a minimum of 1 foot beyond the area of contact.
 - d. Repair any damage to the existing structure resulting from making the connections.

H. Extending Existing Box Culverts

1. Any curb less than 12 inches will be considered subsidiary to the RCB. Any curb taller than 12 inches will be included under the RCB Extended Curb bid item.
2. Break back and extend existing box culverts in accordance with TxDOT Item 420 and 422.
 - a. If extending the existing box culvert is required, provide design notes and Drawings signed and sealed by a Texas licensed professional Engineer.

3.5 REPAIR

- A. Make repairs if necessary for reinforced concrete pipe and machine-made precast boxes in accordance with DMS-7310.

1 B. Reinforced Concrete Box (RCB)

2 1. Cracks:

3 a. Fine cracks on the surface of the section that do not extend to the plan of the
4 nearest reinforcement are acceptable unless the cracks are numerous and
5 extensive. The City will determine if the cracks are considered non-conforming.

6 b. Remove and replace any concrete box considered non-conforming at no cost to
7 the City.

8 2. Excessive damage, honeycomb, or cracking will be subject to structural review by
9 the City.

10 **3.6 RE-INSTALLATION [NOT USED]**

11 **3.7 SITE QUALITY CONTROL**

12 A. Site Tests and Inspections

13 1. Reinforced Concrete Pipe and Box

14 a. Provide access for inspection of the finished pipe at the project site before and
15 during installation.

16 2. Stormwater Mains and Laterals

17 a. Closed Circuit Television (CCTV) Inspection

18 1) Provide a Post-CCTV Inspection in accordance with Section 33 01 30.

19 B. Non-Conforming Work

20 1. Remove and replace any pipe or box damaged by the Contractor during installation
21 at no cost to the City.

22 **3.8 SYSTEM STARTUP [NOT USED]**

23 **3.9 ADJUSTING [NOT USED]**

24 **3.10 CLEANING [NOT USED]**

25 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

26 **3.12 PROTECTION [NOT USED]**

27 **3.13 MAINTENANCE [NOT USED]**

28 **3.14 ATTACHMENTS [NOT USED]**

29 **END OF SECTION**

30

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

31

- 1 6) Storing
- 2 7) Hauling
- 3 8) Handling of materials
- 4 9) Traffic control for all testing
- 5 10) Dewatering
- 6 11) Forms
- 7 12) Trial batches (as needed)
- 8 13) Materials and work needed for any corrective action
- 9 14) Concrete
- 10 15) Reinforcing
- 11 16) Aggregate
- 12 17) Supplementary cementing materials
- 13 18) Concrete additives
- 14 19) Mixing
- 15 20) Placement of concrete
- 16 21) Finishing of concrete
- 17 22) Curing and curing compounds
- 18 23) Sawing
- 19 24) Connections
- 20 25) Fittings
- 21 26) Joints
- 22 27) Joint sealant
- 23 28) Connection to existing structures, pipes, and boxes
- 24 29) Plugs
- 25 30) Excavation
- 26 31) Furnishing, placement and compaction of embedment
- 27 32) Furnishing, placement and compaction of backfill
- 28 33) Cleanup
- 29 34) Disposal of excess material
- 30 2. Stormwater Manhole Riser
- 31 a. Measurement
- 32 1) Measured per each Stormwater Manhole Riser installed.
- 33 b. Payment
- 34 1) The work performed and materials furnished in accordance with this item
- 35 and measured as provided under "Measurement" will be paid for at the unit
- 36 price bid per each for Stormwater Manhole Riser installed for:
- 37 a) Various Depth Ranges. (0 to 4', 4' to 8', 8' to 12', Greater than 12')
- 38 c. The price bid shall include:
- 39 1) Furnishing and installing Stormwater Manhole Riser as specified by the
- 40 Drawings
- 41 2) Staged construction
- 42 3) Water
- 43 4) Loading
- 44 5) Unloading
- 45 6) Storing
- 46 7) Hauling
- 47 8) Handling of materials
- 48 9) Traffic control for all testing
- 49 10) Dewatering

- 1 11) Forms
- 2 12) Trial batches (as needed)
- 3 13) Materials and work needed for any corrective action
- 4 14) Concrete
- 5 15) Reinforcing
- 6 16) Aggregate
- 7 17) Supplementary cementing materials
- 8 18) Concrete additives
- 9 19) Mixing
- 10 20) Placement of concrete
- 11 21) Finishing of concrete
- 12 22) Curing and curing compounds
- 13 23) Sawing
- 14 24) Connections
- 15 25) Fittings
- 16 26) Joints
- 17 27) Joint sealant
- 18 28) Connection to existing structures, pipes, and boxes
- 19 29) Plugs
- 20 30) Excavation
- 21 31) Furnishing, placement, and compaction of embedment
- 22 32) Furnishing, placement, and compaction of backfill
- 23 33) Cleanup
- 24 34) Disposal of excess material

25 1.3 REFERENCES

26 A. Abbreviations and Acronyms

- 27 1. JB – Junction Box
- 28 2. PSI – Pounds per Square Inch
- 29 3. RCB – Reinforced Concrete Box
- 30 4. RCP – Reinforced Concrete Pipe

31 B. Reference Standards

- 32 1. Reference standards cited in this Section refer to the current reference standard
33 published at the time of the latest revision date logged at the end of this Section
34 unless a date is specifically cited.
- 35 2. American Society for Testing and Materials (ASTM):
 - 36 a. C478, Standard Specification for Circular Precast Reinforced Concrete
37 Manhole Sections
 - 38 b. D4101, Standard Classification System and Basis for Specification for
39 Polypropylene Injection and Extrusion Materials
- 40 3. Texas Department of Transportation (TxDOT) Departmental Material
41 Specifications (DMS):
 - 42 a. 4675, Cementitious Grouts and Mortars for Miscellaneous Applications
 - 43 b. 6100, Epoxies and Adhesives
 - 44 c. 7310, Reinforced Concrete Pipe and Machine-Made Precast Concrete Box
45 Culvert Fabrication and Plant Qualification

1 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**
2

1 **1.5 SUBMITTALS**

- 2 A. Submittals shall be in accordance with Section 01 33 00.
3 B. All submittals shall be approved by the City prior to purchasing of materials.

4 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

5 A. Shop Drawings:

- 6 1. Stormwater Junction Boxes and Manhole Risers
7 a. Provide the following information on the shop drawing submittal:
8 1) Product type and size
9 2) Class of concrete
10 3) Concrete mix design (only for cast-in-place)
11 4) Connection/jointing material used
12 5) Manufacturer recommendations for storage, handling, and installation.
- 13 2. Product Data
14 a. Provide a material data sheet for review and approval for:
15 1) Mortar, if applicable
16 2) Epoxy, if applicable
17 3) Jointing Material
18 4) Any bonding material

19 B. Information Submittals:

- 20 1. Certificates:
21 a. Provide the manufacturer's certificate of compliance that their product meets
22 the physical testing requirements of this Section, DMS 6100, DMS 7310, and
23 DMS 4675 (if applicable) for the applicable materials used.
- 24 2. Equipment Information
25 a. Submittal for all major equipment to include:
26 1) Equipment name and description
27 2) Size
28 3) Intended use

29 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

30 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

31 **1.9 QUALITY ASSURANCE [NOT USED]**

32 **1.10 DELIVERY, STORAGE, AND HANDLING**

33 A. Delivery and Acceptance Requirements

- 34 1. Do not place any loads on precast items before design strength has been reached.
35 2. Do not ship items until design strength requirements have been met.

36 B. Storage and Handling Requirements

- 37 1. Secure and maintain a location to store the material in accordance with Section 01
38 66 00.
39 2. Store precast items on a level surface.

40 C. Markings:

1. Mark precast boxes with the following information:
 - a. Name or trademark of manufacturer
 - b. Product designation
 - c. ASTM designation
 - d. Date of manufacture
 - e. Designated fabricator's approval stamp
 - f. Designation "SR" for boxes meeting sulfate-resistant concrete plan requirements (when applicable)
2. Indent markings or paint them on with waterproof paint.

1.11 FIELD CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 CITY-SUPPLIED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Manufacturers

1. Inlet Frame & Cover Manufacturer List
 - a. Bass & Hays Foundry, Inc or
 - b. Approved equal.
2. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

B. Concrete

1. Cast-In-Place:
 - a. Provide Class C in accordance with Section 03 00 00 unless otherwise specified in the Drawings.
2. Precast:
 - a. Provide Class H with a minimum compressive strength of 5,000 PSI in accordance with Section 03 00 00
 - 1) Provide machine-made precast inlets in accordance with DMS-7310

C. Reinforcement

1. Provide grade 60 steel reinforcing in accordance with Section 03 00 00.
2. Provide a minimum of 2 inches of cover on all reinforcing unless otherwise noted.

D. Cast Iron Frame and Cover

1. Provide a frame and cover marked "Storm Sewer" in accordance with Section 33 05 81.
 - a. Provide Pick Slots
 - b. Provide a 32-inch diameter frame and cover that provides minimum 30-inch diameter opening

E. Steps:

1. Provide polypropylene supports and steps at least 12 inches wide in accordance with ASTM D4101 and ASTM C478, Section 16, "Steps and Ladders".

1

1 F. Mortar:

- 2 1. Provide mortar in accordance with DMS-4675.

3 G. Epoxy:

- 4 1. Provide Type V epoxy per DMS-6100 for bonding fresh concrete to hardened
5 concrete.
6 2. Place the bonding epoxy on a clean, dry surface, and place the fresh concrete while
7 the epoxy is still tacky.

8 H. Jointing Materials

- 9 1. Provide jointing materials in accordance with Section 33 42 11.

10 **2.3 ACCESSORIES [NOT USED]**

11 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

12 **PART 3 - EXECUTION**

13 **3.1 INSTALLERS [NOT USED]**

14 **3.2 EXAMINATION [NOT USED]**

15 **3.3 PREPARATION [NOT USED]**

16 **3.4 INSTALLATION**

17 A. Construct junction boxes and manhole risers in 1 or 2 stages. Use the following steps if
18 constructing in 2 stages:

- 19 1. No separate pay will be given for staging construction of junction boxes and
20 manhole risers.
21 2. Stage 1:
22 a. Construct the storm drain pipe or box and attach the base of the junction box or
23 manhole riser.
24 b. Provide a temporary plug for the exposed end of the storm drain if needed.
25 c. Follow all safety requirements for Federal, State, and local requirements when
26 leaving a junction box or manhole riser exposed.
27 3. Stage 2:
28 a. Excavate to expose the top of the stage 1 construction (if needed) and complete
29 the junction box or manhole riser in accordance with the Drawings and this
30 Section.
31 b. Coordinate construction of the junction box or manhole riser top with paving
32 operations.
33 c. Finalize construction of subgrade, asphalt base/surface course, or concrete
34 pavement and adjust the top of the junction box or manhole riser as needed to
35 be flush with the final pavement level.
36 1) All adjustments to grade of the junction boxes and manhole risers will be
37 considered subsidiary to the construction of the junction box or manhole
38 riser regardless of how many times the top needs to be adjusted due to
39 phasing of the project.

- 1 d. Remove any temporary plugs prior to completion of the junction box or
- 2 manhole riser.
- 3 e. Furnish and install any frames, grates, rings, and covers.
- 4 f. Clean all debris from the walls and bottom of the junction box or reinforced
- 5 concrete box.
- 6 B. Cast-In-Place Junction Boxes and Manhole Risers:
- 7 1. Construct cast-in-place junction boxes and manhole risers in accordance with
- 8 Section 03 00 00, 03 30 00, and this Section.
- 9 C. Precast Junction Boxes and Manhole Risers
- 10 1. Precast junction boxes and manhole risers are only permitted when written approval
- 11 has been provided by the City prior to construction activities starting.
- 12 2. Formed precast junction boxes and manhole risers will not be permitted.
- 13 3. Provide cast-in-place or machine-made precast junction boxes and manhole risers.
- 14 4. Construct machine-made items in accordance with ASTM C478 and this Section.
- 15 5. Provide certification letters stating the machine-made items were made in
- 16 accordance with DMS-7310 and ASTM C478 and conform to the product
- 17 permissible variations and rejection criteria stated in ASTM C478.
- 18 D. Steps
- 19 1. Cast-In-Place:
- 20 a. Cast steps into the junction box or manhole riser walls
- 21 2. Precast:
- 22 a. Drill and epoxy or grout steps in place in accordance with manufacturer's
- 23 recommendations.
- 24 E. Lifting Holes
- 25 1. Provide no more than 4 lifting holes in each section for precast boxes.
- 26 2. Lifting holes may be cast-in-place or drilled by manufacturer. Ensure no reinforcing
- 27 has been cut.
- 28 3. Provide lifting holes large enough for adequate lifting devices based on the size and
- 29 weight of the box section.
- 30 4. Use lifting holes no larger than 3 inches in diameter.
- 31 5. Repair any spalled areas around lifting holes.
- 32 6. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs
- 33 may be used.
- 34 F. Excavation, Shaping, Bedding, and Backfill
- 35 1. Perform excavation, shaping, bedding, and backfill in accordance with Section 33
- 36 05 05.
- 37 2. Backfill around junction boxes, manholes risers, pipes, and boxes in accordance
- 38 with Section 33 05 05 and 33 42 11.
- 39 3. Take care when placing and compacting the backfill to avoid any movement or
- 40 damage to the junction boxes, manhole risers, storm water pipe and boxes, or their
- 41 joints.

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4. Do not use heavy earth-moving equipment over pipes or boxes until a minimum of 4 feet of permanent or temporary compacted fill has been placed over the structure unless otherwise specified in the Drawings or permitted in writing.

- 1 c. Backfill the junction box or manhole riser and RCB at the same time.
- 2 I. Inverts
- 3 1. Shape and route floor inverts passing out or through the junction box base as
- 4 specified in the Drawings.
- 5 2. Shape by adding and shaping mortar or concrete after the base is placed or by
- 6 placing the required additional material with the base.
- 7 J. Frame, Grates, and Covers
- 8 1. Provide a 32-inch frame and cover in accordance with Section 33 05 81.
- 9 a. A grated cover will not be permitted unless otherwise specified in the Drawings
- 10 or approved by the City.

11 **3.5 REPAIR [NOT USED]**

12 **3.6 RE-INSTALLATION [NOT USED]**

13 **3.7 SITE QUALITY CONTROL**

- 14 A. When a structure is left open without supervision, provide structurally adequate fencing
- 15 or cover.

16 **3.8 SYSTEM STARTUP [NOT USED]**

17 **3.9 ADJUSTING [NOT USED]**

18 **3.10 CLEANING [NOT USED]**

19 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

20 **3.12 PROTECTION [NOT USED]**

21 **3.13 MAINTENANCE [NOT USED]**

22 **3.14 ATTACHMENTS [NOT USED]**

23 **END OF SECTION**

24

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

25

- 1 7) Hauling
- 2 8) Handling of materials
- 3 9) Traffic control for all testing
- 4 10) Dewatering
- 5 11) Forms
- 6 12) Trial batches (as needed)
- 7 13) Materials and work needed for any corrective action
- 8 14) Concrete
- 9 15) Reinforcing
- 10 16) Aggregate
- 11 17) Supplementary cementing materials
- 12 18) Concrete additives
- 13 19) Mixing
- 14 20) Placement of concrete
- 15 21) Finishing of concrete
- 16 22) Curing and curing compounds
- 17 23) Sawing
- 18 24) Connections
- 19 25) Fittings
- 20 26) Joints
- 21 27) Joint sealant
- 22 28) Connection to existing structures, pipes, and boxes
- 23 29) Plugs
- 24 30) Excavation
- 25 31) Furnishing, placement and compaction of embedment
- 26 32) Furnishing, placement and compaction of backfill
- 27 33) Disposal of excess material
- 28 34) Clean-up
- 29 2. Recessed Curb Inlet
- 30 a. Measurement
- 31 1) Measured per each Recessed Curb Inlet installed.
- 32 b. Payment
- 33 1) The work performed and materials furnished in accordance with this item
- 34 and measured as provided under "Measurement" will be paid for at the unit
- 35 price bid per each for Recessed Curb Inlet installed for:
- 36 a) Various sizes. (5 to 30 feet)
- 37 c. The price bid shall include:
- 38 1) Furnishing and installing Recessed Curb Inlet as specified by the Drawings
- 39 2) Staged construction
- 40 3) Water
- 41 4) Loading
- 42 5) Unloading
- 43 6) Storing
- 44 7) Hauling
- 45 8) Handling of materials
- 46 9) Traffic control for all testing
- 47 10) Dewatering
- 48 11) Forms
- 49 12) Trial batches (as needed)

- 1 13) Materials and work needed for any corrective action
- 2 14) Concrete
- 3 15) Reinforcing
- 4 16) Aggregate
- 5 17) Supplementary cementing materials
- 6 18) Concrete additives
- 7 19) Mixing
- 8 20) Placement of concrete
- 9 21) Finishing of concrete
- 10 22) Curing and curing compounds
- 11 23) Sawing
- 12 24) Connections
- 13 25) Fittings
- 14 26) Joints
- 15 27) Joint sealant
- 16 28) Connection to existing structures, pipes, and boxes
- 17 29) Plugs
- 18 30) Excavation
- 19 31) Furnishing, placement and compaction of embedment
- 20 32) Furnishing, placement and compaction of backfill
- 21 33) Disposal of excess material
- 22 34) Clean-up
- 23 3. Type 2 Curb Inlet
- 24 a. Measurement
- 25 1) Measured per each Type 2 Curb Inlet installed.
- 26 b. Payment
- 27 1) The work performed and materials furnished in accordance with this item
- 28 and measured as provided under "Measurement" will be paid for at the unit
- 29 price bid per each for Type 2 Curb Inlet installed for:
- 30 a) Various sizes. (5 to 30 feet)
- 31 c. The price bid shall include:
- 32 1) Furnishing and installing Type 2 Curb Inlet as specified by the Drawings
- 33 2) Staged construction
- 34 3) Hauling
- 35 4) Water
- 36 5) Loading
- 37 6) Unloading
- 38 7) Storing
- 39 8) Hauling
- 40 9) Handling of materials
- 41 10) Traffic control for all testing
- 42 11) Dewatering
- 43 12) Forms
- 44 13) Trial batches (as needed)
- 45 14) Materials and work needed for any corrective action
- 46 15) Concrete
- 47 16) Reinforcing
- 48 17) Aggregate
- 49 18) Supplementary cementing materials

- 1 19) Concrete additives
- 2 20) Mixing
- 3 21) Placement of concrete
- 4 22) Finishing of concrete
- 5 23) Curing and curing compounds
- 6 24) Sawing
- 7 25) Connections
- 8 26) Fittings
- 9 27) Joints
- 10 28) Joint sealant
- 11 29) Connection to existing structures, pipes, and boxes
- 12 30) Plugs
- 13 31) Excavation
- 14 32) Furnishing, placement and compaction of embedment
- 15 33) Furnishing, placement and compaction of backfill
- 16 34) Disposal of excess material
- 17 35) Clean-up
- 18 4. Drop Inlet
- 19 a. Measurement
- 20 1) Measured per each Drop Inlet installed.
- 21 b. Payment
- 22 1) The work performed and materials furnished in accordance with this item
- 23 and measured as provided under "Measurement" will be paid for at the unit
- 24 price bid per each for Drop Inlet installed for:
- 25 a) Various sizes. (3 to 5 feet)
- 26 c. The price bid shall include:
- 27 1) Furnishing and installing Drop Inlet as specified by the Drawings
- 28 2) Staged construction
- 29 3) Water
- 30 4) Loading
- 31 5) Unloading
- 32 6) Storing
- 33 7) Hauling
- 34 8) Handling of materials
- 35 9) Traffic control for all testing
- 36 10) Dewatering
- 37 11) Forms
- 38 12) Trial batches (as needed)
- 39 13) Materials and work needed for any corrective action
- 40 14) Concrete
- 41 15) Reinforcing
- 42 16) Aggregate
- 43 17) Supplementary cementing materials
- 44 18) Concrete additives
- 45 19) Mixing
- 46 20) Placement of concrete
- 47 21) Finishing of concrete
- 48 22) Curing and curing compounds
- 49 23) Sawing

- 1 24) Connections
- 2 25) Fittings
- 3 26) Joints
- 4 27) Joint sealant
- 5 28) Connection to existing structures, pipes, and boxes
- 6 29) Plugs
- 7 30) Excavation
- 8 31) Furnishing, placement and compaction of embedment
- 9 32) Furnishing, placement and compaction of backfill
- 10 33) Disposal of excess material
- 11 34) Clean-up

12 **1.3 REFERENCES**

13 A. Abbreviations

- 14 1. PSI – Pounds per Square Inch

15 B. Reference Standards

- 16 1. Reference standards cited in this Section refer to the current reference standard
- 17 published at the time of the latest revision date logged at the end of this Section
- 18 unless a date is specifically cited.
- 19 2. American Society for Testing and Materials (ASTM):
- 20 a. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete
- 21 Manhole Sections
- 22 b. ASTM D4101 – Standard Classification System and Basis for Specification for
- 23 Polypropylene Injection and Extrusion Materials
- 24 3. Texas Department of Transportation (TxDOT) Departmental Material
- 25 Specifications (DMS):
- 26 a. 4675, Cementitious Grouts and Mortars for Miscellaneous Applications
- 27 b. 6100, Epoxies and Adhesives
- 28 c. 7310, Reinforced Concrete Pipe and Machine-Made Precast Concrete Box
- 29 Culvert Fabrication and Plant Qualification

30 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

31 **1.5 SUBMITTALS**

32 A. Submittals shall be in accordance with Section 01 33 00.

33 B. All submittals shall be approved by the City prior to delivery.

34 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

35 A. Shop Drawings:

- 36 1. Stormwater Curb and Drop Inlets
- 37 a. Provide the following information on the shop drawing submittal:
- 38 1) Product type and size
- 39 2) Class of concrete
- 40 3) Concrete mix design, for cast-in-place components only
- 41 4) Connection/jointing material used
- 42 5) Manufacturer recommendations for storage, handling, and installation

- 1 2. Product Data
- 2 a. Provide a material data sheet for review and approval for:
- 3 1) Mortar
- 4 2) Epoxy
- 5 3) Jointing Material
- 6 4) Any bonding material
- 7 B. Information Submittals:
- 8 1. Certificates:
- 9 a. Provide manufacturer’s certificate of compliance stating their product is in
- 10 accordance with the physical testing requirements of this Section, DMS 6100,
- 11 DMS 7310, and DMS 4675 (if applicable) for the applicable materials used.
- 12 2. Equipment Information
- 13 a. Submittal for all major equipment to include:
- 14 1) Equipment name and description
- 15 2) Size
- 16 3) Intended use

17 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

18 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

19 **1.9 QUALITY ASSURANCE [NOT USED]**

20

21 **1.10 DELIVERY, STORAGE, AND HANDLING**

22 A. Delivery and Acceptance Requirements

- 23 1. Do not place any loads on precast items before design strength has been reached.
- 24 2. Do not ship items until design strength requirements have been met.

25 B. Storage and Handling Requirements

- 26 1. Secure and maintain a location to store the material in accordance with Section 01
- 27 66 00.
- 28 2. Store precast items on a level surface.

29 C. Markings:

- 30 1. Mark precast inlets and other items with the following information:
- 31 a. Name or trademark of manufacturer
- 32 b. Product designation
- 33 c. ASTM designation
- 34 d. Date of manufacture
- 35 e. Designated fabricator’s approval stamp
- 36 f. Designation “SR” for boxes meeting sulfate-resistant concrete plan
- 37 requirements, if applicable
- 38 2. Indent markings or paint them on with waterproof paint.

39 **1.11 FIELD CONDITIONS [NOT USED]**

40 **1.12 WARRANTY [NOT USED]**

1 **PART 2 - PRODUCTS**

2 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

3 **2.2 MATERIALS**

4 A. Manufacturers

- 5 1. Inlet Frame & Cover Manufacturer List
6 a. Bass & Hays Foundry, Inc or approved equal.
7 2. Substitution requests for manufacturers or models not indicated above shall be
8 processed in accordance with Section 01 25 00.

9 B. Concrete

- 10 1. Cast-In-Place:
11 a. Class S in accordance with Section 03 00 00
12 2. Precast:
13 a. Class H with a minimum compressive strength of 5,000 PSI in accordance with
14 Section 03 00 00
15 1) Provide machine-made precast inlets in accordance with DMS-7310.

16 C. Reinforcement

- 17 1. Provide grade 60 steel reinforcing in accordance with Section 03 00 00.
18 2. Provide a minimum of 2 inches of cover on all reinforcing unless otherwise noted.

19 D. Cast Iron Frame and Cover

- 20 1. Provide a frame and cover marked "Storm Sewer" in accordance with Section 33 05
21 81.
22 2. Provide Pick Slots
23 3. Provide a 32-inch diameter frame and cover that provides minimum 30-inch
24 diameter opening

25 E. Steps:

- 26 1. Provide polypropylene supports and steps that are at least 12 inches wide that meet
27 the requirements of ASTM D4101 and ASTM C478, Section 16, "Steps and
28 Ladders".

29 F. Mortar:

- 30 1. Provide mortar in accordance with DMS-4675.

31 G. Jointing Materials

- 32 1. Provide jointing materials in accordance with Section 33 42 11.

33 H. Epoxy:

- 34 1. Provide Type V epoxy per DMS-6100 for bonding fresh concrete to hardened
35 concrete.
36 2. Place the bonding epoxy on a clean, dry surface, and place the fresh concrete while
37 the epoxy is still tacky.

38 **2.3 ACCESSORIES [NOT USED]**

39 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION [NOT USED]**

5 **3.4 INSTALLATION**

- 6 A. Construct inlets in 1 or 2 stages. Use the following steps if constructing in 2 stages:
- 7 1. No separate pay will be given for staging construction of junction boxes and
8 manhole risers.
- 9 2. Stage 1:
- 10 a. Construct the storm drain pipe or box and attach the pipe to the base of the
11 inlet.
- 12 b. Provide a temporary plug for either end of the storm pipe if needed.
- 13 c. Backfill as necessary and in accordance with the Drawings around the Stage 1
14 construction.
- 15 d. Follow all safety requirements for Federal, State, and local requirements when
16 leaving an inlet base exposed.
- 17 3. Stage 2:
- 18 a. Excavate to expose the top of the stage 1 construction (if needed) and complete
19 the inlet in accordance with the Drawings and this Section.
- 20 b. Coordinate construction of the inlet top with paving operations.
- 21 c. After completion of the subgrade, asphalt base/surface course, concrete
22 pavement, or surrounding ground, construct the inlet top and/or aprons in
23 accordance with the Drawings.
- 24 d. Remove any temporary plugs prior to the completion of the inlet.
- 25 e. Furnish and install any frames, grates, rings, and covers.
- 26 f. Clean all debris from the walls and bottom of inlet base.
- 27 B. Cast-In-Place Inlets:
- 28 1. Where possible, use precast inlet bases with cast-in-place inlet tops.
- 29 2. Construct cast-in-place inlet bases and tops in accordance with Section 03 00 00, 03
30 30 00, and this Section.
- 31 3. Forms for all cast-in-place inlet components will be required unless otherwise
32 approved.
- 33 C. Precast Inlets
- 34 1. Formed precast inlet bases and tops will not be permitted.
- 35 2. Provide machine-made precast inlet bases and tops.
- 36 3. Construct machine-made items in accordance with ASTM C478 and this Section.
- 37 4. Provide certification letters stating the machine-made items were made in
38 accordance with DMS-7310 and ASTM C478 and conform to the product
39 permissible variations and rejection criteria stated in ASTM C478.
- 40 D. Steps
- 41 1. Cast-In-Place:

- 1 a. Cast steps into inlet walls.
- 2 2. Precast:
- 3 a. Drill and epoxy or grout steps in place in accordance with manufacturer's
- 4 recommendations.
- 5

- 1 E. Lifting Holes
- 2 1. Provide no more than 4 lifting holes in each section for precast boxes.
- 3 2. Lifting holes may be cast-in-place or drilled by manufacturer. Ensure no reinforcing
- 4 has been cut.
- 5 3. Provide lifting holes large enough for adequate lifting devices based on the size and
- 6 weight of the box section.
- 7 4. Use lifting holes no larger than 3 inches in diameter.
- 8 5. Repair any spalled areas around lifting holes.
- 9 6. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs
- 10 may be used.
- 11 F. Excavation, Shaping, Bedding, and Backfill
- 12 1. Perform excavation, shaping, bedding, and backfill in accordance with Section 33
- 13 05 05.
- 14 2. Backfill around inlets, pipes, and boxes in accordance with Section 33 05 05 and 33
- 15 42 11.
- 16 3. Take care when placing and compacting the backfill to avoid any movement or
- 17 damage to inlet bases, storm water pipe, boxes, or their joints.
- 18 4. Do not use heavy earth-moving equipment to haul over the pipes or boxes until a
- 19 minimum of 4 feet of permanent or temporary compacted fill has been placed over
- 20 the structure unless otherwise specified in the Drawings or permitted in writing.
- 21 G. Connections to Reinforced Concrete Pipe (RCP)
- 22 1. Construct inlet bases before completion of stormwater pipes into or through the
- 23 inlet.
- 24 2. Neatly cut all stormwater pipes at the inside face of the junction box walls.
- 25 H. Connections to Reinforced Concrete Box (RCB)
- 26 1. Construct inlet bases before completion of stormwater pipes into or through the
- 27 inlet.
- 28 2. Neatly cut all stormwater pipes at the inside face of the junction box walls.
- 29 I. Connections to Reinforced Concrete Box (RCB)
- 30 1. For inlets that connect directly to the top slab of an RCB, install the inlet base in
- 31 conjunction with the placement of the RCB.
- 32 2. Backfill the junction box or manhole riser and RCB at the same time.
- 33 J. Inverts
- 34 1. Shape and route floor inverts passing out or through the inlet as specified in the
- 35 Drawings.
- 36 2. Shape by adding and shaping mortar or concrete after the base is placed or by
- 37 placing the required additional material with the base.
- 38 K. Inlet Top Construction and Finishing
- 39 1. Complete the inlet base and top in accordance with the Drawings in either 1 or 2
- 40 stages.

1

- 1 c. The price bid shall include:
 - 2 1) Installing each aluminum Sign
 - 3 2) Furnishing and fabricating frames, wind beams, stiffeners, or required joint
 - 4 backing strips
 - 5 3) Furnishing bolts, rivets, screws, fasteners, clamps, brackets, and sign
 - 6 support connections
 - 7 4) Assembling and erecting the signs
 - 8 5) Preparing and cleaning the signs
- 9 3. Furnishing and Installing Ground Mounted Aluminum Sign and Post Assemblies
 - 10 a. Measurement
 - 11 1) Measured per each sign and post assembly furnished and installed.
 - 12 b. Payment
 - 13 1) The work performed and materials furnished in accordance with this item
 - 14 and measured as provided under “Measurement” will be paid for at the unit
 - 15 price bid per each for “Furnish/Install Alum Sign Ground Mount” installed
 - 16 for:
 - 17 a) Various types.
 - 18 c. The price bid shall include:
 - 19 1) Fabrication of signs and posts
 - 20 2) Treatment of sign panels required before application of background
 - 21 materials
 - 22 3) Application of the background materials and messages to the sign panels
 - 23 4) Scheduling utility line locates
 - 24 5) Furnishing and fabricating frames, wind beams, stiffeners, or required joint
 - 25 backing strips
 - 26 6) Furnishing bolts, rivets, screws, fasteners, clamps, brackets, and sign
 - 27 support connections
 - 28 7) Assembling and erecting the signs
 - 29 8) Preparing and cleaning the signs
- 30 4. Installing Ground Mounted Aluminum Sign and Post Assemblies
 - 31 a. Measurement
 - 32 1) Measured per each sign and post assembly installed.
 - 33 b. Payment
 - 34 1) The work performed and materials furnished in accordance with this item
 - 35 and measured as provided under “Measurement” will be paid for at the unit
 - 36 price bid per each for “Install Alum Sign Ground Mount” installed.
 - 37 a) Various types.
 - 38 c. The price bid shall include:
 - 39 1) Scheduling utility line locates.
 - 40 2) Assembling and erecting the signs and posts.
 - 41 3) Preparing and cleaning the signs.
- 42 5. Furnishing and Installing Aluminum Signs Mounted on Existing Poles
 - 43 a. Measurement
 - 44 1) Measured per each sign furnished and installed.
 - 45 b. Payment

- 1) The work performed, and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each for “Furnish/Install Alum Sign Ex. Pole Mount” installed.
- c. The price bid shall include:
- 1) Furnishing and Installing the aluminum sign
 - 2) Furnishing and fabricating frames, wind beams, stiffeners, or required joint backing strips
 - 3) Furnishing bolts, rivets, screws, fasteners, clamps, brackets, and sign support connections
 - 4) Assembling and erecting the signs
 - 5) Preparing and cleaning the signs
6. Installing Aluminum Sign Mounted on Existing Poles
- a. Measurement
- 1) Measured per each sign installed.
- b. Payment
- 1) The work performed, and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each for “Install Alum Sign Ex. Pole Mount” installed.
- c. The price bid shall include:
- 1) Furnishing and fabricating frames, wind beams, stiffeners, or required joint backing strips.
 - 2) Furnishing bolts, rivets, screws, fasteners, clamps, brackets, and sign support connections.
 - 3) Assembling and erecting the signs.
 - 4) Preparing and cleaning the signs.
7. Removal of Signs
- a. Measurement
- 1) Measured per each sign panel removed or each sign panel and post removed.
- b. Payment
- 1) The work performed and materials furnished in accordance with this item and measured as provided under “Measurement” will be paid for at the unit price bid per each “Remove Sign” or “Remove Sign and Post” for:
 - a) Various types.
 - b) Various configurations.
- c. The price bid shall include:
- 1) Removal of sign panel
 - 2) Removal of sign post, if required
 - 3) Excavation, if required
 - 4) Hauling, if required
 - 5) Disposal of excess materials
 - 6) Furnishing, placement, and compaction of backfill, if required
 - 7) Returning materials to the City as specified in the Drawings
 - 8) Cleaning sign panel if sign is to be reinstalled
 - 9) Clean-up

1.3 REFERENCES

- 1 A. Reference Standards
- 2 1. Reference standards cited in this Section refer to the current reference standard
- 3 published at the time of the latest revision date logged at the end of this Section
- 4 unless a date is specifically cited.
- 5

- 1 2. American Standard Testing Materials (ASTM):
 - 2 a. A1011 / A1011M-18a, Standard Specification for Steel, Sheet and Strip, Hot-
3 Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-
4 Alloy with Improved Formability, and Ultra-High Strength.
 - 5 b. B117-18, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 6 c. B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet
7 and Plate.
 - 8 d. B209-02a, Standard Specification for Aluminum and Aluminum-Alloy Sheet
9 and Plate.
 - 10 e. D4956-17, Standard Specification for Retroreflective Sheeting for Traffic
11 Control.
- 12 3. American Association of State Highways and Transportation Officials (AASHTO):
 - 13 a. M120-08, Standard Specification for Zinc.
- 14 4. Texas Manual on Uniform Traffic Control Devices (TMUTCD).
- 15 5. Texas Department of Transportation, Standard Specifications for Construction and
16 Maintenance of Highways, Streets, and Bridges (TxDOT):
 - 17 a. Item 644, Small Roadside Sign Assemblies.
- 18 6. United States Military Standard (MIL):
 - 19 a. C5541, Chemical Conversion Coatings on Aluminum and Aluminum Alloys.

20 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

21 **1.5 SUBMITTALS**

- 22 A. Submittals shall be in accordance with Section 01 33 00.
- 23 B. All submittals shall be approved by the City prior to delivery and/or fabrication for
24 special signs.

25 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 26 A. Shop Drawings
 - 27 1. Submit sign shop drawings to City for review prior to fabrication.

28 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

29 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

30 **1.9 QUALITY ASSURANCE [NOT USED]**

31 **1.10 DELIVERY, STORAGE, AND HANDLING**

- 32 A. Delivery and Acceptance Requirements
 - 33 1. Properly protect signs and parts so that no damage or deterioration occurs during
34 the time of shipment until installation.
- 35 B. Storage and Handling Requirements
 - 36 1. Secure and maintain a location to store the material in accordance with Section 01
37 66 00.
 - 38 2. Ship, handle, and store completed sign blanks and completed signs so that corners,
39 edges, and faces are not damaged.

- 1 3. Replace unacceptable signs as directed by City.
- 2 4. Store all finished signs off the ground and in a vertical position until erected.
- 3 5. Store finished signs 60 inches x 60 inches or smaller in a weatherproof building.
- 4 a. Larger signs may be stored outside.

5 **1.11 FIELD CONDITIONS [NOT USED]**

6 **1.12 WARRANTY [NOT USED]**

7 **PART 2 - PRODUCTS**

8 **2.1 CITY-FURNISHED PRODUCTS**

9 A. Items eligible for purchase from the City include:

- 10 1. Aluminum Signs.

11 **2.2 MATERIALS**

12 A. Manufacturers

13 1. Sign Sheeting

14 a. Acrylic Overlay Film

- 15 1) 3M Scotchlite ElectroCut Film Series 1170

16 b. Non-Reflective Vinyl Film

- 17 1) 3M Scotchlite ElectroCut Film Series 7725

18 c. High Intensity Prismatic Retroreflective Sheeting with Adhesive Backing

- 19 1) 3M Series 3930

20 d. Super-High Efficiency Full Cube Retroreflective Sheeting with Pressure Sensitive Adhesive

- 21 1) 3M Series 4000

- 22 2. Substitution requests for manufacturers or models not indicated above shall be processed in accordance with Section 01 25 00.

23 B. Sign Blanks

- 24 1. New, unweathered, milled, rolled, and finished aluminum alloy meeting requirements for 5052H38 in accordance with ASTM B209-14.

- 25 2. Free of buckle, crevice, warp, dent, cockles, burrs, corrosion, dirt, grease, oil, white rust, fingerprints, and/or other irregularities.

- 26 3. Degreased and etched according to industry standards with an Alodine finish applied in accordance with MIL-C5541, Class 1A.

- 27 4. Uniform thickness throughout.

28 C. Sign Sheeting

29 1. Acrylic Overlay Film

- 30 a. Applied to Type I, Type II, Type IV, Type IX, and other retroreflective sheeting for permanent signing.

31 b. Durable

32 c. Transparent

33 d. Acrylic

34 e. Electronic-cuttable

- 1 f. Coated with a transparent, pressure sensitive adhesive
- 2 g. Have a removable synthetic liner – paper liner is not acceptable
- 3 h. Fill colors may be yellow, green, blue, brown, red, and orange.
- 4 2. Non-Reflective Vinyl Film
- 5 a. Applied to Type IV, Type XI (DG3) retroreflective sheeting for permanent
- 6 signing.
- 7 b. Durable
- 8 c. 2 mil opaque cast vinyl
- 9 d. Coated with a transparent, pressure-sensitive adhesive
- 10 e. Have a removable synthetic liner – paper liner is not acceptable
- 11 f. Film colors may include yellow, green, blue, brown, red, and orange.
- 12 3. High Intensity Prismatic Retroreflective Sheeting with Adhesive Backing
- 13 a. Combine with other components for permanent signing.
- 14 b. Unmetallized microplastic lens retroreflective element material
- 15 c. Smooth outer surface with the property of the retroreflector over its entire
- 16 surface.
- 17 1) The adhesive backing shall be pressure-sensitive, require no heat, solvent,
- 18 or other preparation for the adhesion to smooth, clean surfaces.
- 19 d. Film colors may include white, yellow, green, red, blue, and brown.
- 20 4. Super-High Efficiency Full Cube Retroreflective Sheeting with Pressure Sensitive
- 21 Adhesive
- 22 a. Combine with other components for permanent signing.
- 23 b. Have the highest retroreflectivity characteristics at medium and short road
- 24 distances.
- 25 c. Microprismatic retroreflective element material
- 26 d. Smooth outer surface with the property of retroreflector over its entire surface.
- 27 1) The adhesive backing shall be pressure-sensitive, require no heat, solvent,
- 28 or other preparation for adhesion to smooth, clean surfaces.
- 29 e. Film colors may include white, yellow, green, red, blue, brown, fluorescent
- 30 yellow, fluorescent yellow green, and fluorescent orange.
- 31 D. Telescopic Steel Sign Posts and Anchors
- 32 1. Provide posts and anchors in accordance with ASTM A1011 / A1011M-18a.
- 33 a. Minimum 60,000 psi yield strength.
- 34 b. Manufactured from raw steel.
- 35 c. Formed and welded on the corner prior to receiving a triple coat protection of
- 36 inline hot-dipped, galvanized zinc in accordance with AASHTO M-120-08 (0.8
- 37 ounces per square foot).
- 38 d. Provide chromate conversion coating and a cross-linked polyurethane acrylic
- 39 exterior coating.
- 40 e. Install double coat of zinc based organic coating on interior of posts.
- 41 1) Test coating in accordance with ASTM B-117-18.
- 42 E. Hardware
- 43 1. Provide galvanized steel, stainless steel, or dichromate-sealed aluminum for bolts,
- 44 nuts, washers, lock washers, screws, and other sign assembly hardware.
- 45 2. Use plastic or nylon washers to avoid tearing the reflective sheeting.

46 **2.3 ACCESSORIES [NOT USED]**

1 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

2 **PART 3 - EXECUTION**

3 **3.1 INSTALLERS [NOT USED]**

4 **3.2 EXAMINATION [NOT USED]**

5 **3.3 PREPARATION [NOT USED]**

6 **3.4 FABRICATION**

7 A. Sign Blanks

- 8 1. Provide sign blanks to the sizes and shapes specified in the Drawings, free of
- 9 buckles, warps, burrs, dents, cockles, or other defects.
- 10 2. Do not splice individual extruded aluminum panels.
- 11 3. Complete the fabrication of sign blanks, including the cutting and drilling or
- 12 punching of holes, before cleaning and degreasing.
- 13 4. After cleaning and degreasing, ensure the substrate does not come into contact with
- 14 grease, oils, or other contaminants before the application of the reflective sheeting.

15 B. Sign Sheeting

- 16 1. Use reflective sheeting from the same manufacturer for the entire face of a sign.
- 17 2. Apply sheeting to sign blanks in accordance with the recommended procedures of
- 18 the sheeting manufacturer.
- 19 3. Clean and prepare the outside surface of extruded aluminum flanges in the same
- 20 manner as the sign panel face.
- 21 4. Minimize the number of splices in the sheeting.
- 22 5. Overlap the lap-splices by at least 1/4 inch.
- 23 6. Provide a 1-foot minimum dimension for any piece of sheeting.
- 24 7. Do not splice sheeting for signs fabricated with transparent screen inks or colored
- 25 transparent films.

26 C. Sign messages

- 27 1. Fabricate sign messages to the sizes, types, and colors specified in the Drawings.
- 28 2. Use sign message material from the same manufacturer for the entire message of a
- 29 sign.
- 30 3. Ensure the screened messages have clean, sharp edges and exhibit uniform color
- 31 and reflectivity.
- 32 4. Prevent runs, sags, and voids.

33 D. Telescopic steel sign posts

- 34 1. Permissible variation in straightness is 1/16 inch in 3 feet.
- 35

- 1 2. Allowable tolerances are based on outside dimensions in accordance with the table
2 below.
3 a. Measurements for outside dimensions shall be made at least 2 inches from end
4 of tube.
5

Nominal Outside Dimensions (inches)	Outside Tolerance at all Side Corners (inches)
1-1/2 x 1-1/2	±0.006
1-3/4 x 1-3/4	±0.008
2 x 2	±0.008
2-1/4 x 2-1/4	±0.010
2-1/2 x 2-1/2	±0.010

- 6
7 3. Permissible variation in wall thickness is plus 0.011 inches, minus 0.008 inches.
8 4. Measured in the center of the flat side tolerance is ± 0.01 inch applied to the
9 specific size determined at the corner.
10 5. Allowable tolerance for squareness of sides and permissible twist are based on
11 outside dimensions in accordance with the table below.
12

Nominal Outside Dimensions (inches)	Squareness Tolerance (inches)	Twist Permissible in 3 inches Lengths (inches)
1-1/2 x 1-1/2	±0.009	0.050
1-3/4 x 1-3/4	±0.010	0.062
2 x 2	±0.012	0.062
2-1/4 x 2-1/4	±0.014	0.062
2-1/2 x 2-1/2	±0.015	0.075

- 13
14 6. All top posts must be capable of fracturing at the point of connection with a single
15 anchor when impacted. Posts must fracture in a manner to allow the piece inside of
16 the anchor to be removed and a new top post be installed.
17 7. The shape of all posts and anchors shall be square and straight with smooth tubing
18 welded in one corner with a tolerance that permits telescoping of the next larger or
19 small size, in 1/4-inch increments.
20 8. All anchors shall be 12 gauge with holes that are fully perforated 7/16-inch
21 diameter on 1-inch centers for at least the top 4 inches of the anchor while being
22 truly aligned in the center of the section.

1 9. All top posts shall be 14 gauge with holes that are die embossed knockouts on 1-
2 inch centers for the entire length of the post and truly aligned in the center of
3 section.
4

5 **3.5 REPAIR / RESTORATION [NOT USED]**

6 **3.6 RE-INSTALLATION [NOT USED]**

7 **3.7 FIELD QUALITY CONTROL [NOT USED]**

8 **3.8 SYSTEM STARTUP [NOT USED]**

9 **3.9 ADJUSTING [NOT USED]**

10 **3.10 CLEANING**

11 A. Wash completed signs with a biodegradable cleaning solution acceptable to the
12 manufactures of the sheeting, colored transparent film, and screen ink to remove grease,
13 oil, dirt, smears, streaks, finger marks, and other foreign material.

14 B. Wash again before final inspection after erection.

15 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

16 **3.12 PROTECTION [NOT USED]**

17 **3.13 MAINTENANCE [NOT USED]**

18 **3.14 ATTACHMENTS [NOT USED]**

19 **END OF SECTION**

20

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

21

- 1 3. Preparation of Traffic Control Plan Details
- 2 a. Measurement
- 3 1) Measured per each Traffic Control Detail prepared.
- 4 b. Payment
- 5 1) The work performed and materials furnished in accordance with this item
- 6 and measured as provided under “Measurement” will be paid for at the unit
- 7 price bid per each “Traffic Control Detail” prepared.
- 8 c. The price bid shall include:
- 9 1) Preparing the Traffic Control Plan Details for closures of 24 hours or
- 10 longer.
- 11 2) Adherence to City and TMUTCD.
- 12 3) Obtaining the signature and seal of a licensed Texas Professional Engineer.
- 13 4) Incorporation of City comments.
- 14

15 **1.3 REFERENCES**

16 A. Abbreviations and Acronyms

- 17 1. TMUTCD – Texas Manual of Uniform Traffic Control Devices

18 B. Reference Standards

- 19 1. Reference standards cited in this Section refer to the current reference standard
- 20 published at the time of the latest revision date logged at the end of this Section
- 21 unless a date is specifically cited.
- 22 2. Texas Manual on Uniform Traffic Control Devices (TMUTCD).
- 23 3. Texas Department of Transportation (TxDOT), Standard Specifications for
- 24 Construction and Maintenance of Highways, Streets, and Bridges:
- 25 a. Item 502, Barricades, Signs, and Traffic Handling of the Texas Department of
- 26 Transportation, Standard Specifications for Construction and Maintenance of
- 27 Highways, Streets, and Bridges.

28 **1.4 ADMINISTRATIVE REQUIREMENTS**

29 A. Coordination

- 30 1. Contact City Traffic Control Operations (940-349-8462) a minimum of 48 hours
- 31 prior to implementing Traffic Control within 500 feet of a traffic signal.

32 B. Sequencing

- 33 1. Any deviations to the Traffic Control Plan specified in the Drawings must first be
- 34 approved by the City and design Engineer before implementation.

35 **1.5 SUBMITTALS**

- 36 A. Provide the City with a current list of qualified flaggers before beginning flagging
- 37 activities. Use only flaggers on the qualified list.

- 38 B. Obtain a Street Use Permit from the Streets Division, 901 Texas St., Denton, TX 76209.

- 39 1. The Traffic Control Plan (TCP) for the Project shall be as detailed on the Traffic
- 40 Control Plan Detail sheets of the Drawing set.
- 41 2. A copy of this Traffic Control Plan shall be submitted with the Street Use Permit.

- 1 C. Traffic Control Plans shall be signed and sealed by a licensed Texas Professional
2 Engineer.
- 3 D. Contractor shall prepare Traffic Control Plans if required by the Contract Documents.
4 1. The Contractor will be responsible for having a licensed Texas Professional
5 Engineer sign and seal the Traffic Control Plan sheets.
- 6 E. Lane closures 24 hours or longer shall require a site-specific traffic control plan.
- 7 F. Contractor is responsible for having a licensed Texas Professional Engineer sign and
8 seal changes to the Traffic Control Plan(s) developed by the Design Engineer.
- 9 G. Design Engineer will furnish standard details for Traffic Control.

10 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

11 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

12 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

13 **1.9 QUALITY ASSURANCE [NOT USED]**

14 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

15 **1.11 FIELD CONDITIONS [NOT USED]**

16 **1.12 WARRANTY [NOT USED]**

17 **PART 2 - PRODUCTS**

18 **2.1 CITY-FURNISHED PRODUCTS [NOT USED]**

19 **2.2 MATERIALS**

20 A. Description

- 21 1. Regulatory Requirements
22 a. Provide Traffic Control Devices in accordance with the details specified in the
23 Drawings, TMUTCD, and TxDOT's Compliant Work Zone Traffic Control
24 Device List (CWZTCDL).
- 25 2. Materials
26 a. Traffic Control Devices in accordance with all reflectivity requirements
27 included in the TMUTCD and TxDOT Item 502 at all times during
28 construction.

29 **2.3 ACCESSORIES [NOT USED]**

30 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

31 **PART 3 - EXECUTION**

32 **3.1 INSTALLERS [NOT USED]**

33 **3.2 EXAMINATION [NOT USED]**

1 **3.3 PREPARATION**

- 2 A. Protection of In-Place Conditions
3 1. Protect existing traffic signal equipment.

4 **3.4 INSTALLATION**

- 5 A. Follow the Traffic Control Plan and install Traffic Control Devices as specified in the
6 Drawings and as directed by the City.
- 7 B. Install Traffic Control Devices straight and plumb.
- 8 C. Do not make changes to the location of any device or implement any other changes to
9 the Traffic Control Plan without the approval of the Engineer.
10 1. Minor adjustments to meet field constructability and visibility are allowed.
- 11 D. Maintain Traffic Control Devices by taking corrective action as soon as possible.
12 1. Corrective action includes but is not limited to cleaning, replacing, straightening,
13 covering, or removing devices.
14 2. Maintain the devices such that they are properly positioned, spaced, and legible,
15 and that retroreflective characteristics are in accordance with TMUTCD
16 requirements after dark and during rain events.
- 17 E. If the City discovers the Contractor has failed to comply with applicable Federal, State,
18 and local requirements, the City may order additional precautionary measures be taken
19 to protect persons and property.
- 20 F. Subject to the approval of the City, portions of this Project not affected by or in conflict
21 with the proposed method of handling traffic or utility adjustments can be constructed
22 during any phase.
- 23 G. Barricades and signs shall be placed in such a manner as to not interfere with the sight
24 distance of drivers entering the highway from driveways or side streets.
- 25 H. To facilitate shifting, barricades and signs used in lane closures or traffic staging may
26 be erected and mounted on portable supports.
27 1. The support design is subject to the approval of the Engineer.
- 28 I. Lane closures shall be in accordance with the approved Traffic Control Plans.
- 29 J. If at any time the existing traffic signals become inoperable as a result of construction
30 operations, provide portable stop signs with 2 orange flags, as approved by the
31 Engineer, to be used for Traffic Control.
- 32 K. Contractor shall make arrangements for police assistance to direct traffic if traffic signal
33 turn-ons, street light pole installation, or other construction will be done during peak
34 traffic times.
35 1. AM peak traffic time: 7 AM – 9 AM
36 2. PM peak traffic time: 4 PM - 6 PM
37

1 L. Flaggers

- 2 1. Provide a Contractor representative who has been certified as a flagging instructor
3 through courses offered by the Texas Engineering Extension Service, the American
4 Traffic Safety Services Association, the National Safety Council, or other approved
5 organizations.
6 a. Provide the certificate indicating course completion when requested.
7 b. The certified representative is responsible for verifying all flaggers are qualified
8 to perform flagging duties.
9 2. A qualified flagger must be independently certified by one of the organizations
10 listed above or trained by the Contractor's certified flagging instructor.
11 3. Flaggers must be courteous and able to effectively communicate with the public.
12 4. When directing traffic, flaggers must use standard attire, flags, signs, signals, and
13 flagging procedures in accordance with the TMUTCD.
14 5. Provide and maintain flaggers at such points and for such periods of time to provide
15 for the safety and convenience of public travel and Contractor's personnel, and as
16 specified in the Drawings or as directed by the Engineer.
17 a. These flaggers shall be located at each end of the lane closure.

18 M. Removal

- 19 1. Upon completion of Work, remove from the Site all barricades, signs, cones, lights,
20 and other Traffic Control Devices used for work-zone traffic handling in a timely
21 manner, unless otherwise specified in the Drawings.

22 **3.5 REPAIR [NOT USED]**

23 **3.6 RE-INSTALLATION [NOT USED]**

24 **3.7 FIELD QUALITY CONTROL [NOT USED]**

25 **3.8 SYSTEM STARTUP [NOT USED]**

26 **3.9 ADJUSTING [NOT USED]**

27 **3.10 CLEANING [NOT USED]**

28 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

29 **3.12 PROTECTION [NOT USED]**

30 **3.13 MAINTENANCE [NOT USED]**

31

1 **3.14 ATTACHMENTS [NOT USED]**

2 **END OF SECTION**

3

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

4

- 1 3. Texas Department of Transportation (TxDOT) Test Procedures:
- 2 a. Tex-920-K, Verifying the Accuracy of Drum Mix Plant Belt Scales
- 3 b. Tex-921-K, Verifying the Accuracy of Hot Mix Asphalt Meters
- 4 4. Texas Department of Transportation, Standard Specifications for Construction and
- 5 Maintenance of Highways, Streets, and Bridges (TxDOT):
- 6 a. Item 320, Equipment for Asphalt Concrete Pavement.
- 7 b. Item 520, Weighing and Measuring Equipment.

8 **1.4 ADMINISTRATIVE REQUIREMENTS**

- 9 A. Batching Meeting
- 10 1. On-Site Batch Plant
- 11 a. Considered on-site if the plant is within 500 feet of the site and was erected
- 12 specifically for the project.
- 13 b. Conduct a walkthrough with the City prior to producing concrete or asphalt.
- 14 2. Off-Site Batch Plant
- 15 a. No walkthrough is required for an off-site batch plant.
- 16 b. The City may request a walkthrough at any time.

17 **1.5 SUBMITTALS**

- 18 A. Submittals shall be in accordance with Section 01 33 00.
- 19 B. All submittals shall be approved by the City prior to delivery.

20 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 21 A. Shop Drawings
- 22 1. Batch Plants
- 23 a. Provide mix designs produced and tested using the proposed batch-plant.
- 24 b. If a batch-plant is erected after the start of construction, provide revised mix
- 25 designs.
- 26 c. Provide test results verifying the batch plant can produce concrete in accordance
- 27 with the mix design requirements of the concrete class specified in the
- 28 Drawings.
- 29 2. Volumetric Mixers
- 30 a. Provide test results verifying the concrete produced is in accordance with ASTM
- 31 C685.
- 32 3. Agitators and Truck and Stationary Mixers
- 33 a. Provide test results verifying the concrete produced is in accordance with ASTM
- 34 C94.
- 35 B. Samples
- 36 1. Produce all concrete or asphalt samples using the batch plant.
- 37 C. Certificates
- 38 1. Batch Plant and Truck Mixer Certifications
- 39 a. Obtain recertification every year, when the plant is relocated, and when the plant
- 40 is erected.
- 41 b. Provide certifications dated within a year of construction notice to proceed or
- 42 when the plant was erected, whichever is the most recent.

- c. Volumetric Mixed Concrete
 - 1) Provide information verifying the capacity and performance are in accordance with the Volumetric Mixer Manufacturers Bureau or equivalent.
 - 2) Provide information verifying the mixer and the concrete produced are in accordance with ASTM C685.
- d. Ready Mixed Concrete
 - 1) Provide a current Certification of Ready Mixed Concrete Production Facilities from the NRMCA, or equivalent.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

A. Concrete Plants and Mixing Equipment

- 1. General
 - a. Produce concrete in accordance with the requirements of ASTM C94/C94M, NRMCA, Sections 03 00 00, 03 30 00, 31 37 00, 32 05 16, 32 13 13, 32 13 16, 32 32 00, and this Section.
 - b. Utilize a commercial concrete plant to produce all structural concrete unless otherwise approved by the City.
 - c. Comply with all TCEQ permit requirements for portable facilities.
- 2. Commercial Concrete Plants
 - a. Ensure the concrete being transported from a commercial concrete plant is in accordance with the requirements of Sections 03 00 00, 03 30 00, 31 37 00, 32 05 16, 32 13 13, 32 13 16, 32 32 00, and this Section.
- 3. Batch Plant
 - a. Provide a batch plant in accordance with the requirements of the NRMCA and is certified through NRMCA or an equivalent organization.
 - b. Provide a batch plant that accurately measures volume and weight of water and admixtures.
 - c. Scales
 - 1) Check all scales before beginning operations, after each move, and a minimum of once every 6 months.
 - 2) Immediately correct deficiencies and recalibrate.
 - 3) Provide a record of calibration showing scales in compliance with ASTM C94 requirements.
 - 4) Check batching accuracy of volumetric water batching devices a minimum of every 90 days.
 - 5) Check batching accuracy of chemical admixture dispensing devices a minimum of every 6 months.
 - 6) Perform daily checks as necessary to ensure measuring accuracy.
 - 7) Verify the accuracy of drum mix plant belt scales in accordance with Tex-920-K.
- 4. Volumetric Mixers

- 1 a. Provide volumetric mixers with rating plates defining the capacity and the
- 2 performance of the mixer in accordance with the Volumetric Mixer
- 3 Manufacturers Bureau or equivalent.
- 4 b. Provide volumetric mixers in accordance with ASTM C685.
- 5 5. Agitators, Truck Mixers, and Stationary Mixers (Ready Mixed Concrete)
- 6 a. Provide stationary and truck mixers capable of combining the ingredients of the
- 7 concrete into a thoroughly mixed and uniform mass in accordance with ASTM
- 8 C94.
- 9 b. Provide a measuring gauge capable of determining how much water or air
- 10 entraining admixture is added to the mixer.
- 11 1) Provide documentation to the City specifying the weight or volume of
- 12 water or admixture added.
- 13 c. Provide mixing trucks with back-up alarms.
- 14 d. Sample concrete per ASTM C94 Alternate Procedure 2.
- 15 e. Follow the manufacturer's instructions for adding water, air entraining
- 16 admixtures, rotation speed, and number of drum revolutions before discharge.
- 17 f. Admixtures:
- 18 1) Air Entraining
- 19 a) Follow manufacturer's recommendations for adding admixture.
- 20 2) All of Admixtures
- 21 a) All other admixtures must be added either at a batch plant or a
- 22 commercial plant. No other admixtures can be added directly to the
- 23 mixer.
- 24 g. Inspect and maintain mixers and agitators. Keep them free of concrete buildup,
- 25 and repair or replace worn or damaged blades or fins.
- 26 h. Provide trucks that are equipped with actuated counters that measure the number
- 27 of drum revolutions. Start counting revolutions at the time of mixing starting at
- 28 mixing speeds.
- 29 6. Hauling Equipment
- 30 a. Provide equipment capable of maintaining the mixed concrete in a thoroughly
- 31 mixed and uniform mass, and discharging the concrete uniformly.
- 32 b. Provide equipment with smooth, mortar-tight metal containers equipped with
- 33 gates that prevent accidental discharge of the concrete when using non-agitating
- 34 equipment for transporting concrete.
- 35 c. Provide equipment with back-up alarms.
- 36 d. Perform uniformity testing in accordance with Tex-472-A at the request of the
- 37 City.
- 38 e. Deliver concrete in accordance with supplier recommendations.
- 39 f. Provide clean equipment, free of built-up concrete.
- 40 7. Delivery Tickets:
- 41 a. Tickets from the haul truck and the batch or commercial plant are required for
- 42 all concrete being delivered.
- 43 1) The City will verify that the haul ticket and the plant ticket match and that
- 44 no additional water or admixtures have been added to the haul truck.
- 45 b. Provide delivery ticket from the batch or commercial plant containing the
- 46 following information:
- 47 1) Water added by receiver of concrete
- 48 2) Water withheld

- 1 3) Weight of cementitious material
- 2 4) Type and amount of admixtures
- 3 5) Maximum size of aggregate
- 4 6) Weight of aggregate
- 5 c. Provide delivery ticket for the batch of concrete containing the following
- 6 information:
- 7 1) Name of concrete supplier
- 8 2) Serial number of ticket
- 9 3) Date
- 10 4) Truck number
- 11 5) Name of purchaser
- 12 6) Specific designation of job (name and location)
- 13 7) Specific class, design identification, and designation of the concrete
- 14 8) Amount of concrete in cubic yards
- 15 9) Time loaded or of first mixing of cement and aggregates
- 16 10) Water added by receiver of concrete
- 17 11) Water withheld
- 18 12) Weight of cementitious material
- 19 13) Type and amount of admixtures
- 20 14) Maximum size of aggregate
- 21 15) Weight of aggregate
- 22 8. Testing Equipment
- 23 a. Furnish and maintain equipment capable of performing all testing required in
- 24 accordance with ASTM C94/C94M, NRMCA, Sections 03 00 00, 03 30 00, 31
- 25 37 00, 32 05 16, 32 13 13, 32 13 16, 32 32 00, and this Section.
- 26 B. Asphalt Production Equipment
- 27 1. Provide asphalt production equipment in accordance with the requirements of
- 28 TxDOT Item 320 and TxDOT Item 520.
- 29 2. Equipment Requirements:
- 30 a. Drum-mix type, weigh-batch, or modified weigh-batch mixing plants that ensure
- 31 a uniform, continuous production
- 32 b. Automatic proportioning and measuring devices with interlock cut-off circuits
- 33 that stop operations if the control system malfunctions
- 34 c. Visible readouts indicating the weight or volume of asphalt and aggregate
- 35 proportions
- 36 d. Safe and accurate means to take required samples by inspection forces
- 37 e. Permanent means to check the output of metering devices and to perform
- 38 calibration and weight checks
- 39 f. Additive-feed systems to ensure a uniform, continuous material flow in the
- 40 desired proportion
- 41 3. Verify the accuracy of hot mix asphalt meters in accordance with Tex-921-K.

42 **1.10 DELIVERY, STORAGE, AND HANDLING**

43 **A. Storage and Handling Requirements**

- 44 1. Secure and maintain a location to store the material in accordance with Section 01
- 45 66 00.

1 B. In accordance with the requirements of Sections 03 00 00, 03 30 00, 32 05 16, 31 37 00,
2 32 12 16, 32 13 13, 32 13 16, and 32 32 00.

3 **1.11 FIELD CONDITIONS**

4 A. In accordance with the requirements of Sections 03 00 00, 03 30 00, 32 05 16, 31 37 00,
5 32 12 16, 32 13 13, 32 13 16, and 32 32 00.

6 **1.12 WARRANTY [NOT USED]**

7 **PART 2 - PRODUCTS [NOT USED]**

8 **2.1 CITY-SUPPLIED PRODUCTS [NOT USED]**

9 **2.2 EQUIPMENT [NOT USED]**

10 **2.3 ACCESSORIES [NOT USED]**

11 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

12 **PART 3 - EXECUTION [NOT USED]**

13 **3.1 INSTALLERS [NOT USED]**

14 **3.2 EXAMINATION [NOT USED]**

15 **3.3 PREPARATION [NOT USED]**

16 **3.4 INSTALLATION [NOT USED]**

17 **3.5 REPAIR [NOT USED]**

18 **3.6 RE-INSTALLATION [NOT USED]**

19 **3.7 SITE QUALITY CONTROL [NOT USED]**

20 **3.8 SYSTEM STARTUP [NOT USED]**

21 **3.9 ADJUSTING [NOT USED]**

22 **3.10 CLEANING [NOT USED]**

23 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

24 **3.12 PROTECTION [NOT USED]**

25

1 **3.13 MAINTENANCE [NOT USED]**

2 **3.14 ATTACHMENTS [NOT USED]**

3 **END OF SECTION**

4

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

5

Appendix GC-5.03

Subsurface and Physical Conditions

October 1, 2021

City of Denton – Engineering Services

901A Texas Street
 Denton, Texas 76209

Attention: Mr. Trevor Crain

Re: Geotechnical Recommendations
2020 Street Reconstruction – Sector 3
 Off South Bradshaw Street and East Hickory Street
 Denton, Texas
 ALPHA Report No. W211585

Submitted herein are the results of the geotechnical exploration performed for the project referenced above. A total of about 10,800 linear ft of selected city streets will be reconstructed for this project. This study was authorized through City of Denton Standard Agreement for Engineering Related Professional Services contract by Ms. Rebecca Deviney on May 20, 2021 and Mr. Cori Power on May 21, 2021, and performed in accordance with ALPHA Proposal No. 83934 dated May 5, 2021.

The selected streets for this project are listed below in Table A with the associated borings.

TABLE A		
Selected Street Locations with Associated Boring Numbers		
Street	Between Cross Streets	Borings
E Oak Street	N. Bradshaw St. and N. Wood St.	11 through 13
N. Bradshaw St.	E. Hickory St. and E. McKinney St.	1 and 2
N. Crawford St.	E. Hickory St. and E. McKinney St.	3 and 4
N. Wood St	E. McKinney St and E Sycamore St.	34 through 38
N. Wood St	E Sycamore St. and E. McKinney St	29 through 33
Uland St.	Railroad Ave. and Frame St.	23
Uland St./Rose St.	Frame St. and Paisley St.	24 through 28
E. Hickory St.	Exposition St. and N. Ruddell St.	5 through 10
E. McKinney St	N. Crawford St. and N. Woodrow Ln.	14 through 22

The purpose of this study is to develop pavement subgrade recommendations for the selected streets in accordance with the City of Denton Transportation Design Criteria Manual (Design Manual) dated March 2018. We understand the proposed streets could be classified as “All-Other Residential”, “Residential Collector”, “Collector” or “Arterial”, as described in the



referenced manual. Pavement section recommendations for portland cement concrete and asphalt are not included in the scope of this study. We understand pavement design will be performed by others.

PURPOSE AND SCOPE

The purpose of this geotechnical exploration is for ALPHA TESTING, INC. (ALPHA) to evaluate for City of Denton – Engineering Services (Client) some of the physical and engineering properties of subsurface materials at selected locations on the subject site with respect to formulation of appropriate geotechnical design parameters for the proposed pavement subgrade. The field exploration was accomplished by securing subsurface samples from widely spaced test borings performed on the selected streets. Engineering analyses were performed from results of the field exploration and results of laboratory tests performed on representative samples.

Also included are general comments pertaining to reasonably anticipated construction problems and recommendations concerning earthwork and quality control testing during construction. This information can be used to evaluate subsurface conditions and to aid in ascertaining construction meets project specifications.

Recommendations provided in this report were developed from information obtained in test borings depicting subsurface conditions only at the specific boring locations and at the particular time designated on the logs. Subsurface conditions at other locations may differ from those observed at the boring locations, and subsurface conditions at boring locations may vary at different times of the year. The scope of work may not fully define the variability of subsurface materials and conditions that are present along the selected street alignments.

The nature and extent of variations between borings may not become evident until construction. If significant variations then appear evident, our office should be contacted to re-evaluate our recommendations after performing on-site observations and possibly other tests.

SUMMARY OF RECOMMENDATIONS

Table B and C contains a summary of subgrade stabilization requirements in accordance with our findings and with the referenced manual for PCC and Asphalt pavement for the selected streets at the subject project.

TABLE B				
Summary of Pavement Section Requirements for PCC				
Street Classification	All-Other Residential	Residential-Collector	Commercial	Arterial
Subgrade Treatment Depth (lime, cement, or Cem-Lime™ stabilization)	8 inches	8 inches	12 inches	12 inches
% Subgrade Treatment ¹	7 %	7 %	7 %	7 %
¹ Minimum % allowed by City of Denton				



Street Classification	All-Other Residential	Residential-Collector	Commercial	Arterial
Subgrade Treatment (lime, cement, Cem-Lime™ stabilization)	12 inches	12 inches	12 inches	12 inches
% Subgrade Treatment ¹	7 %	7 %	7 %	7 %
¹ Minimum % allowed by City of Denton				

Additional recommendations used to develop the summary in Table B and C are provided further in this report.

FIELD EXPLORATION

Subsurface conditions on the site were explored by drilling 38 test borings to a depth of about 5 ft below current surface grades. The test borings were drilled in general accordance with ASTM Standard D 420 using standard rotary drilling equipment. The approximate location of each boring is shown on the attached Boring Location Plan, Figure 1.

Subsurface types encountered during the field exploration are presented on the attached Log of Boring sheets (boring logs). These boring logs contain our Field Technician's and Engineer's interpretation of conditions believed to exist between actual samples retrieved. Therefore, the boring logs contain both factual and interpretive information. Lines delineating subsurface strata on the boring logs are approximate and the actual transition between strata may be gradual.

LABORATORY TESTS

Selected samples of the subsurface materials were tested in the laboratory to evaluate their engineering properties as a basis in providing recommendations for pavement sections design and earthwork construction. The following laboratory tests were performed to facilitate pavement subgrade recommendations:

- Moisture Content (ASTM D 2216)
- Atterberg-Limits (ASTM D 4318)
- Minus #200 Sieve (ASTM D 1140)
- Unconfined Compressive Strength (ASTM D 2166)
- Sulfate Content (TX-145-E Part II)
- Lime Series (Plasticity Index vs. Lime Content)

GENERAL SUBSURFACE CONDITIONS

Based on geological maps available from the Bureau of Economic Geology, published by The University of Texas at Austin, the site lies within the Woodbine formation. The Grayson Marl and Main Street Limestone formation, mapped as undivided, is mapped within about 300 ft of the northwest area of this project (near Uland Street). The Woodbine formation generally consists of shale, sandstone, and limestone. The residual overburden soils associated with the



Woodbine formation generally consist of high to low plasticity clay and sand. Hard and discontinuous sandstone lenses, layers, ledges, and boulders are commonly encountered at various depths within the formation. The Woodbine formation was deposited in a near shore marine environment, which accounts for the **extreme lateral variability** of this formation as evidenced on the boring logs in the Appendix. The undivided Grayson Marl and Main Street Limestone formation generally consists of interbedded marl (limey shale) and limestone. Residual soils associated with this formation generally consist of clay soils with moderate to very high shrink-swell potential.

Subsurface conditions encountered in Borings 1 through 36 generally consisted of clay, sandy clay, clayey sand, sand, and/or gravel extending to the 5 ft termination depth of the borings. Borings 37 and 38 consist of clayey sand to the respective depths of 2 ft and 3.5 ft underlain by sandstone extending to the 5 ft termination depth. More detailed stratigraphic information is presented on the attached Log of Boring sheets.

The granular soils (clayey sand, sand, and gravel) encountered in the borings are considered relatively permeable and are anticipated to have relatively rapid response to water movement. However, the clay and sandy clay soils and sandstone are relatively impermeable and are expected to have a slower response to water movement. Therefore, several days of observation would be required to evaluate actual groundwater levels within the depths explored. Also, the groundwater level at the site is anticipated to fluctuate seasonally depending on the amount of rainfall, prevailing weather conditions and subsurface drainage characteristics.

Free groundwater was encountered at depths of about 3 ft to 5 ft below the ground surface during drilling in Borings 6, 19, and 20. Free groundwater was not encountered at completion of these borings and in the remaining borings. However, it is common to encounter seasonal groundwater in granular materials, from natural fractures within the clayey matrix and perched on sandstone layers, particularly during or after periods of precipitation. If more detailed groundwater information is required, monitoring wells or piezometers can be installed.

Further details concerning subsurface materials and conditions encountered can be obtained from the provided boring logs.

PAVEMENT SUBGRADE PREPARATION

Calculations used to determine the subgrade improvements are based only on the physical and engineering properties of the materials encountered in the borings.

Based on the soil profiles encountered in the borings, we would expect the pavement subgrade could consist of sandy material or clayey material depending on where the pavement is located. Our borings indicate the sand percentages of the subgrade soils may be highly variable. In general, clays and sandy clays with a plasticity index of 15 or greater should be lime stabilized. Clayey sands and sands, and sandy clays with a plasticity index less than 15 should be cement modified. As an alternative, Cem-Lime™ could be used to improve either clayey or sandy soils. Provided below are subgrade improvement recommendations for lime, cement, and Cem-Lime™.



In areas where moderate to high plasticity clays or sandy clays (plasticity index of about 15 or greater) are exposed after final subgrade elevation is achieved, the exposed surface of the pavement subgrade soil should be scarified to a depth of 8 or 12 inches (depending on the street designation as summarized in Tables B and C) and mixed with a minimum 7 percent hydrated lime (by dry soil weight) in conformance with TxDOT Standard Specification Item 260. Assuming an in-place unit weight of 100 pcf for the pavement subgrade soils, this percentage of lime equates to about 42 lbs and 63 lbs of lime per square yd for the 8 or 12-inch-thick subgrade, respectively. The recommended application rate is the minimum required by the City of Denton. Results of a lime series test are attached as Figure 2. The actual amount of lime required should be confirmed by additional laboratory tests (ASTM C 977 Appendix XI) prior to construction. The soil-lime mixture should be compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of 0 to 4 percentage points above the mixture's optimum moisture content. In all areas where hydrated lime is used to stabilize subgrade soil, routine Atterberg-limit tests should be performed to verify the resulting plasticity index of the soil-lime mixture is at/or below 15.

Cement modification should be used in pavement areas where sand, clayey sand and low PI (less than 15) sandy clay is exposed after final subgrade elevation is achieved. The exposed surface of the pavement subgrade soils should be scarified to a depth of 8 or 12 inches (depending on the street designation as summarized in Tables B and C) and mixed with at least 7 percent Portland cement (by dry unit weight) in conformance with TxDOT Item 275. Assuming an in-place unit weight of 105 pcf for the pavement subgrade soils, this percentage of cement equates to about 44 lbs and 66 lbs of cement per sq yard, respectively, of subgrade treated. The soil-cement mixture should be compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of -1 to +3 percentage points of the mixture's optimum moisture content. Cement stabilization could also be utilized where subgrade consists of clay and sandy clay soils with a higher PI, although processing cement in these materials could be more difficult. *Cement modified subgrades should be micro-cracked prior to installation of asphalt concrete. Micro-cracking of cement modified subgrade is not required for PCC pavement.*

Cem-Lime™ is designed to serve the same purpose as both lime and cement for soil stabilization or modification in highly variable subgrade conditions similar to those encountered at the referenced project site. Cem-Lime™ is a proprietary product manufactured by Martin Marietta. Cem-Lime™ should be placed according to the manufacturer's specifications. After final subgrade elevation is achieved, the exposed surface of the pavement subgrade soils should be scarified to a depth of at least 8 or 12 inches and mixed with Cem-Lime™. For preliminary purposes, a minimum 7 percent (by dry soil unit weight) of Cem-Lime™ should be used. Unconfined compressive strength tests should be performed on laboratory molded specimens of representative onsite material mixed with Cem-Lime™ to evaluate the actual percent of required Cem-Lime™. *Cem-Lime™ modified subgrades should be micro-cracked prior to installation of asphalt concrete. Micro-cracking of Cem-Lime™ modified subgrade is not required for PCC pavement.*

Special Considerations for Micro-Cracking: Following compaction of the cement treated or Cem-Lime™ treated subgrade material and prior to placing the pavement section, the treated subgrade should be micro-cracked to introduce a network of hair line cracks. The purpose of micro-cracking is to pre-crack the cement or Cem-Lime™ treated material to significantly reduce or prevent reflective cracking from occurring through the asphalt layer. Micro-cracking should be performed between 24 to 48 hours after the cement treatment or Cem-Lime™



treatment is completed. During this period (24 to 48 hours) the treated material must be kept moist at all times. Micro-cracking should extend throughout the entire length and width of the pavement section. Micro-cracks should be introduced using vibratory rollers weighing about 10 to 12 tons travelling at a relatively low speed (2 mph or less). The micro-cracking should be performed with a minimum of one pass of a vibratory roller.

Flexible base material can also be used as a subgrade improvement layer. City of Denton requires a filter fabric overlaid upon geo-grid to be placed between the flexible base section and the underlying native subgrade. The design depth of the flexible base section should be based upon ultimate traffic conditions. This would require a full depth pavement section design which is outside the scope of this study. ALPHA testing can be retained to analyze this section upon request.

We recommend subgrade improvement procedures extend at least 1 ft beyond the edge of the pavement to reduce effects of seasonal shrinking and swelling upon the extreme edges of pavement.

Improvement of the pavement subgrade soil will not prevent normal seasonal movement of the underlying untreated materials. Pavement and other flatwork will have the same potential for movement as slabs constructed directly on the existing undisturbed soils. Based on conditions encountered in the borings, we expect pavement could be subject to about 2 to 6 inches of movement depending on the subsurface profile at the given street location. The active depth of moisture change is generally estimated to be about 15 ft. Deeper borings would be required to provide a more accurate estimate of potential movements. Good surface drainage and perimeter drainage with a minimum slope of 2 percent away from the pavement is recommended. The use of sand as a leveling course below pavement supported on expansive clays should be avoided. Normal maintenance of pavement should be expected over the life of the pavement.

California Bearing Ratio (CBR) tests were not performed for this specific project, but our previous experience with similar soils indicates the CBR value for lime stabilized clayey material or cement/Cem-Lime stabilized sandy soils will be at least 10 whereas the CBR value for native untreated materials could be about 2 to 3.

DRAINAGE AND MAINTENANCE

Routine maintenance, including sealing of cracks and joints should be performed over the life of the pavement. Adequate drainage should be provided to reduce seasonal variations in the moisture content of subgrade soils. **Maintaining positive surface drainage throughout the life of the pavement is essential.**

SOLUBLE SULFATES

A total of seven (7) samples obtained from the borings were tested for soluble sulfate concentrations. Results of the laboratory testing (TxDOT Test Method TEX-145-E Part II) are tabulated below.

**TABLE D: Soluble Sulfates**

Sample No.	Boring No.	Depth, ft	Material Type	Soluble Sulfate, mg/Kg (ppm)
1	2	2-4	Tan CLAYEY SAND	74
2	3	0-2	Brown CLAY with sand and gravel	43
3	7	2-4	Brown SANDY CLAY with gravel	52
4	12	0-2	Brown SANDY CLAY with gravel	25
5	17	2-4	Tan SAND with gravel	80
6	25	2-4	Brown SANDY CLAY	59
7	35	2-4	Tan SANDY CLAY	415

Based on the results of laboratory testing, the soluble sulfate content measured in the samples tested is considered relatively low (<2,000 ppm). It should be noted that concentrations of soluble sulfates in soil are typically very localized and concentrations in other areas of the site could vary significantly. Hence, it is recommended sulfate sampling/testing be performed along the pavement subgrade alignment during construction. During construction, experienced geotechnical personnel should make close observations for possible sulfate reactions.

GENERAL CONSTRUCTION PROCEDURES AND RECOMMENDATIONS

Variations in subsurface conditions could be encountered during construction. To permit correlation between test boring data and actual subsurface conditions encountered during construction, it is recommended a registered Professional Engineering firm be retained to observe construction procedures and materials.

Some construction problems, particularly degree or magnitude, cannot be reasonably anticipated until the course of construction. The recommendations offered in the following paragraphs are intended not to limit or preclude other conceivable solutions, but rather to provide our observations based on our experience and understanding of the project characteristics and subsurface conditions encountered in the borings.

SITE PREPARATION AND GRADING

Sandstone was encountered within about 4 ft of the ground surface in Borings 37 and 38. Sandstone could be encountered during general excavation and grading at the site depending on the final grades. The residual sandy and clayey soils of the Woodbine formation frequently contain very hard and discontinuous sandstone seams, layers and boulders. Rock excavation methods (including, but not limited to rock teeth, rippers, jack hammers, or sawcutting) may be required to remove this sandstone. The contractor selected should have experience with excavation and earthwork in sandstone in the Woodbine formation.

All areas supporting slab foundations, flatwork or areas to receive new fill should be properly prepared.



- After completion of the necessary stripping, clearing, and excavating and prior to placing any required fill, the exposed subgrade should be carefully evaluated by probing and testing. Any undesirable material (organic material, wet, soft, or loose soil) still in place should be removed.
- The exposed subgrade should be further evaluated by proof-rolling with a heavy pneumatic tired roller, loaded dump truck or similar equipment weighing approximately 25 tons to check for pockets of soft or loose material hidden beneath a thin crust of possibly better soil.
- Proof-rolling procedures should be observed routinely by a Professional Engineer or his designated representative. Any undesirable material (organic material, wet, soft, or loose soil) exposed from the proof roll should be removed and replaced with well-compacted material as outlined in Section 7.3.
- Prior to placement of any fill, the exposed subgrade should then be scarified to a minimum depth of 6 inches and recompacted as outlined in Section 7.3.

If fill is to be placed on existing slopes (natural or constructed) steeper than six horizontal to one vertical (6:1), the fill materials should be benched into the existing slopes in such a manner as to provide a minimum bench width of five (5) ft. This should provide a good contact between the existing soils and new fill materials, reduce potential sliding planes, and allow relatively horizontal lift placements.

Slope stability analysis of embankments (natural or constructed) and global stability analysis for retaining walls was not within the scope of this study.

The contractor is responsible for designing any excavation slopes, temporary sheeting or shoring. Design of these structures should include any imposed surface surcharges. Construction site safety is the sole responsibility of the contractor, who shall also be solely responsible for the means, methods and sequencing of construction operations. The contractor should also be aware that slope height, slope inclination or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state and/or federal safety regulations, such as OSHA Health and Safety Standard for Excavations, 29 CFR Part 1926, or successor regulations. Stockpiles should be placed well away from the edge of the excavation and their heights should be controlled so they do not surcharge the sides of the excavation. Surface drainage should be carefully controlled to prevent flow of water over the slopes and/or into the excavations. Construction slopes should be closely observed for signs of mass movement, including tension cracks near the crest or bulging at the toe. If potential stability problems are observed, a geotechnical engineer should be contacted immediately. Shoring, bracing or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Texas.

Due to the nature of the clayey and sandy soils found near the surface at the borings, traffic of heavy equipment (including heavy compaction equipment) may create pumping and general deterioration of shallow soils. Therefore, some construction difficulties should be anticipated during periods when these soils are saturated.



FILL COMPACTION

The following compaction recommendations pertain to general filling and site grading. The pavement subgrade should be prepared as discussed above in the “Pavement Subgrade Preparation” section of this report.

Sandy clay soils with a plasticity index equal to or greater than 25 should be compacted to a dry density between 93 and 100 percent of standard Proctor maximum dry density (ASTM D 698). The compacted moisture content of the clays during placement should be within the range of 2 to 5 percentage points above optimum.

Clayey sand and sandy clay soils with a plasticity index less than 25 should be compacted to a dry density of at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of 1 percentage point below to 3 percentage points above the material's optimum moisture content.

Clayey soils used as fill should be processed and the largest particle or clod should be less than 6 inches prior to compaction.

Non-plastic granular materials (sand and gravel) should be compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of 2 percent below to 1 percentage points above the material's optimum moisture content. Compaction of these soils is very sensitive to moisture content and these soils are prone to rutting when too dry and pumping when too wet.

In cases where either mass fills or utility lines are more than 10 ft deep, the fill/backfill below 10 ft should be compacted to at least 100 percent of standard Proctor maximum dry density (ASTM D-698) and within 2 percentage points of the material's optimum moisture content. The portion of the fill/backfill shallower than 10 ft should be compacted as outlined above.

Compaction should be accomplished by placing fill in about 8-inch thick loose lifts and compacting each lift to at least the specified minimum dry density. Field density and moisture content tests should be performed on each lift.

In general site grading areas where final fill slopes will be four horizontal to one vertical (4:1) or steeper and greater than 5 ft in height, field density and moisture content tests should be performed on each lift.

UTILITIES

In cases where utility lines are more than 10 ft deep, the fill/backfill below 10 ft should be compacted to at least 100 percent of standard Proctor maximum dry density (ASTM D 698) and within -2 to +2 percentage points of the material's optimum moisture content. The portion of the fill/backfill shallower than 10 ft should be compacted as previously outlined. Density tests should be performed on each lift (maximum 12-inch thick) and should be performed as the trench is being backfilled.



Even if fill is properly compacted, fills in excess of about 10 ft are still subject to settlements over time of up to about 1 to 2 percent of the total fill thickness. This should be considered when designing utility lines under pavements and/or other areas with deep fill.

If utility trenches or other excavations extend to or beyond a depth of 5 ft below construction grade, the contractor or others shall be required to develop an excavation safety plan to protect personnel entering the excavation or excavation vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, is beyond the scope of this study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standards.

GROUNDWATER

Groundwater seepage was encountered in Borings 6, 19 and 20 at depths of about 3 ft to 5 ft below the ground surface. From our experience, shallower groundwater could be encountered during general excavation at this site. The risk of encountering this seepage is increased during or after periods of precipitation. Standard sump pit and pumping procedures could be adequate to control seepage on a local basis for relatively shallow excavations in clay soils.

Where groundwater is encountered in granular soils, sump pits may not be adequate to control seepage and supplemental dewatering measures may be necessary to control groundwater seepage. Supplemental dewatering measures include (but are not limited to) submersible pumps in slotted casings and well points.

In any areas where cuts are made, attention should be given to possible seasonal water seepage that could occur through natural cracks and fissures in the newly exposed stratigraphy. The risk of seepage is increased where sandstone is exposed in slopes and excavations or is near final grade. In these areas, subsurface drains may be required to intercept seasonal groundwater seepage. The need for these or other de-watering devices should be carefully addressed during construction. Our office could be contacted to visually observe the final grades to evaluate the need for such drains.

LIMITATIONS

Professional services provided in this geotechnical exploration were performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. The scope of services provided herein does not include an environmental assessment of the site or investigation for the presence or absence of hazardous materials in the soil, surface water or groundwater. ALPHA, upon written request, can be retained to provide same.

ALPHA TESTING, INC. is not responsible for conclusions, opinions or recommendations made by others based on this data. Information contained in this report is intended for the exclusive use of the Client (and their designated design representatives), and is related solely to design of the specific structures outlined on the cover page of this report. No party other than the Client (and their designated design representatives) shall use or rely upon this report in any manner whatsoever unless such party shall have obtained ALPHA's written acceptance of such intended use. Any such third party using this report after obtaining ALPHA's written acceptance



shall be bound by the limitations and limitations of liability contained herein, including ALPHA's liability being limited to the fee paid to it for this report. Recommendations presented in this report should not be used for design of any other structures except those specifically described in this report. In all areas of this report in which ALPHA may provide additional services if requested to do so in writing, it is presumed that such requests have not been made if not evidenced by a written document accepted by ALPHA. Further, subsurface conditions can change with passage of time. Recommendations contained herein are not considered applicable for an extended period of time after the completion date of this report. It is recommended our office be contacted for a review of the contents of this report for construction commencing more than one (1) year after completion of this report. Non-compliance with any of these requirements by the Client or anyone else shall release ALPHA from any liability resulting from the use of, or reliance upon, this report.

Recommendations provided in this report are based on our understanding of information provided by the Client about characteristics of the project. If the Client notes any deviation from the facts about project characteristics, our office should be contacted immediately since this may materially alter the recommendations. Further, ALPHA TESTING, INC. is not responsible for damages resulting from workmanship of designers or contractors and it is recommended the Owner retain qualified personnel, such as a Geotechnical Engineering firm, to verify construction is performed in accordance with plans and specifications.

CLOSING

We appreciate the opportunity to be of service. Please contact us with any questions or comments.

Sincerely,

ALPHA TESTING, INC.



September 24, 2021

Antonio Franco, E.I.T.
Geotechnical Project Manager

Brian J. Hoyt, P.E.
Geotechnical Department Manager

AF/BJH/af

Copies: (1-PDF) Client

Attachments: Boring Location Plan – Figure 1
Mechanical Lime Series – Figure 2
Log of Boring (Borings 1 through 38)
Key to Soil Symbols and Classifications



GEOTECHNICAL RECOMMENDATIONS
 2020 STREET RECONSTRUCTION - SECTOR 3
 OFF SOUTH BRADSHAW STREET AND
 EAST HICKORY STREET
 DENTON, TEXAS
 ALPHA PROJECT NO. W211585



 APPROXIMATE BORING LOCATION

FIGURE 1

BORING LOCATION PLAN

REPORT OF MECHANICAL LIME SERIES RESULTS

Project No: W211585

Date: 07/09/21

% Lime	0%	2%	6%	8%
PI	32	15	11	11

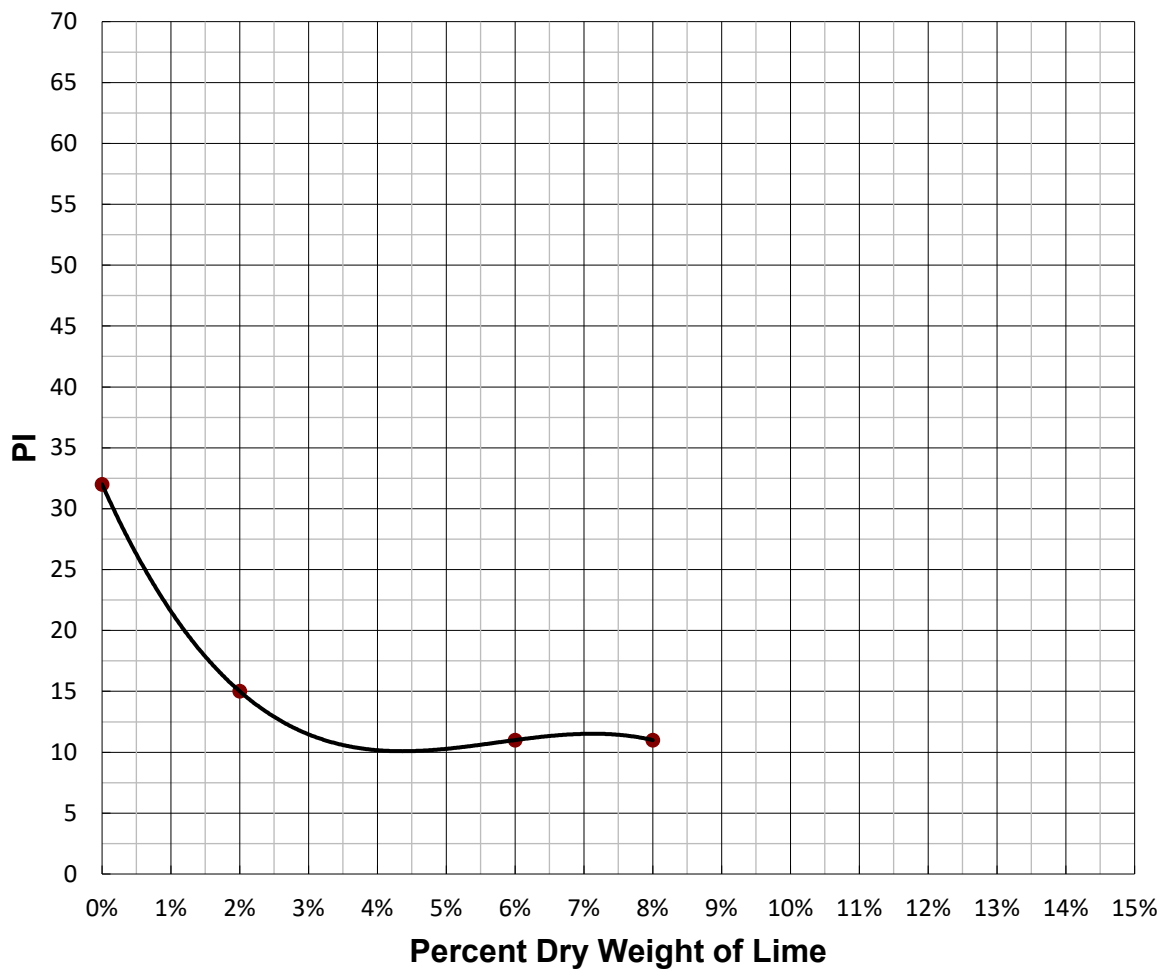


FIGURE 2A

REPORT OF MECHANICAL LIME SERIES RESULTS

Project No: W211585

Date: 09/01/21

% Lime	0%	2%	4%	6%	8%
PI	28	17	13	9	6

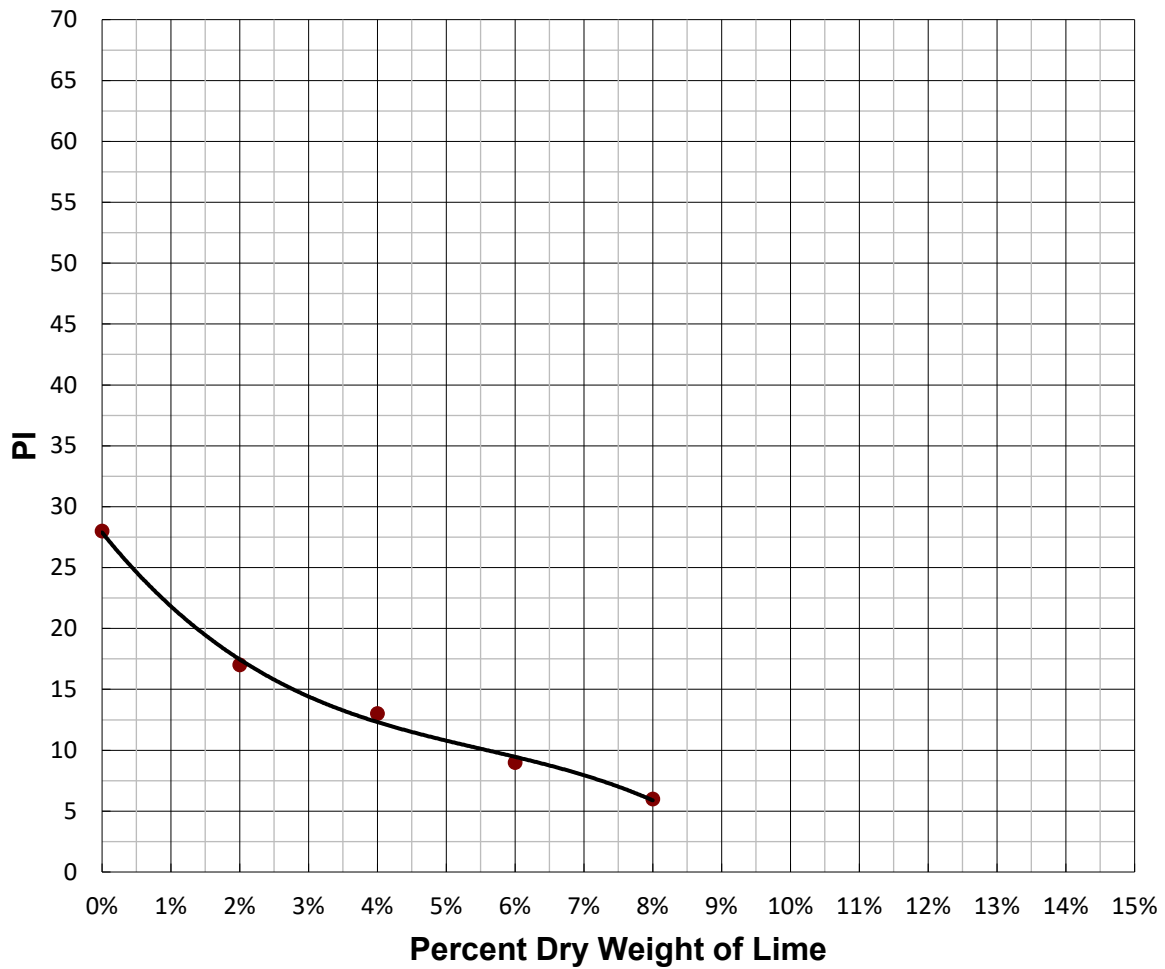


FIGURE 2B

REPORT OF MECHANICAL LIME SERIES RESULTS

Project No: W211585

Date: 09/01/21

% Lime	0%	2%	4%	6%	8%
PI	20	12	8	7	4

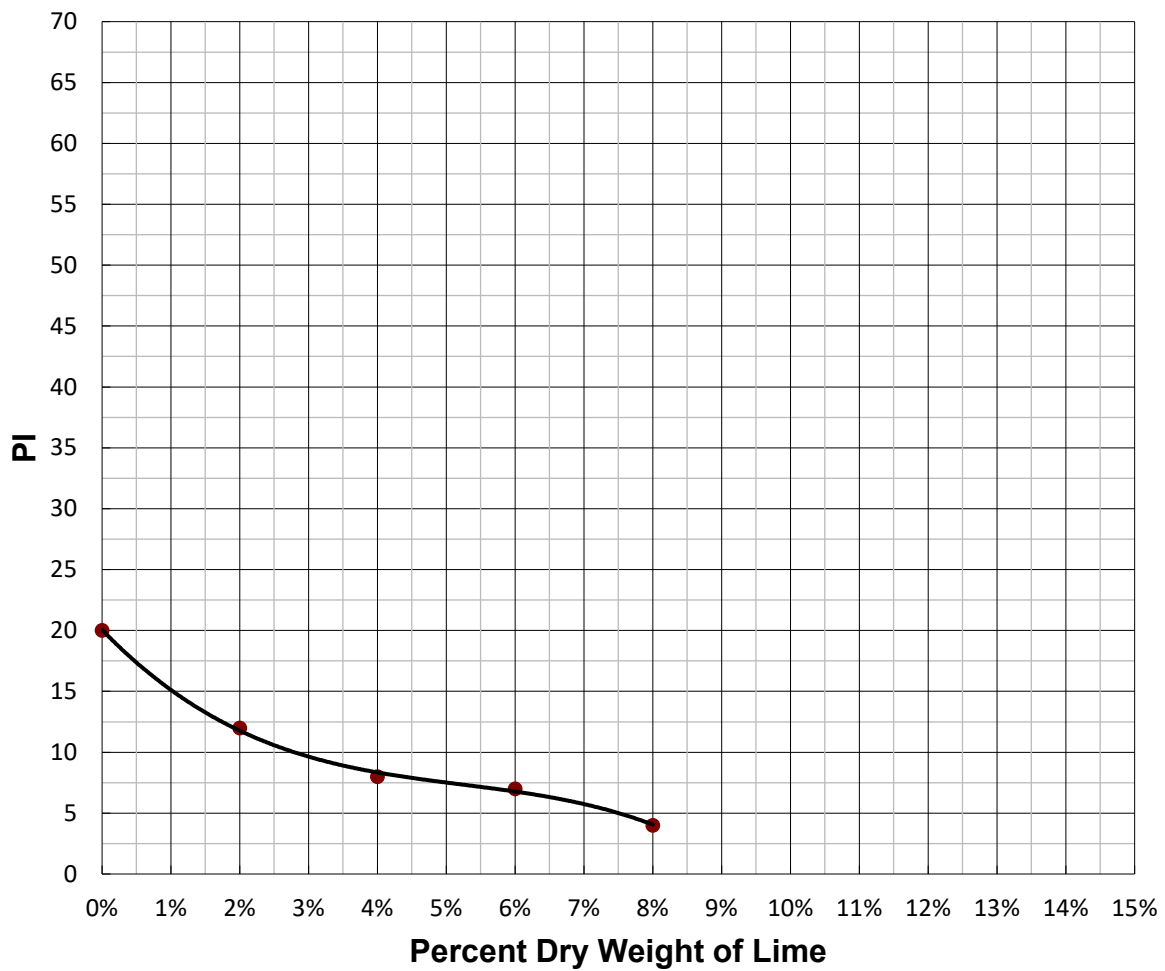


FIGURE 2C

REPORT OF MECHANICAL LIME SERIES RESULTS

Project No: W211585

Date: 09/01/21

% Lime	0%	2%	4%	6%	8%
PI	19	9	7	6	3

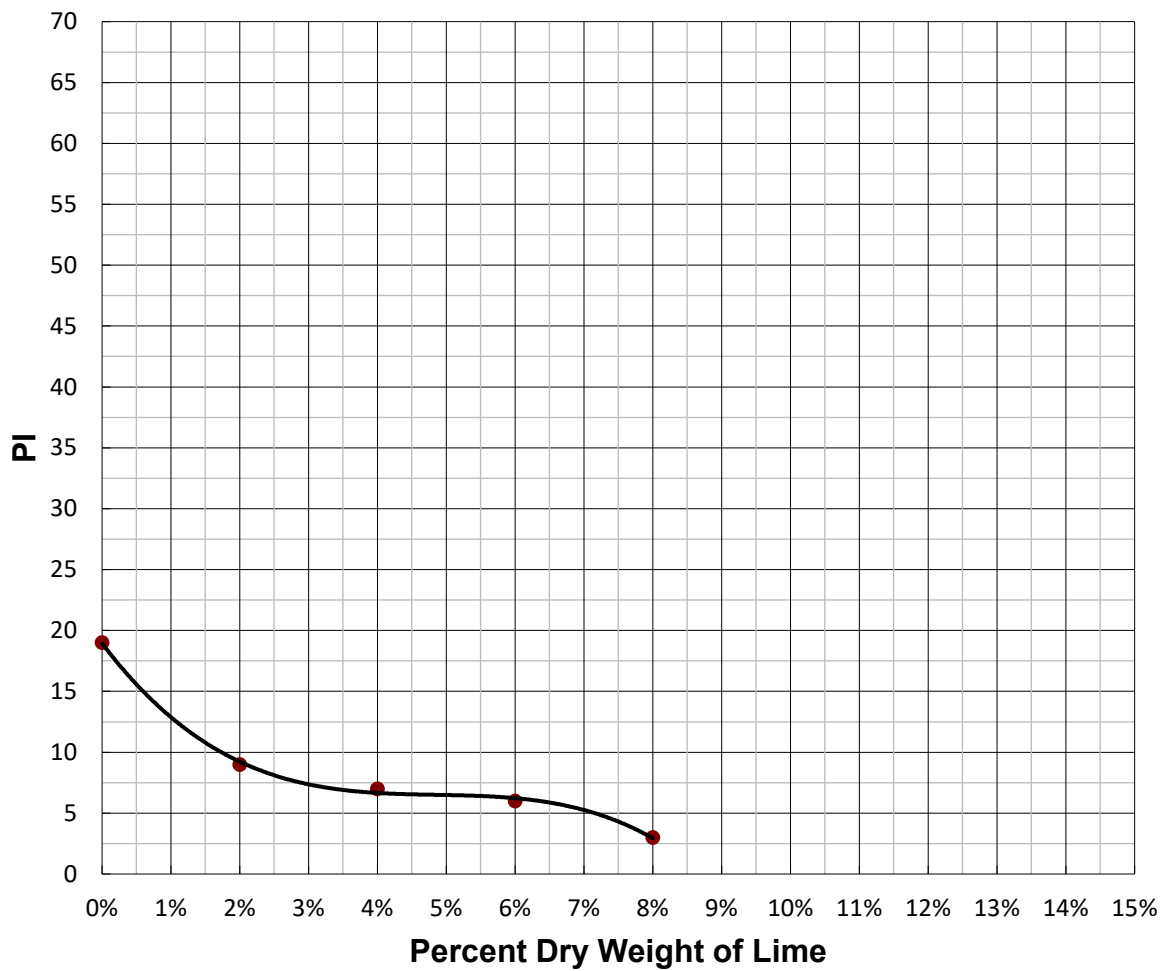


FIGURE 2D

REPORT OF MECHANICAL LIME SERIES RESULTS

Project No: W211585

Date: 09/01/21

% Lime	0%	2%	4%	6%	8%
PI	32	15	11	9	7

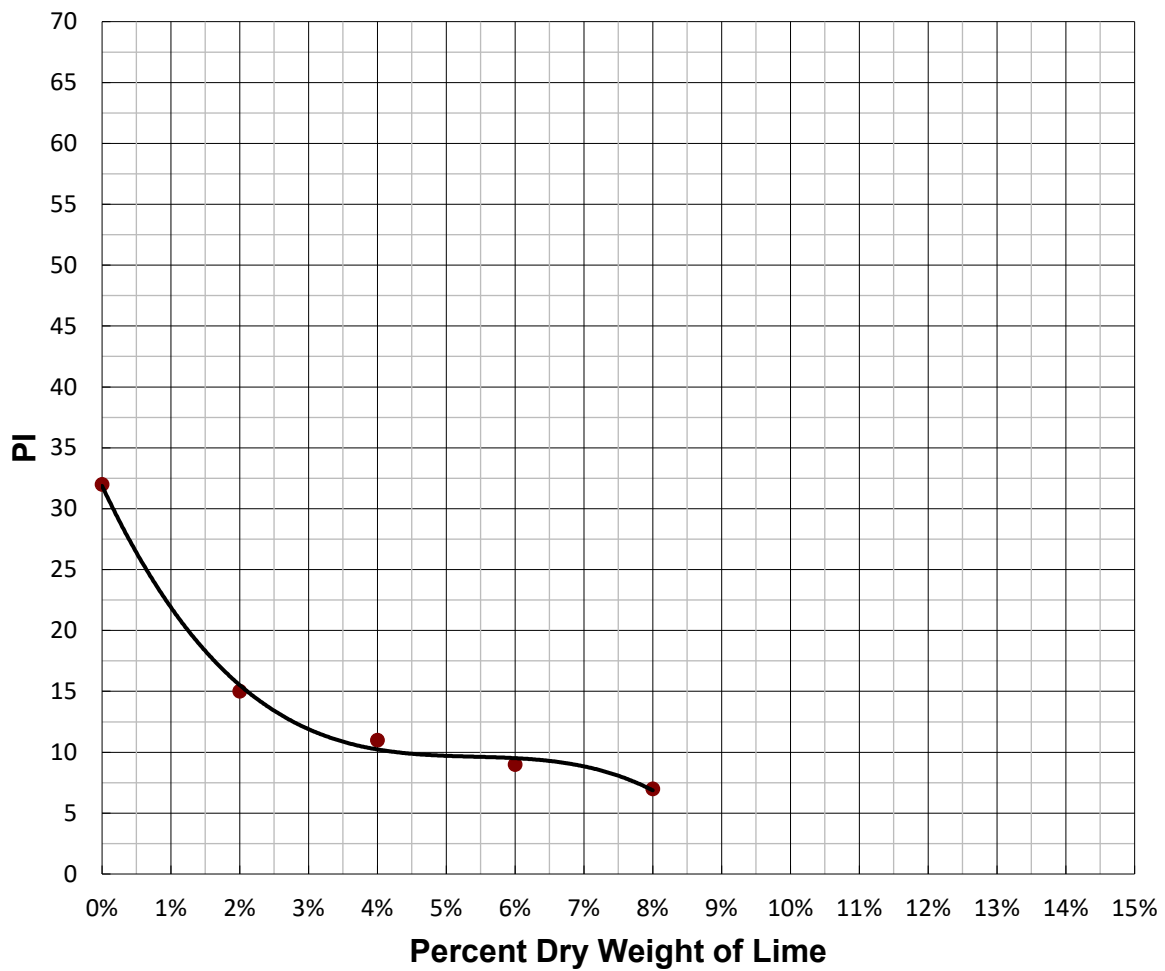


FIGURE 2E

REPORT OF MECHANICAL LIME SERIES RESULTS

Project No: W211585

Date: 09/01/21

% Lime	0%	2%	4%	6%	8%
PI	20	12	9	7	4

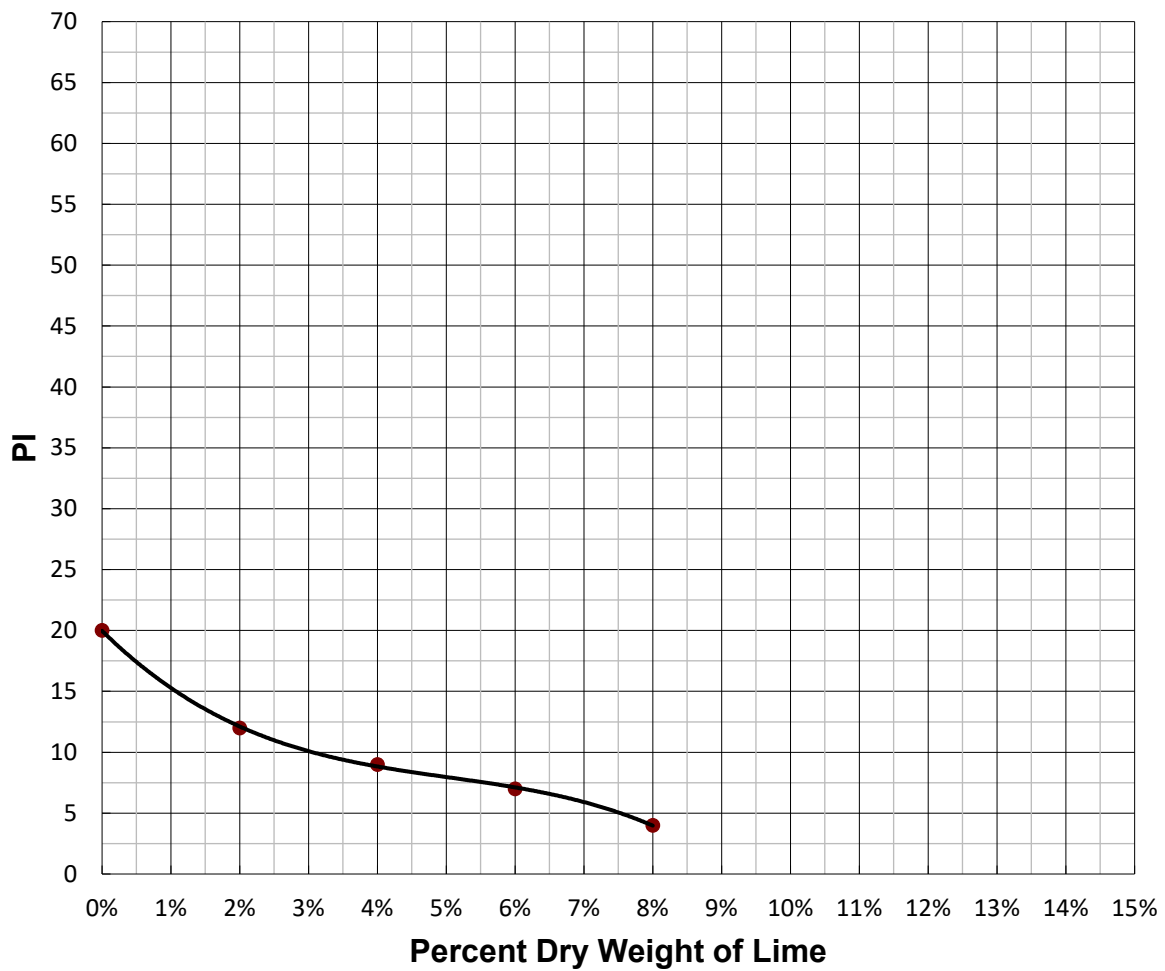


FIGURE 2F

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/3/2021 **End Date:** 6/3/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS <input type="checkbox"/> On Rods (ft): <u>NONE</u> <input checked="" type="checkbox"/> After Drilling (ft): <u>DRY</u> <input type="checkbox"/> After _____ Hours (ft): _____	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
	7" ASPHALT		0.8											
	Brown SANDY CLAY					3.5		53		18	34	17	17	
						4.25				16				
						4.5				14				
5			5.0											
		TEST BORING TERMINATED AT 5 FT												

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/3/2021 **End Date:** 6/3/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		7" ASPHALT												
		Brown CLAY with sand				3.0				17				
						3.75	73	18	49	18	31			
						3.5				19				
5		TEST BORING TERMINATED AT 5 FT												

GROUND WATER OBSERVATIONS

▽ On Rods (ft): NONE

▼ After Drilling (ft): DRY

▼ After _____ Hours (ft): _____

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/3/2021 **End Date:** 6/3/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		7" ASPHALT												
		0.8 Brown SANDY CLAY with gravel				4.0		68		16	43	17	26	
		4.0 Tan SANDY CLAY with calcareous nodules and gravel				3.75	4.3	103	19					
		5.0 TEST BORING TERMINATED AT 5 FT				4.5				16				

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/3/2021 **End Date:** 6/3/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		▽ On Rods (ft):	_____ NONE												
		MATERIAL DESCRIPTION													
	8" ASPHALT			0.8											
	Brown SANDY CLAY with gravel						2.75				25				
							4.5+		69		12	31	13	18	
							4.5+				15				
5				5.0											
		TEST BORING TERMINATED AT 5 FT													

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/3/2021 **End Date:** 6/3/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS ▽ On Rods (ft): <u>NONE</u> ▼ After Drilling (ft): <u>DRY</u> ▼ After _____ Hours (ft): _____	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
	7" ASPHALT		0.8											
	Brown SANDY CLAY					4.5		53		16	34	17	17	
						4.5+				14				
						3.5				13				
5			5.0											
		TEST BORING TERMINATED AT 5 FT												

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/3/2021 **End Date:** 6/3/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS ▽ On Rods (ft): <u>NONE</u> ▼ After Drilling (ft): <u>DRY</u> ▼ After _____ Hours (ft): _____	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
			6" ASPHALT												
			Brown SANDY CLAY with gravel				1.75		59		23	42	19	23	
			Tan and Gray SANDY CLAY				1.0				19				
			TEST BORING TERMINATED AT 5 FT				2.0		63		19	41	19	22	



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BORING NO.: 23

Sheet 1 of 1

PROJECT NO.: W211585

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/22/2021 **End Date:** 6/22/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS <input type="checkbox"/> On Rods (ft): <u>NONE</u> <input checked="" type="checkbox"/> After Drilling (ft): <u>DRY</u> <input type="checkbox"/> After _____ Hours (ft): _____	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
			Brown CLAYEY SAND						48		17	52	18	34	
			Tan SANDY CLAY				1.75				20				
5			TEST BORING TERMINATED AT 5 FT					2.0				19			

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/23/2021 **End Date:** 6/23/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		3" ASPHALT												
		Brown SANDY CLAY				3.25	3.7		108	17				
		Tan SANDY CLAY				3.25		66		17	48	16	32	
		TEST BORING TERMINATED AT 5 FT				4.5+				16				



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BORING NO.: 28

Sheet 1 of 1

PROJECT NO.: W211585

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/23/2021 **End Date:** 6/23/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		▽ On Rods (ft):	NONE												
		▽ After Drilling (ft):	DRY												
		▽ After _____ Hours (ft):													
		MATERIAL DESCRIPTION													
	3" ASPHALT	0.3	████												
	Tan CLAYEY SAND with gravel	1.0	████████				4.5+	2.5		123	11				
	Brown CLAY with sand	5.0	████████████████				4.5		73	18	54	17	37		
5	TEST BORING TERMINATED AT 5 FT	5.0	████████████████████							9					

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/3/2021 **End Date:** 6/3/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		▽ On Rods (ft):	_____ NONE												
		▼ After Drilling (ft): _____ DRY ▼ After _____ Hours (ft): _____													
		MATERIAL DESCRIPTION													
		2" ASPHALT with 6" base material													
		0.8													
		Tan SANDY CLAY with calcareous nodules													
		1.75													
		3.0													
		69													
		18													
		50													
		17													
		33													
5		5.0													
		TEST BORING TERMINATED AT 5 FT													

Client: CITY OF DENTON - ENGINEERING SERVICES
Project: 2020 STREET RECONSTRUCTION - SECTOR 3
Start Date: 6/3/2021 **End Date:** 6/3/2021
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: DENTON, TX
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		▽ On Rods (ft):	_____ NONE												
		▼ After Drilling (ft): _____ DRY ▼ After _____ Hours (ft): _____													
		MATERIAL DESCRIPTION													
		2" ASPHALT with 4" base material													
		0.8													
		Brown CLAY with sand													
		2.75 5.3 105 23													
		4.5+ 74 15 52 15 37													
		4.5+ 14													
5		5.0													
		TEST BORING TERMINATED AT 5 FT													

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/4/2021 **End Date:** 6/4/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		6" ASPHALT												
		Brown SANDY CLAY				3.25		68		19	56	17	39	
		Tan SANDY CLAY				3.0				20				
5		TEST BORING TERMINATED AT 5 FT				4.5+				13				

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/4/2021 **End Date:** 6/4/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		5" ASPHALT												
		0.5 Reddish Brown CLAYEY SAND				4.5+		27		13	56	17	39	
		2.0 Reddish Brown SANDSTONE			100/ 2.5"					7				
		5.0 TEST BORING TERMINATED AT 5 FT			100/ 2.75"					9				

Client: CITY OF DENTON - ENGINEERING SERVICES

Location: DENTON, TX

Project: 2020 STREET RECONSTRUCTION - SECTOR 3

Surface Elevation: _____

Start Date: 6/4/2021 **End Date:** 6/4/2021

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER



















North: _____

Hammer Drop (lbs / in): 170 / 24






Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft, in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Swell, %
		6" ASPHALT												
		0.5 Reddish Brown CLAYEY SAND				1.5			21					
		3.5 Reddish Brown SANDSTONE				2.25		23	14	30	16	14		
5		5.0 TEST BORING TERMINATED AT 5 FT			100/ 3.5"				13					

KEY TO SOIL SYMBOLS AND CLASSIFICATIONS

SOIL & ROCK SYMBOLS

	(CH), High Plasticity CLAY
	(CL), Low Plasticity CLAY
	(SC), CLAYEY SAND
	(SP), Poorly Graded SAND
	(SW), Well Graded SAND
	(SM), SILTY SAND
	(ML), SILT
	(MH), Elastic SILT
	LIMESTONE
	SHALE / MARL
	SANDSTONE
	(GP), Poorly Graded GRAVEL
	(GW), Well Graded GRAVEL
	(GC), CLAYEY GRAVEL
	(GM), SILTY GRAVEL
	(OL), ORGANIC SILT
	(OH), ORGANIC CLAY
	FILL

SAMPLING SYMBOLS

	SHELBY TUBE (3" OD except where noted otherwise)
	SPLIT SPOON (2" OD except where noted otherwise)
	AUGER SAMPLE
	TEXAS CONE PENETRATION
	ROCK CORE (2" ID except where noted otherwise)

RELATIVE DENSITY OF COHESIONLESS SOILS (blows/ft)

VERY LOOSE	0 TO 4
LOOSE	5 TO 10
MEDIUM	11 TO 30
DENSE	31 TO 50
VERY DENSE	OVER 50

SHEAR STRENGTH OF COHESIVE SOILS (tsf)

VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
FIRM	0.50 TO 1.00
STIFF	1.00 TO 2.00
VERY STIFF	2.00 TO 4.00
HARD	OVER 4.00

RELATIVE DEGREE OF PLASTICITY (PI)

LOW	4 TO 15
MEDIUM	16 TO 25
HIGH	26 TO 35
VERY HIGH	OVER 35

RELATIVE PROPORTIONS (%)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

PARTICLE SIZE IDENTIFICATION (DIAMETER)

BOULDERS	8.0" OR LARGER
COBBLES	3.0" TO 8.0"
COARSE GRAVEL	0.75" TO 3.0"
FINE GRAVEL	5.0 mm TO 3.0"
COURSE SAND	2.0 mm TO 5.0 mm
MEDIUM SAND	0.4 mm TO 5.0 mm
FINE SAND	0.07 mm TO 0.4 mm
SILT	0.002 mm TO 0.07 mm
CLAY	LESS THAN 0.002 mm