
STANDARD SPECIFICATIONS



Springs Hill Special Utility District

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**SECTION 01 71 13
MOBILIZATION****PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. This item shall govern the mobilization of personnel, equipment, and supplies at the project site in preparation for beginning work on other contract items that will be performed by the Contractor. Mobilization shall include, but is not limited to, the movement of equipment, personnel, material, supplies, etc. to the project site, application fees, permit fees for all necessary permits and the establishment of the Contractor's office and other facilities prior to beginning the work. The cost of required insurance and bonds shall be include in this item.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION**3.01 MEASUREMENT**

- A. Measurement of Item No. 01 71 13, as specified herein, will be the "Lump Sum," as the work progresses.

3.02 PAYMENT

- A. Mobilization will be paid for at the unit contract price, per lump sum, which shall be considered full compensation for establishment of the requisite bonds, insurance, documentation, etc. necessary for the project to proceed in accordance with the Contract Documents as well as the readying and/or movement of equipment, personnel, material, supplies, etc. to the project site and the establishment of office and other facilities necessary prior to beginning the work.

END OF SECTION

SECTION 02 82 00
HANDLING ASBESTOS CEMENT PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This item governs the uncovering, dislodging, handling, removal, transport, and disposal of asbestos cement (AC) pipe and other asbestos-containing materials (ACM), including transite pipe. AC pipe typically contains 15–20% chrysotile or crocidolite asbestos and is classified as ACM.
- B. The intent is to ensure that all ACM—particularly AC pipe—is handled in a manner that maintains it in an intact, non-friable state and prevents release of asbestos fibers.

1.02 REFERENCE STANDARDS

- A. All work under these specifications shall comply with all applicable Federal, State, and local regulations governing the disturbance, handling, removal, transport, and disposal of asbestos-containing materials (ACM), as well as SHSUD Specifications.
- B. The most current version of any referenced regulation or standard shall apply. Where conflicts exist between these documents, the most stringent shall govern.
- C. Applicable regulations and standards include, but are not limited to:
 - 1. National Emission Standards for Hazardous Air Pollutants (NESHAP):
 - i. 40 CFR Part 61, Subpart M – National Emission Standard for Asbestos.
 - 2. Occupational Safety and Health Administration (OSHA):
 - i. 29 CFR 1926.1101 – Asbestos in Construction
 - ii. 29 CFR 1910.134 – Respiratory Protection
 - iii. 29 CFR 1910.1200 – Hazard Communication
 - iv. 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records
 - 3. Texas Department of State Health Services (DSHS):
 - i. 25 Texas Administrative Code (TAC), Chapter 295, Subchapter C – Asbestos Health Protection
 - 4. Texas Commission on Environmental Quality (TCEQ):
 - i. 30 TAC §330 – Municipal Solid Waste
 - 5. Texas Statutes:
 - i. Occupations Code, Chapter 1954 – Asbestos Health Protection

- ii. Health and Safety Code Chapters 361 and 363 – Solid Waste Management

6. Local Standards:

- i. SHSUD Design Criteria Manual and Standard Specifications

- D. As defined by 40 CFR 61.141, asbestos cement (AC) pipe is considered Category II non-friable ACM, unless it becomes crumbled, pulverized, or reduced to powder by hand pressure. In such cases, it shall be reclassified as regulated ACM (RACM) and subject to additional requirements under NESHAP.

1.03 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall develop an Asbestos Removal Work Plan, herein referred to as "The Plan", that provides specific and detailed procedures they and/or any of their subcontractors will follow to maintain the AC pipe in an intact state.
1. The contractor shall have and follow a written Plan that describes their detailed handling and disposal procedures of the AC pipe.
 2. The contractor shall submit copies of the Plan to SHSUD for review and approval.
 3. The Contractor shall comply with the SHSUD and any other agencies requirements.
 4. The Plan shall specify the wet techniques to be followed when the pipe collars are dislodged.
 5. The Plan shall include procedures/actions to be followed if the intact AC pipe becomes broken and the possibility exists of asbestos fibers becoming airborne.
 6. Plans submitted with insufficient detail will be returned for revision and resubmission
 7. OSHA classifies the handling and removal of ACM as Class II asbestos work.
 - i. Contractor shall acknowledge and describe how their program complies with OSHA standard 29 CFR 1926.1101
 8. The Plan submitted shall contain the following:
 - i. A detailed scope of work to be accomplished.
 - ii. Specific details regarding involvement with existing AC pipe, such as:
 1. Abandoning or removing X feet of AC pipe
 2. Tying into one or more joints/sections of an existing water main and replacing X feet
 3. Removing buried AC pipe encased in concrete across inaccessible terrain

4. Tapping into existing AC pipe joints/sections
 - iii. Detailed procedures that describe the methods/techniques to be employed to uncover, dislodge, handle, remove, secure, transport, and dispose of the AC pipe and any generated ACM waste.
 - iv. For illustrative purposes, example procedures may be provided as a baseline for preparation. Contractors may use such examples as guidance but must tailor the Plan to the project-specific scope and materials.
9. The Plan shall state or reference procedures in the contractor's Safety and health program document that they will follow to comply with the federal OSHA asbestos standard. Finally, the Plan shall contain provisions for the environmentally compliant disposal of the intact AC pipe and any RACM created during the removal process.
10. The Plan shall be provided to SHSUD at the pre-construction (pre-con) meeting for its review and approval prior to initiating uncovering operations to verify the contractor has met the contractual requirements.
11. Preparation and submission of the Plan shall be considered subsidiary to the work required and no direct payment will be made.
12. The guidance provided in these special specifications is not intended and does not constitute an asbestos abatement project design as described under 25 TAC §295.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. No handling and disposing of SHSUD AC pipe will begin without approval from SHSUD.
- B. The Contractor shall uncover, dislodge, handle, remove, transport, and dispose of all AC pipe specified in the contract documents for this project using wet technique procedures.
- C. All work involving AC pipe and other ACM products must be addressed in the Plan.
- D. The Contractor shall take precautions to prevent damage to adjacent structures and material/finished material not required for AC pipe handling.
- E. All projects involving AC pipe require that NESHAP and OSHA standards are met and/or exceeded.
- F. To comply with NESHAP and OSHA requirements, this project will require workers trained in using wet technique procedures to dislodge and remove AC pipe, AC pipe joints, valves (any type) containing ACM, and any surrounding soils that may contain ACM.

- G. OSHA requires that during any ACM disturbance, regardless of amount, the asbestos worker(s) shall be protected from potential airborne asbestos exposure in excess of the permissible exposure limit or excursion limit as stipulated in 29 CFR 1926.1101
- H. Contractors shall not use procedures that subject the AC pipe to forces that will crumble, pulverize, or reduce to powder the AC pipe. Once the pipe becomes crumbled, pulverized, or reduced to powder it becomes classified as regulated ACM. (40 CFR 61.141) ACM (RACM) and subject to NESHAP.
- I. The following work practices and engineering controls shall not be used for work related to AC pipe or for work which disturbs ACM, regardless of asbestos exposure or the results of Initial Exposure Assessments. These procedures will protect workers from the health risk associated with airborne asbestos.
 - 1. High-speed abrasive disc saws and sanders not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air;
 - 2. Carbide-tipped cutting blades;
 - 3. Electrical drills, chisels, and rasps used to make field connections in AC pipe;
 - 4. Shell cutters used to cut entry holes in AC pipe;
 - 5. A hammer and chisel without using wet techniques to remove pipe connections;
 - 6. Compressed air used to remove asbestos or material containing asbestos;
 - 7. Dry sweeping, dry shoveling, or other dry clean-up of dust and ACM debris
 - 8. Employee rotation as a means of reducing employee exposure to asbestos;
- J. To meet and/or exceed NESHAP and OSHA guidelines, the contractor may subcontract the AC pipe handling plan and work to an Environmental Protection Agency (EPA) accredited and DSHS licensed asbestos abatement contractor, DSHS licensed asbestos consultant, and DSHS air monitoring technician. The contractor shall be responsible for submitting the DSHS notification with copies to SHSUD.
- K. NESHAP guidelines apply to facility projects in which the combined amount of RACM is at least 260 linear feet (LF) or 35 cubic feet or 160 square feet.
 - 1. If the combined amount of RACM is at least 260 linear feet of the AC pipe, including AC collars, and it is expected to become or becomes crumbled, pulverized, or reduced to powder, then the project is subject to the NESHAP provisions of reporting and asbestos emission control paragraphs in 40 CFR Section 61.145.
 - 2. If the scope of the project involves the threshold amount (260 linear feet or greater), a Demolition/Renovation Notification Form is required to be sent to DSHS by the Contractor.

- i. This form shall be post-marked no later than 10 working days prior to the start of any asbestos handling work.
- L. The Contractor shall notify SHSUD, at least 72 hours prior to beginning uncovering, dislodging, handling, and removing the AC pipe. AC pipe uncovering, dislodging, handling, and/or removing shall be conducted during regular business hours, 8 a.m. to 5 p.m., Monday-Friday. No uncovering, dislodging, handling, and or removing of AC pipe outside of the normal business hours or during the weekend is allowed unless special circumstances require the contractor to do so and the work has been approved in writing at least 72 hours before the commencement of the work.
- M. Disposal bags for RACM shall be 6-mil polyethylene and labeled as required by EPA Regulation 40 CFR 61.150 (a)(1)(iv) or OSHA requirement 29 CFR 1926.1101(k)(8).
- N. Stick-on labels identifying the generator's name (SAWS) and address and the project site location shall be applied to any asbestos waste disposal bag that contains RACM, as per EPA or OSHA and Department of Transportation requirements
- O. The Contractor shall remove and double bag with 6-mil polyethylene sheeting to yield a total of at least 12-mil, the asbestos pipe in the trench or immediately when it comes out of the trench, seal, label, transport, and dispose of all Category II non- friable ACM and RACM in compliance with applicable current Federal, State and local regulations, laws, ordinances, rules, standards and regulatory agency recommended requirements.
- P. Time is of the essence in removing the ACM from the project area.
- Q. All work must be completed within the period specified in the contract. SHSUD will be responsible for coordinating this work in high-density areas, such as schools, church facilities, and residential areas.
- R. All notifications required to state regulatory agencies will be made by the Contractor with copies provided to SHSUD, including but not limited to the DSHS Demolition/Renovation Notification Form.
- S. The Contractor shall have an on-site supervisor, who is an OSHA Competent Person, always present on the job site that the AC pipe work is in progress.
 - 1. Supervisor shall be thoroughly familiar with and experienced at asbestos pipe handling using wet techniques and shall be familiar with and shall enforce the use of all safety procedures and equipment.
 - 2. Supervisor shall be knowledgeable of all applicable EPA, OSHA, and DSHS asbestos requirements and guidelines.
- T. The Contractor has sole and primary responsibility for the "means and/or methods" of the work; an obligation to SHSUD to inspect all stages of the work; and sole responsibility to supervise the performance of the work.

- U. The Contractor shall be responsible for site safety and for taking all necessary precautions to protect the Contractor's, SHSUD personnel and the public from airborne asbestos exposure and/or injury. The Contractor shall be responsible for maintaining the integrity of the work area.
- V. The Contractor shall confine operations at the site to the area requiring interface with the AC pipe and the general site area in close proximity to the project.
- W. If ACWMs are required to be stored overnight in a secured area, the waste material and waste containers shall be labeled according to OSHA and EPA, and the State of Texas requirements, & containerized to preclude unauthorized disturbance of the ACWMs.
- X. The Contractor shall be responsible for obtaining and coordinating waste disposal and transport of ACWM to a TCEQ permitted asbestos waste landfill.
- Y. Abandonment of AC water mains/pipes:
 - 1. The Contractor is responsible for isolating the existing mains to remain in place by capping, plugging and blocking as necessary.
 - 2. The opening of an abandoned AC water main and all other openings or holes shall be blocked off by manually forcing cement grout or concrete into & around the openings in sufficient quantity to provide a permanent watertight seal.
 - 3. Valves to be abandoned, that contain ACM, in the execution of the work shall have the valve box and extension packed with sand to within eight inches of the finished grade.
 - i. The remaining eight inches shall be filled with 3,000 psi concrete or an equivalent sand-cement mix and finished flush with the adjacent pavement or ground surface.
 - ii. The valve covers shall be salvaged & returned to SHSUD.
- Z. The Contractor's on-site Competent Person shall inspect the work area, verify, and certify that no residual AC pipe fragments and debris remain.

3.02 MEASUREMENT

- A. Measurement of Section 02 82 00, Handling Asbestos Cement Pipe shall be per linear foot for removal, transportation, and disposal of asbestos cement pipe.

3.03 PAYMENT

- A. Payment shall be compensation at the contract unit price bid per linear foot for "Handling Asbestos Cement Pipe", which prices shall be full compensation for the work herein specified including the furnishing of all materials, equipment, tools and for the material disposal, submittals, and labor necessary to complete the work.
 - 1. No payment shall be made for the Plan.

2. Abandonment of AC water mains will be considered subsidiary to the work required, and no direct payment will be made.
3. Abandonment of valves containing ACM is considered subsidiary to the work required, and no direct payment will be made.
4. If the DSHS RACM limit of 260 LF is exceeded, the contractor is responsible for any DSHS administrative fees and fines at no additional cost to owner.
5. Any uncovering, dislodging, handling, or disposing of AC pipe and associated written handling and removal plans, such as an abatement plan, required by another agency will be paid for by that agency using their specification/bid item number.
6. Any ACM encountered that is not SHSUD pipe and not previously identified by SHSUD or shown on SHSUD plans will not be authorized for disposal payment.

END OF SECTION

SECTION 31 23 00**EXCAVATION, TRENCHING, AND FILL****PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required, and perform all operations in connection with the excavation, trenching, and backfilling for water pipelines, unless otherwise noted in the contract documents. The work shall include all necessary drainage, dewatering, pumping, bailing, sheeting, shoring and incidental construction.

1.02 RELATED WORK

- A. Division 01 – General Requirements
- B. Division 31 – Earthwork
- C. Division 33 - Utilities

1.03 SUBMITTALS

- A. Submit the following
 - 1. Submit testing laboratory reports, as specified or required, to show compliance with specifications for material from off-site locations. The specified tests shall be performed by a certified independent testing laboratory retained and paid by the Contractor.
 - 2. Submit details of excavation plans designed and prepared by a licensed Professional Engineer, who is registered in the State of Texas and has experience in soils engineering, for all structure excavation. The plans shall include details of any proposed shoring systems, systems to protect existing facilities, slope stability monitoring, and the Contractor's means and methods for controlling groundwater. The plans shall be submitted to the Engineer for record purposes prior to proceeding with any excavation work.
 - 3. Submit details of temporary excavation support system plans for all trench excavations, where an existing structure or utility falls within a 2 horizontal to 1 vertical (2:1) slope from the bottom of the excavation, or where considerations dictate a plan. The plans shall be developed by the Contractor's licensed Professional Engineer, who is registered in the State of Texas and has experience in trench safety analysis. The plans shall be submitted to the Owner's Representative for record purposes prior to proceeding with any excavation work.

1.04 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials
 - 1. AASHTO T-180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop

- B. American National Standards Institute/American Society for Testing and Materials (ANSI/ASTM) latest version.
 - 1. ASTM C33 - Standard Specification for Concrete Aggregate.
 - 2. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 3. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
 - 4. ASTM C150 - Standard Specification for Portland Cement.
 - 5. ASTM D75 - Sampling Aggregates.
 - 6. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-mm/m³))
 - 7. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,00 ft-lb/ft³ (2,700 kN-m/m³))
 - 8. ASTM D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 9. ASTM D4253 - Maximum Index Density of Soils Using a Vibratory Table
 - 10. ASTM D4254 - Minimum Index Density of Soils and Calculation of Relative Density.
 - 11. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - 12. ASTM E1745 – Standard Specification for Plastic Water Vapor Retarders Used in Contract with Soil or Granular Fill Under Concrete Slabs.
- C. Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014) - Texas, Department of Transportation (TXDOT).
- D. Manual of Water Supply Practices - Concrete Pressure Pipe - American Water Works Association (AWWA) M9.
- E. Where reference is made to one of the preceding standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All field testing and inspection services will be provided by the Contractor's independent testing laboratory. The cost of such work, unless specifically stated otherwise, will be paid by the Contractor. Testing methods shall comply with the latest applicable ASTM Standards.
- B. Materials shall be tested and observed as described in the following paragraphs. Allow free access to the work for selection of materials and observation.

1. At all structures, prior to placement of bedding material, concrete working mats, crushed stone base, or concrete fill, the geotechnical engineer shall observe the prepared subgrade to confirm its suitability for supporting the work to be placed thereon. Such observation shall include visual review, and in-place soil density tests as required.
 2. Before and during placement of fill and backfill, the soils testing laboratory shall provide at least one density and moisture content test for each 232 m² (2,500 ft²) of surface area for each compacted lift of fill.
- C. Test pits for the purpose of locating underground utilities or structures in advance of the construction excavated by the Contractor shall be backfilled immediately after the desired information has been obtained and shall be performed in a manner consistent with trench backfill requirements. The backfilled surface shall be restored and maintained in a manner consistent with the original conditions.

1.06 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for design and implementation of adequate support, safety, dewatering, and drainage systems and for all loss or damage resulting from partial or complete failure of protective measures.
- B. The Contractor shall be responsible for dewatering of seepage and leakage past any existing valve, wall, or gate.
- C. The Contractor shall protect the existing utilities during excavation work including that of test pits. The Contractor shall be fully responsible for any and all damages, which might be occasioned by the Contractor's failure to protect the existing utilities.
- D. Unless otherwise specified, the Contractor is responsible for removal and disposal of waste material in accordance with applicable regulations.
- E. Any submittals required for trench safety plan, dewatering and drainage plans, and similar temporary facilities, will be for reference purposes only and maintained for record purposes in the Owner's Representative files. Submittal of these items will not relieve the Contractor of any responsibility for the adequacy of support, safety, dewatering, and drainage systems.

1.07 PROTECTION OF FACILITIES

- A. Before the start of earthwork operations, adequately protect utilities, trees, shrubs, and other permanent objects. Repair costs resulting from damage to permanent facilities due to negligence or lack of adequate protection will be charged to the Contractor.
- B. Provide surface drainage during the period of construction to protect the work and to avoid nuisance to adjoining property.
- C. The Contractor shall conduct operations in such fashion that trucks and other vehicles do not create a dirt nuisance in the streets. The truck beds shall be sufficiently tight and shall be loaded in such a manner that objectionable materials will not be spilled onto the streets. Any

dirt, mud, or other materials that are spilled onto the streets or deposited onto the streets by the tires of vehicles shall be promptly cleared away by the Contractor.

1.08 INSPECTION OF EXCAVATIONS

- A. Do not place reinforcing steel or concrete in the excavation prior to inspection unless the Engineer's Representative has given approval to proceed without inspection.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Rock

1. Crushed rock shall consist of sound and durable particles free from injurious amounts of salt, alkali, vegetable matter, or other material either free or as adherent coating. Its quality shall be reasonably uniform throughout.
2. Gradation shall meet the following requirements for percentage by weight when tested in accordance with ASTM C136:

i. Standard Crushed Rock

Passing 38.1 mm (1-1/2") sieve	100%
Passing 25.4 mm (1") sieve	95-100%
Passing 12.7 mm (1/2") sieve	25-60%
Passing No. 4 sieve	0-10%
Passing No. 8 sieve	0-5%

ii. Fine Crushed Rock

Passing 12.7 mm (1/2") sieve	100%
Passing 9.53 mm (3/8") sieve	95-100%
Passing No. 4 sieve	40-65%
Passing No. 8 sieve	0-10%

iii. Coarse Crushed Rock

Passing 38.1 mm (1-1/2") sieve	100%
Retained on 19.1 mm (3/4") sieve	100%

B. Gravel

1. Gravel shall consist of uncrushed stones and shall not have by weight more than one percent organic matter, clays, or loam and not more than five percent by weight of any, one or combination of slate, shale, schist, or soft particles of sandstone.
2. Gradation shall meet the following requirements for percentage by weight when tested in accordance with ASTM C136:

Passing 38.1 mm (1-1/2") sieve	100%
Retained on 19.1 mm (3/4") sieve	95%

C. Sand For Embedment

1. Sand shall consist of clean, hard, durable, uncoated grains, free from lumps, and organic material.
2. Gradation shall meet the following requirements for percentage by weight when tested in accordance with ASTM C136:

Passing No. 4 sieve	80-100%
Passing No. 8 sieve	65-100%
Passing No. 16 sieve	40-80%
Passing No. 50 sieve	7-40%
Passing No. 100 sieve	2-20%
Passing No. 200 sieve	0-10%

D. Granular Material

1. Granular material shall be free flowing, such as sand or hydraulically graded crushed stone fines, or mixed sand and gravel. Material shall have no more than 10 percent fines and shall be free from lumps, stones over two inches in diameter, and organic matter.

E. Select Material

1. Structure: Where select material is shown or specified, use an approved material, free of organic matter and foreign substances, obtained from an approved off-site source. The material shall be gravel, fine rock cuttings, sand, or loam free from excessive clay. Rock cuttings shall have no dimension greater than (3"). The material shall have a plasticity index (PI) between 4 and 12 and a maximum liquid limit of less than 35 as determined by ASTM D4318. The material shall retain a minimum of 50 percent on the No. 200 sieve. Prior to bringing any of the proposed material to the site, submit, for review by the Owner's Representative, an analysis of the proposed material, including a moisture-density relationship curve prepared in accordance with ASTM D698 by a certified independent testing laboratory employed and paid by the Contractor.
2. Material for Basin Embankments: All material used in the construction of the embankment surrounding the structures and any other embankment fill areas shall be comprised of on-site lean to fat clays free of organic material and debris.

F. Concrete For Embedment and Encasement

1. Concrete for embedment and encasement shall be Class "B" concrete with a minimum compressive strength of 3,000 psi at 28 days. Dry mix will not be permitted. The concrete cushion portion of the embedment or encasement shall be mixed to give a slump of not more than one-inch (1"). Concrete for the sides and top, if specified, shall be mixed to obtain a slump of not less than one-inch (1") nor more than three inches (3"), and shall

be placed after the concrete used for cushion portion of the embedment or encasement sets up.

G. Vapor Barrier Membrane

1. Polyethylene sheeting conforming to Polyethylene sheeting conforming to ASTM E1745 – Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs, not less than 6-mil nominal thickness.

H. Filter Material

1. Where indicated on the Drawings or required in the work, use a mixture of coarse aggregate or fine aggregate for filter material. Proportion the mixture with two parts coarse aggregate to one part fine aggregate by volume.
2. Coarse aggregate shall consist of gravel, crushed gravel or crushed stone and shall have a gradation limit of three-quarter-inch (3/4") to No. 4 complying with ASTM C33 (Type 7).
3. Fine aggregate shall consist of natural sand and shall comply with the requirements of ASTM C33 for fine aggregate.

I. Stockpiled Topsoil for Finish Grading

1. Natural friable soil of region, free from lumps, clay, toxic substances, roots, debris, vegetation, stones over one-inch (1") in maximum dimension, and containing no salt or alkali.

J. Materials And Equipment for Dewatering and Drainage

1. Select materials and equipment as appropriate for the intended use.

PART 3 EXECUTION

3.01 PREPARATION

- A. All existing utilities shall be protected from damage during the excavation and backfilling of trenches and, if damaged, shall be replaced by the Contractor at their own expense.

B. General

1. Unless otherwise shown in the contract documents, all excavation shall be unclassified and shall include all materials encountered regardless of their nature or manner in which they are removed, to include but not limited to groundwater, water, rock, stone, sand, concrete, organic material, existing abandoned utility lines whether shown on the plans or not, or any kind of material that is encountered.
2. Trenches shall not be backfilled until all constructed structures or appurtenances, as installed, conform to the requirements specified. Failure to comply will require Contractor to re-excavate trench at no expense to SHSUD.

3. Where pipe is specially coated or sleeve/tape wrapped for protection against corrosion, care shall be taken not to damage the coating or sleeve/tape wrap.
 4. Where a trench has been improperly backfilled, or settlement occurs, the identified section shall be excavated to the trench depth and a length of 50 feet in both directions of the failed area, then refilled and compacted to the grade and compaction level required.
 5. Safety Devices: The Contractor shall provide and maintain barricades, flags, road flares, and other safety devices as required by local, state and federal codes and ordinances and conduct work to create a minimum inconvenience to the public.
 6. Temporary suspension of work does not relieve Contractors' responsibility of the above requirements.
 7. Safety and Health Regulations: The Contractor shall at all times conform to all applicable regulations of 29 CFR Part 1926 Subpart "P" entitled Excavation, of OSHA Safety and Health Regulations for Construction" or most applicable approved equal provisions, and all other applicable state and local rules and regulations.
- C. Excavation: The Contractor shall perform all excavation of every description and all substances, including rock, encountered to the lines and grades shown in the contract documents or as determined by the Engineer.
1. During excavation, material suitable for backfilling may be stockpiled in an orderly manner a safe distance from the banks of the trench to avoid overloading and prevent slides or cave-ins as per 29 CFR Part 1926 Subpart "P" entitled Excavation, of OSHA Safety and Health Regulations for Construction"
 2. All excavated material not required or suitable for backfill shall be removed and properly disposed of by the Contractor or as directed by the Inspector at no additional cost to SHSUD.
 3. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods.
 4. Sheet piling and shoring shall be installed in accordance with all applicable safety requirements for the protection of the work, adjoining property, and for the safety of all personnel.
 5. Unless otherwise indicated, all excavations shall be open cut, with banks of trenches kept as nearly vertical as possible.
 6. Where over-excavation occurs and when not as directed by the Engineer or Inspector, the under-cut trench shall be restored to grade at no cost to SHSUD by replacement with material conforming to the requirements of the bedding material or a material approved by the Engineer.

D. Trenching

1. Trench walls shall be vertical.
2. Open trenches are limited to 150 ft open at one time.
3. All open trench segments shall be backfilled or properly secured within 50 feet of the active work face by the end of each workday.
4. The practice of undercutting at the bottom or flaring at the top will not be permitted except where it is justified for safety or at the Engineer's and/or Inspector's direction.
5. The trench bottom shall be square or slightly curved to the shape of the trenching machine cutters.
6. The trench shall be accurately graded along its entire length to provide uniform bearing and support for each section of pipe installed upon the bedding material.
7. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and bedding installed.
8. The pipe shall rest upon the new bedding material for its full length.
9. The minimum allowable trench width at the pipe zone shall be at least 12 inches greater than the outside diameter of the pipe, providing a minimum of 6 inches of clearance on each side.
10. The maximum allowable trench width at the pipe zone shall not exceed 24 inches greater than the outside diameter of the pipe, allowing no more than 12 inches of clearance on each side.
11. Any additional trench restoration required as a result of an excavation wider than this maximum width or subsequent surface or paving work, will be done at the Contractor's sole expense.

E. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. The Contractor shall not allow water to accumulate in excavations or at subgrade level.
2. Remove water to prevent softening of foundation bottoms and soil changes detrimental to stability of subgrades and foundations.
3. Provide and maintain dewatering system components necessary to convey water from excavations.
4. Convey water removed from excavation and rainwater to collecting or runoff areas away from buildings and other structures.
5. Do not use trench excavations as temporary drainage ditches.

6. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench.
 7. Upon completion of the dewatering work, the Contractor shall remove all equipment and leave the construction area in a neat, clean, condition that is acceptable to the Inspector.
 8. No direct payment shall be made for costs associated with dewatering.
 9. All costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.
 10. Other methods of water control, other than dewatering, shall be subject to the approval of SHSUD.
- F. Backfilling: Trenches shall not be backfilled until the construction structures or appurtenances, as installed, conform to the requirements specified.
1. Definitions:
 - i. Bedding: Material placed at the bottom of the trench to provide uniform, stable support for the pipe. Bedding shall be compacted to ensure full bearing and minimize settlement.
 - ii. Select backfill is the material placed and compacted from the top of the bedding envelope to the top of the trench or the bottom of pavement section. This backfill material must be free of debris, brush, and trash, and primarily composed of compactible soil.
 2. Bedding material shall be placed and compacted from the trench bottom to a minimum depth of 6 inches, or as otherwise specified in the contract documents.
 3. Select backfill shall generally consist of material removed from the trench, provided it is free of brush, debris, trash, and other deleterious material.
 - i. Rocks or stones larger than 6 inches in any dimension shall be removed before use as select backfill.
 - ii. Select backfill shall be primarily composed of compactible soil and placed in maximum 12-inch loose lifts or as directed by the Engineer or Inspector.
 4. Select backfill shall be placed and compacted in accordance with trench details provided in the construction documents.
 5. In unpaved areas, compaction of select backfill shall achieve a minimum of 85% relative dry density, from the top of bedding to finished grade, or as otherwise specified.
 6. In paved areas (e.g., streets), compaction of select backfill shall achieve a minimum of 98% relative dry density, from the top of bedding to the bottom of pavement or finished grade, or as otherwise specified.

7. Where pipe is specially coated or sleeve/tape wrapped for protection against corrosion, care shall be taken not to damage the coating or sleeve/tape wrap.
 8. Damaged wrap will be replaced at Contractor's expense.
 9. Where a trench has been improperly backfilled, or where settlement occurs, the identified section shall be excavated to the trench depth and a length 50 feet in both directions of the failed area, then refilled and compacted to the grade and compaction level required at the Contractor's expense.
 10. The use of sand backfill shall not be allowed, except if the native soil is sand. Compaction and moisture-density relationship to be determined by TxDOT Testing Methods Tex-113 or Tex-114.
 11. Soil Characteristics determined by TxDOT-142e.
 12. The pavement (asphalt) section shall have 98% compaction density with a maximum dry density at + or – 1% optimum moisture content as determined by tests on samples as outlined in the latest provisions of TX-DOT Testing Method Tex 113-E or Tex-114, unless otherwise shown on the contract documents.
 13. At the time of compaction, the water content shall be at optimum moisture content, + or - 1% points as outlined in the latest provisions of TX-DOT Testing Method Tex 113-E or Tex-114.
- G. Trench Surface Restoration: The surface of the backfilled trench shall be restored to match the previous existing conditions.
1. This shall include final grading, placement of topsoil and seeding, placement of sod (such as at homes or businesses that had maintained grass), or other unprepared and prepared surfaces.
 2. Contractor shall compact trench and install an all-weather surface on any paved surface, roadway or trench as directed by SHSUD inspector.
 3. Trenches in alleys actively being used by vehicles (such as trash pickup, vehicle parking, etc.) shall be restored by grading and compacting to 98%
 4. No separate payment for the surface restoration is permitted. The cost for this work must be included in the appropriate bid item.

3.02 DISPOSAL OF EXCAVATED MATERIALS

- A. Any excess excavated material, not utilized after all fill requirements have been met, shall become the responsibility of the Contractor.
- B. The Contractor shall dispose of it by hauling and wasting outside the limits of the right-of-way or easements of this project and of public thoroughfares and water courses, in conformity with

pertinent City, County, State and Federal codes and ordinances and in a manner meeting the approval of the Engineer or Inspector.

3.03 QUALITY CONTROL

- A. The Contractor will perform both field and laboratory test and inspection as required by SHSUD.
- B. All testing to be coordinated 48 hours in advance with SHSUD Inspector.
- C. The Owner reserves the right to conduct any tests or inspections deemed necessary to ensure the quality and compliance of the work. Such testing shall be performed by a nationally accredited, independent testing laboratory, selected at the Owner's discretion, and used for the Owner's guidance and quality control.
 - 1. Payment for such tests shall be the responsibility of the Owner, including the material proctor tests and density tests.
 - 2. The Contractor shall coordinate with the Owner for testing by providing timely notice of the areas available for inspection.
 - 3. The frequency and location of tests shall be determined solely by SHSUD. At a minimum, testing shall be conducted at random locations selected by the Inspector or Test Administrator. Tests shall be performed for each 18-inch (bottom lift) and each 12-inch loose lift per 100 linear feet, with a probe depth of six (6) inches.
- D. Quality Control Testing: The Contractor shall be responsible for compaction in accordance with the appropriate Specification.
 - 1. Compaction tests will be done at location points randomly selected or as indicated by the SHSUD Inspector/Test Administrator.
 - 2. The inspector shall determine the depth at which the density test shall be taken.
 - 3. All depths shall be considered for testing without a predetermined maximum or minimum
 - 4. Test requirements above are indicated as a minimum requirement, but maybe subjected to follow more stringent requirements as established by other appropriate agencies
 - 5. Any failed test shall require the Contractor to remove and replace that layer of backfill in the identified section of the failed test location to the trench depth and a length 50 feet in both directions, then refilled and compacted to the grade and compaction level required.
 - i. The Contractor will also be required at no cost to SHSUD to provide two additional tests at the replaced location where the initial test failed and at one location point, randomly selected or as indicated by the SHSUD Inspector/Test Administrator

6. The Contractor shall be responsible for all costs associated with the proctor and density tests, and for providing SHSUD and Consultant, if applicable, verification that necessary compaction levels were achieved.
7. These tests shall be performed by a nationally-accredited, independent testing laboratory.

3.04 MEASUREMENT

- A. Excavation, trenching, and backfill will not be measured for payment

3.05 PAYMENT

- A. No direct payment shall be made for incidental costs associated with quality control testing, excavation, trenching, backfilling for water mains. These shall be included in the applicable contract price for the item to which the work pertains.

END OF SECTION

SECTION 31 23 23.33
FLOWABLE FILL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this item consists of furnishing, transporting, mixing, testing and installing flowable fill. Flowable fill is a concrete material suitable as a backfill for utility trenches, abandoned pipes, manholes and valves. It is a heavy material and will exert high fluid pressure against any forms, embankment, or wall used to contain backfill.

1.02 REFERENCE STANDARDS

- A. American Society for Testing Materials (ASTM)
 - 1. ASTM C 4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- B. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications
- C. Texas Department of Transportation (TxDOT)
 - 1. TxDOT DMS-4600 Hydraulic Cement
 - 2. TxDOT DMS-4610 Fly Ash
 - 3. TxDOT DMS 4640 Chemical Admixtures for Concrete
 - 4. Tex-401-A
 - 5. TxDOT Tex-106-A
 - 6. TxDOT-Tex-418-A
 - 7. TxDOT-Tex-447-A

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cement: Furnish hydraulic cement that meets the requirements of TxDOT's DMS-4600, "Hydraulic Cement," TxDOT's Hydraulic Cement Quality Monitoring Program (HCQMP), and ASTM C-150 Type I Portland Cement. Sources not on the HCQMP or other sources to be used in combination with an approved source will require approval before use.
- B. Fly Ash: Furnish fly ash conforming to TxDOT DMS-4610, "Fly Ash."
- C. Chemical Admixtures: Furnish chemical admixtures conforming to TxDOT DMS-4640, Chemical Admixtures for Concrete.

- D. Fine Aggregate: Provide fine aggregate that will stay in suspension in the mortar to the extent required for proper flow and that meets the gradation requirements of Table 1. Test fine aggregate gradation in accordance with TxDOT standard laboratory test procedure Tex-401-A. Plasticity Index (PI) must not exceed 6 when tested in accordance with TxDOT standard laboratory test procedure Tex-106-A.

Table 1. Aggregate Gradation Chart

Sieve Size	Percent Passing
¾ inch	100
No. 200	0-30

- E. Mixing Water: Use mixing water conforming to the requirements of Specification Item No. 300, Concrete (Natural Aggregate).

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. Unless otherwise shown on the plans, furnish a mix meeting the requirements of this section as set forth below.
1. Strength. The compressive strength range shall be between the following strength values unless otherwise directed by the Engineer or shown on the plans:
 - i. Low Strength. Between 80 psi and 150 psi at 28 days,
 - ii. High Strength. Greater than 500 psi at 28 days.
 - iii. Emergency repairs. Strength shall be greater than 50 psi at 2 hours.
 2. Consistency. Design the mix to be placed without consolidation and to fill all intended voids.
 - i. Fill an open-ended, 3 inch diameter by 6 inch high cylinder to the top to test the consistency.
 - ii. Immediately pull the cylinder straight up. The correct consistency of the mix must produce a minimum 8 inch diameter circular spread with no segregation.
 - iii. When necessary, use specialty type admixtures to enhance the flowability, reduce shrinkage, and reduce segregation by maintaining solids in suspension.
 - iv. All admixtures must be used and proportioned in accordance with the manufacturer's recommendations.
 - v. Mix the flowable fill using a central-mixed concrete plant, ready-mix concrete truck, pug mill, or other approved method.

3. Shrinkage and Bleeding. Limit shrinkage to 0.5% or less based upon the results from ASTM C 827, "Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures."
 - i. Batch, mix and transport flowable fill in accordance with ASTM C 94, except when directed otherwise by the Engineer.
 - ii. Mix flowable fill in quantities required for immediate use. Do not use portions which have developed initial set or which are not in place within 90 minutes after the initial water has been added.
 - iii. Do not mix flowable fill while the air temperature is at or below 35 degrees F without prior approval from the Engineer.
 - iv. Monitor and control the fluid pressure during placement of flowable fill prior to set. Take appropriate measures to avoid excessive pressure that may damage or displace structures or cause flotation. Cease operations if flowable fill is observed leaking from the area.
 - v. Repair or replace damaged or displaced structures at no additional cost to SHSUD.
 - vi. Clean up excess flowable fill discharged from the work area and remove excess flowable fill from pipes at no additional cost to SHSUD.

3.02 TESTING

- A. Testing shall be in accordance with TxDOT standard laboratory test procedure Tex-418-A
- B. Contractor to furnish all labor, equipment, tools, containers, and molds required for sampling, making, transporting, curing, removal, and disposal of test specimens. Furnish test molds meeting the requirements of TxDOT standard laboratory test procedure Tex-447-A
- C. Two specimens are required for a strength test, and the compressive strength is defined as the average of the breaking strength of the 2 cylinders.
- D. Contractor to transport, strip, and cure the test specimens as scheduled at the designated location.
- E. Cure test specimens in accordance with TxDOT standard laboratory test procedure Tex-447-A.
- F. The Contractor will sample, take, and test all quality control testing.
- G. Contractor to dispose of used, broken specimens in an approved location and manner.
- H. The frequency of job control testing will be at the direction of the Engineer.
- I. SHSUD will be responsible for quality assurance testing.

3.03 MEASUREMENT

- A. Measurement of Section 31 23 23.33, Flowable Fill shall be by the cubic yard of material placed of accepted work complete in place.
 - 1. Measurement will not include the additional volume caused by slips, slides, or cave-ins resulting from the Contractor's operations.

3.03 PAYMENT

- A. Payment shall be compensation at the contract unit price bid per cubic yard for “Flowable Fill”, which prices shall be full compensation for the work herein specified including the furnishing, hauling, and placing materials and for equipment, tools, labor, and incidentals.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor, materials, equipment, installation, maintenance, removal, and incidentals as shown, specified, and required to install the project's Storm Water Pollution Prevention Plan (SWPPP), erosion and sediment control devices, and establishment of final stabilization.

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics
 - 2. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - 3. ASTM D4751 – Standard ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - 4. ASTM D4833, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
- B. Texas Commission on Environmental Quality (TCEQ)
 - 1. TPDES General Permit No. TXR150000
- C. Texas Department of Transportation (TXDOT) Departmental Material Specifications (DMS)
 - 1. DMS 6230 – Temporary Sediment Control Fence Fabric

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rock Filter Dams
 - 1. Aggregate
 - i. Furnish aggregate with hardness, durability, cleanliness and resistance to crumbling, flaking and eroding, subject to approval by the Engineer.
 - ii. Provide aggregate sizes as follows:
 - a. Types 1, 2 and 4 Rock Filter Dams - Use 3 to 6 inch aggregate.
 - b. Type 3 Rock Filter Dams - Use 4 to 8 inch aggregate.

2. Wire

- i. Provide minimum 20-gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams
- ii. Type 4 dams require:
 - a. Double-twisted, hexagonal weave with a nominal mesh opening of 2½ inches x 3 ¼ inches
 - b. Minimum 0.0866-inch steel wire for netting
 - c. Minimum 0.1063-inch steel wire for selvages and corners
 - d. Minimum 0.0866-inch for binding or tie wire

3. Geotextile Fabric

- i. Install geotextile fabric beneath all rock filter dams. Fabric shall conform to the following minimum properties:
 - a. Tensile Strength of 250 pounds, per ASTM D4632
 - b. Puncture Strength of 135 pounds, per ASTM D4833
 - c. Mullen Burst Rate of 420 psi, per ASTM D3786
 - d. Apparent Opening Size of No. 20 (max), per ASTM D4751

B. Stabilized Construction Entrances

1. Provide materials that meet the details shown on the Drawings and this Section.
 - i. Provide crushed aggregate for long and short-term construction exits.
 - ii. Furnish aggregates that are clean, hard, durable and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials and organic and injurious matter.
 - iii. Use 3 to 5 inch coarse aggregate with a minimum thickness of 12 inches.
 - iv. The aggregate shall be placed over a geotextile fabric meeting the following criteria:
 - a. Tensile Strength of 300 pounds, per ASTM D4632
 - b. Puncture Strength of 120 pounds, per ASTM D4833
 - c. Mullen Burst Rate of 600 psi, per ASTM D3786

d. Apparent Opening Size of No. 40 (max), per ASTM D4751

C. Embankment for Erosion Control

1. Provide rock, loam, clay, topsoil or other earth materials that will form a stable embankment to meet the intended use.

D. Sandbags

1. Provide sandbag material of polypropylene, polyethylene or polyamide woven fabric with a minimum unit weight of 4 ounces per square yard, a Mullen burst- strength exceeding 300 psi, and an ultraviolet stability exceeding 70 percent.
2. Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags.
3. Filled sandbags must be 24 to 30 inches long, 16 to 18 inches wide, and 6 to 8 inches thick.

Table 1 Sand Gradation

Sieve #	Maximum Retained (% by Weight)
4	3
100	80
200	95

E. Temporary Sediment Control Fence

1. Provide a net-reinforced fence using woven geo-textile fabric.
2. Logos visible to the traveling public will not be allowed.
 - i. Fabric
 - a. Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."
 - ii. Posts
 - a. Provide essentially straight wood or steel posts with a minimum length of 48 inches, unless otherwise shown on the Drawings.
 - b. Soft wood posts must be at least 3 inches in diameter or nominal 2 x 4 inch
 - c. Hardwood posts must have a minimum cross-section of 1-1/2 x 1-1/2 inch
 - d. T- or L-shaped steel posts must have a minimum weight of 1.3 pounds per foot.
 - iii. Net Reinforcement

- a. Provide net reinforcement of at least 12-1/2 gauge galvanized welded wire mesh, with a maximum opening size of 2 x 4 inch, at least 24 inches wide, unless otherwise shown on the Drawings.

- iv. Staples

- a. Provide staples with a crown at least 3/4 inch wide and legs 1/2 inch long.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. Storm Water Pollution Prevention Plan

1. Develop and implement the project's Storm Water Pollution Prevention Plan (SWPPP) in accordance with the TPDES Construction General Permit TXR150000 requirements. Prevent water pollution from storm water runoff by using and maintaining appropriate structural and nonstructural BMPs to reduce pollutants discharges to the MS4 from the construction site.

B. Control Measures

1. Implement control measures in the area to be disturbed before beginning construction, or as directed. Limit the disturbance to the area shown on the Drawings or as directed.
2. Control site waste such as discarded building materials, concrete truck washout water, chemicals, litter and sanitary waste at the construction site.
3. If, in the opinion of the Engineer, the Contractor fails to adequately control soil erosion and sedimentation, the Engineer may limit further disturbance to areas where effective control can be maintained. The Contractor shall be responsible for all corrective measures required to restore compliance, at no additional cost to the Owner.
4. Immediately correct ineffective control measures. Implement additional controls as directed. Remove excavated material within the time requirements specified in the applicable storm water permit.
5. Upon acceptance of vegetative cover by the City, remove and dispose of all temporary control measures, temporary embankments, bridges, matting, falsework, piling, debris, or other obstructions placed during construction that are not a part of the finished work, or as directed.
6. Do not locate disposal areas, stockpiles, or haul roads in any wetland, water body, or streambed.
7. Do not install temporary construction crossings in or across any water body without the prior approval of the appropriate resource agency and the Engineer.

8. Provide protected storage area for paints, chemicals, solvents, and fertilizers at an approved location. Keep paints, chemicals, solvents, and fertilizers off bare ground and provide shelter for stored chemicals.

C. Installation and Maintenance

1. Perform work in accordance with the TPDES Construction General Permit TXR150000.
2. When approved, sediments may be disposed of within embankments, or in areas where the material will not contribute to further siltation and when appropriate stabilization is provided.
3. Dispose of removed material in accordance with federal, state, and local regulations.
4. Remove devices upon approval or when directed.
 - i. Upon removal, finish-grade and dress the area.
 - ii. Stabilize disturbed areas in accordance with the permit, and as shown on the Drawings or directed.
5. The Contractor retains ownership of stockpiled material and must remove it from the project when new installations or replacements are no longer required.

D. Rock Filter Dams for Erosion Control

1. Remove trees, brush, stumps and other objectionable material that may interfere with the construction of rock filter dams.
2. Place sandbags as a foundation when required or at the Contractor's option.
3. For Types 1, 2, 3, and 5, place the aggregate to the lines, height, and slopes specified, without undue voids.
4. For Types 2 and 3, place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings, or as directed.
5. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed.
6. Construct filter dams according to the following criteria, unless otherwise shown on the Drawings:
 - i. Type 1 (non-reinforced)
 - a. Height - At least 18 inches measured vertically from existing ground to top of filter dam
 - b. Top Width - At least 2 feet

- c. Slopes - At most 2:1
- ii. Type 2 (Reinforced)
 - a. Height - At least 18 inches measured vertically from existing ground to top of filter dam
 - b. Top Width - At least 2 feet
 - c. Slopes - At most 2:1
- iii. Type 3 (Reinforced)
 - a. Height - At least 36 inches measured vertically from existing ground to top of filter dam
 - b. Top Width - At least 2 feet
 - c. Slopes - At most 2:1
- iv. Type 4 (Sack Gabions)
 - a. Unfold sack gabions and smooth out kinks and bends.
 - b. For vertical filling, connect the sides by lacing in a single loop–double loop pattern on 4- to 5-inches spacing. At 1 end, pull the end lacing rod until tight, wrap around the end, and twist 4 times. At the filling end, fill with stone, pull the rod tight, cut the wire with approximately 6 inches remaining, and twist wires 4 times.
 - c. For horizontal filling, place sack flat in a filling trough, fill with stone, and connect sides and secure ends as described above.
 - d. Lift and place without damaging the gabion.
 - e. Shape sack gabions to existing contours.

E. Construction Entrances

1. When tracking conditions exist, prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction entrances.
2. Place the exit over a foundation course, if necessary.
 - i. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the Drawings or as directed.
3. At drive approaches, make sure the construction entrance is the full width of the drive and meets the length shown on the Drawings.

- i. The width shall be at least 14 feet for 1-way and 24 feet for 2-way traffic for all other points of ingress or egress or as directed by the Engineer.

F. Earthwork for Erosion Control

1. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.
2. Excavation and Embankment for Erosion Control Measures
 - i. Place earth dikes, swales or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover.
 - ii. Place swales and dikes at other locations as shown on the Drawings or as directed to prevent runoff spillover or to divert runoff.
 - iii. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides.
 - iv. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the Drawings or as directed.
 - v. Where required, create a sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at 1 time, not including offsite areas.
3. Excavation of Sediment and Debris
 - i. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.
 - ii. Remove sediment from sediment traps and sedimentation ponds no later than the time that design capacity has been reduced by 50%.

G. Sandbags for Erosion Control

1. Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment and release water in sheet flow.
2. Fill each bag with sand so that at least the top 6 inches of the bag is unfilled to allow for proper tying of the open end.
3. Place the sandbags with their tied ends in the same direction.
4. Offset subsequent rows of sandbags 1/2 the length of the preceding row.
5. Place a single layer of sandbags downstream as a secondary debris trap.

6. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.

H. Temporary Sediment-Control Fence

1. Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow.
2. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the Drawings, as specified in this Section, or as directed by the Engineer or City representative.
3. Post Installation
 - i. Embed posts at least 18 inches deep, or adequately anchor, if in rock, with a spacing of 6 to 8 feet and install on a slight angle toward the run-off source.
4. Fabric Anchoring
 - i. Dig trenches along the uphill side of the fence to anchor 6 to 8 inches of fabric.
 - ii. Provide a minimum trench cross-section of 6 x 6 inches
 - iii. Place the fabric against the side of the trench and align approximately 2 inches of fabric along the bottom in the upstream direction.
 - iv. Backfill the trench, then hand-tamp.
5. Fabric and Net Reinforcement Attachment
 - i. Unless otherwise shown under the Drawings, attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced.
 - ii. Sewn vertical pockets may be used to attach reinforcement to end posts.
 - iii. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 inches or less.
6. Fabric and Net Splices
 - i. Locate splices at a fence post with a minimum lap of 6 inches attached in at least 6 places equally spaced, unless otherwise shown under the Drawings.
 - a. Do not locate splices in concentrated flow areas.
 - ii. Requirements for installation of used temporary sediment-control fence include the following:
 - a. Fabric with minimal or no visible signs of biodegradation (weak fibers)

- b. Fabric without excessive patching (more than 1 patch every 15 to 20 feet)
- c. Posts without bends
- d. Backing without holes

3.02 MAINTENANCE

- A. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until earthwork construction and permanent erosion control features are in place or the disturbed area has been adequately stabilized as determined by the Engineer.
- B. If a device ceases to function as intended, repair or replace the device or portions thereof as necessary.
- C. Perform inspections of the construction site as prescribed in the Construction General Permit TXR150000.
- D. Records of inspections and modifications based on the results of inspections must be maintained and available in accordance with the permit.

3.03 CLEANING

- A. Waste Management
 - 1. Remove sediment, debris and litter as needed.

3.04 CLOSEOUT ACTIVITIES

- A. Erosion control measures remain in place and are maintained until all soil disturbing activities at the project site have been completed.
- B. Establish a uniform vegetative cover with a density of 70 percent on all unpaved areas, on areas not covered by permanent structures, or in areas where permanent erosion control measures (i.e. riprap, gabions, or geotextiles) have been employed.
- C. Once vegetative cover is achieved, the contractor shall remove all temporary control measures, before final project acceptance. It is the contractor's responsibility to remove all temporary control measures, unless transfer of maintenance and subsequent removal is transferred to another entity in writing.

3.05 MEASUREMENT

- A. Storm Water Pollution Prevention Plan <1 acre shall be considered subsidiary to the various Items bid.
- B. Storm Water Pollution Prevention Plan >1 acre shall be measured as one lump sum.

3.06 PAYMENT

- A. Storm Water Pollution Prevention Plan <1 acre shall be paid for the work performed and the materials furnished in accordance with this Item are subsidiary to the structure or Items being bid and no other compensation will be allowed.
- B. Storm Water Pollution Prevention Plan >1 acre shall be paid for the work performed and the materials furnished in accordance with this Item shall be paid for at the lump sum price bid for “SWPPP ≥ 1 acre”. This price bid shall include:
 - 1. Preparation of SWPPP
 - 2. Implementation
 - 3. Permitting fees
 - 4. Installation
 - 5. Maintenance
 - 6. Removal
 - 7. Obtaining and/or complying with grading and/or fill permits, if required
 - 8. Final stabilization

END OF SECTION

SECTION 31 50 00
TRENCH EXCAVATION SAFETY PROTECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This item shall govern the trench excavation safety protection required for the construction of all trench excavation protection systems to be utilized in the project and including all additional excavation and backfill necessitated by the protection system.

1.02 REFERENCE STANDARDS

- A. Occupational Safety and Health Administration (OSHA)
 - 1. Federal Regulations, 29 CFR, Part 1926, Standards – Safety and Health Regulations for Construction – Subpart P Excavation
- B. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications
- C. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC), Chapter 290, Subchapter D – Rules and Regulations for Public Drinking Water

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. Trench excavation safety protection shall be accomplished as required by the latest provision of Part 1926, Subpart P – Excavations, Trenching, and Shoring of the OSHA Standards and Interpretations, or the most approved equal provision.
- B. A trench shall be defined as a narrow excavation made below the surface of the ground or pavement. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.
- C. If forms or other structures are installed or constructed in an excavation to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less (measure at the bottom of the excavation), the excavation is also considered to be a trench.
- D. In addition, "Trench Excavation Protection" will not be limited to these applications but may be used whenever deemed expedient and proper to ensuing work.

3.02 MEASUREMENT

- A. Measurement of Section 31 50 00, Trench Excavation Safety Protection shall be per linear foot along the centerline of any OSHA defined trench.

3.03 PAYMENT

- A. Payment shall be compensation at the contract unit price bid per linear foot for “Trench Excavation Safety Protection” regardless of the depth of the trench.
- B. This payment includes all elements of the safety protection system, such as sloping, sheeting, trench boxes or shields, sheet piling, cribbing, bracing, shoring, and any necessary dewatering or water management.
- C. Payment also covers any additional excavation and backfill, jacking and jack removal, and removal of trench supports after completion.
- D. This payment constitutes full compensation for all labor, materials, equipment, consultants, and incidentals required to complete the work under this item.

END OF SECTION

**SECTION 33 01 10
DISINFECTION****PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. Disinfection of potable water lines and water plant piping for raw and finished water.

1.03 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - 1. AWWA C651 – Disinfecting Water Mains

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION**3.01 CONDUCTING DISINFECTION**

- A. The Contractor shall disinfect all pipe and fittings installed in the system and receive the required approvals and clearances prior to placing the system in service. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA C651, "Disinfecting Water Mains," and all appropriate approval agencies. Care shall be taken to provide disinfection of the entire system. After disinfection, the Contractor will thoroughly flush the line until water samples show a chlorine content equal to or greater than existing system and no less than 0.20 mg/L and bacteriological tests are satisfactory.
- B. Water lines constructed shall be promptly disinfected before any tests are conducted on water lines and before water lines are connected to the Owner's water distribution system.
- C. Water for disinfection and flushing will be furnished by the Owner without charge for initial disinfection. If the disinfection fails testing, Contractor shall be charged for water at the owner's lowest rate.
- D. Unless otherwise provided in Contract Documents, Contractor will conduct disinfection operations.
- E. Chlorination operations shall be coordinated with the SHSUD personnel.

3.02 PREPARATION

- A. Provide and install all temporary items necessary for disinfection, including blind flanges, plugs, cast-iron sleeves, and temporary valves. Typically, each valved section of water line shall be equipped with two ¾-inch taps for sampling and injecting chlorine solution.

- B. Provide a minimum 2-inch blow-off for water mains 6 inches in diameter and smaller. For mains 8 inches and larger, fire hydrants may be used for flushing. If hydrants are unavailable, install temporary blow-off assemblies as shown on the Drawings. Remove temporary assemblies promptly after successful disinfection and testing.
- C. Install permanent blow-offs at the ends of all dead-end mains as shown on the Drawings.
- D. Slowly fill each pipeline section with potable water in a manner approved by the Engineer. Water velocity during filling shall not exceed 2 feet per second, with a recommended average velocity of 1 foot per second or less. Expel all air from the pipeline prior to disinfection.
- E. Complete backfilling of excavations after risers or blow-off assemblies are installed and tested, unless otherwise directed by the Engineer.

3.03 DISINFECTION BY OWNER'S PERSONNEL

- A. Correct problems that may prevent disinfection operations prior to advising the Engineer to perform disinfection work. When disinfection work cannot be performed due to covered up valves, missing valve stacks, inoperative fire hydrants or other nonconforming construction, a charge will be levied against Contractor for each trip made by the Owner's personnel.
- B. Notify and coordinate with the Engineer a minimum of 48 hours before disinfection work is to be performed. Assist the Owner's personnel during disinfection operations.

3.04 DISINFECTION BY CONTRACTOR

- A. The following procedure will be used when disinfection by Contractor is required by Contract Documents:
 - 1. Initial Chlorination: Introduce a chlorine solution to achieve a minimum concentration of 100 mg/L throughout the entire pipeline. Maintain this concentration for a minimum of 24 hours.
 - 2. Valve Cycling: Operate all valves, hydrants, and other appurtenances within the section being disinfected multiple times during the 24-hour contact period to ensure thorough exposure of all components to the disinfecting solution.
 - 3. Final Flushing: After the contact period, flush the pipeline with potable water until the residual chlorine concentration is no greater than 1.0 mg/L and is approximately equal to the normal system chlorine level.
 - 4. Use of Chemical Compounds: If a chemical compound is used for disinfection (e.g., tablets or granules), it shall be applied only with prior approval of the Engineer and in accordance with AWWA C651 provisions.
 - 5. Contractor Responsibilities: All labor, materials, chlorination equipment, temporary piping, blow-offs, and testing necessary to disinfect the pipeline shall be furnished and installed by the Contractor.

3.05 BACTERIOLOGICAL TESTING

- A. After disinfection and flushing of water lines, the Contractor shall obtain bacteriological samples and have them tested by a certified laboratory. If test results indicate the need for additional disinfection in accordance with TCEQ requirements, the Contractor shall repeat the disinfection, flushing, and testing at no additional cost to the Owner.

3.06 COMPLETION

- A. Upon completion of disinfection and testing, remove risers except those approved for use in subsequent hydrostatic testing, and backfill excavation promptly.

3.07 MEASUREMENT

- A. Disinfection operations are considered subsidiary to the work and no separate measurement will be made by the Contractor for this work.

3.08 PAYMENT

- A. Disinfection operations are considered subsidiary to the work and no separate payment will be made to the Contractor for this work. The Contractor is required to provide all appurtenances to the pipe to allow for machine chlorination at no additional cost or separate pay item.

END OF SECTION

SECTION 33 05 05
BURIED WATER MAIN INSTALLATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to install all buried piping, fittings, and specials. The work includes the following:

1. All types and sizes of buried piping, except where buried piping installations are specified under other sections or other contracts.
2. Unless otherwise shown or specified, this Section includes all buried piping work required, beginning at the outside face of structures or structure foundations, including piping beneath structures, and extending away from structures.
3. Work on or affecting existing buried piping.
4. Installation of all jointing and gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, cathodic protection, and other work required for a complete, buried piping installation.
5. Supports and restraints.
6. Pipe encasements, with the exception of piping embedded in concrete within a structure or foundation.
7. Incorporation of valves, meters, and special items shown or specified into piping systems in accordance with the Contract Documents and as required.

B. Coordination:

1. Review installation procedures under this and related Sections. Coordinate installation of items to be installed with or before buried piping work.
2. Coordinate with applicable Sections of Division 33, Utilities and Division 40, Process Interconnections to ensure proper sequencing of work.

1.02 RELATED WORK

- A. Division 31 – Earthwork
- B. Division 33 – Utilities
- C. Division 40 – Process Interconnections

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- i. Laying schedules for concrete pipe and piping with restrained joints.
- ii. Details of piping, specials, joints, harnessing and thrust blocks, and connections to piping, structures, equipment, and appurtenances.

2. Product Data:

- i. Manufacturer's literature and specifications, as applicable, for products specified in this Section.

Informational Submittals:

3. Certificates:

- i. Certificate signed by manufacturer of each product certifying that product conforms to applicable referenced standards.

B. Closeout Submittals:

1. Record Documentation:

- i. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping work. Submittal shall show actual location of all piping Work and appurtenances at same scale as the Drawings.
- ii. Show piping with elevations referenced to Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping provide offset dimensions as required to document piping location.
- iii. Include profile drawings with buried piping record documents when the Contract Documents include piping profile drawings.

1.04 REFERENCE STANDARDS

A. American Water Works Association (AWWA)

1. AWWA C 105 – Polyethylene Encasement for Ductile-Iron Pipe System
2. AWWA C 111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. AWWA C 600 – Installation of Ductile-Iron Water Mains and Their Appurtenances
4. AWWA C 605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
5. AWWA C 606 – Grooved and Shouldered Joints

6. AWWA M 23 - PVC Pipe Design and Installation
7. AWWA M 41 – Ductile-Iron Pipe and Fittings
- B. Texas Commission of Environmental Quality (TCEQ)
 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- C. Springs Hill Special Utility District (SHSUD)
 1. Design Guidelines and Standard Specifications

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Comply with requirements and recommendations of authorities having jurisdiction over the work, including:
 - i. Paulding County Water and Sewer Department.
- B. Obtain required permits for Work in roads, rights-of-way, railroads, and other areas of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 1. Deliver materials to the site to ensure uninterrupted progress of the Work.
 2. Upon delivery inspect pipe and appurtenances for cracking, gouging, chipping, denting, and other damage and immediately remove from Site and replace with acceptable material.
- B. Storage:
 1. Store materials to allow convenient access for inspection and identification. Store material off ground using pallets, platforms, or other supports. Protect packaged materials from corrosion and deterioration.
 2. Pipe and fittings other than PVC and CPVC may be stored outdoors without cover. Cover PVC and CPVC pipe and fittings stored outdoors.
- C. Handling:
 1. Handle pipe, fittings, specials, and accessories carefully in accordance with pipe manufacturer's recommendations. Do not drop or roll material off trucks. Do not drop, roll or skid piping.
 2. Avoid unnecessary handling of pipe.

3. Keep pipe interiors free from dirt and foreign matter.
4. Protect interior linings and exterior coatings of pipe and fittings from damage. Replace pipe and fittings with damaged lining regardless of the cause of damage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All 4-inch pipe shall be either PVC or ductile iron cement lined (DICL) pipe; Pipe sizes 6 inches through 12 inches shall be either molecularly oriented PVC or DICL pipe; pipes larger than 12 inches shall be determined on a case-by-case basis. Pipes larger than 24-inches in diameter shall be approved on a case-by-case basis. All pipes on bridges, under railroad tracks, crossing residential streets and cul-de-sacs shall be DICL. All lines requiring casing shall be constructed in accordance with the SHSUD Standard Detail for casing. Any deviation from this standard shall be subject to review and approval by SHSUD.

Table 1 Water Main Pipe Material

Diameter	Material	General Specification
4"	PVC	ASTM D 2241 SDR 21
6" to 12"	PVC or DICL	AWWA C 900/909 Class 200 (Ultra Blue)
4" to 24"	DICL	ANSI/AWWA A 21.51/C 151 Class 350

- B. Piping materials are specified in the Contract Drawings.
- C. General:
 1. Manufacturer shall cast or paint on each length of pipe and each fitting pipe material, diameter, and pressure or thickness class.
 2. Pipe shall have an exterior bituminous coating in accordance with ANSI A21.51. Pipe interior shall have a cement mortar lining with an asphaltic seal coat conforming to ANSI/AWWA A21.4/C104.
 3. All PVC pipe water mains shall have a suitable electronic locator buried over the water main approximately one foot below grade. The tape shall be continuous between valves and secured to each valve. The tape shall be at least 4.5 mils thick, 6-inch minimum width and made with an aluminum material sandwiched between 2 layers of polyethylene. It shall have imprinted in permanent black ink with 1-inch letters "CAUTION WATER MAIN BURIED BELOW" on blue background.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
 1. Install piping as shown, specified, and as recommended by pipe and fittings manufacturer.

2. In event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from Engineer before proceeding.
3. Engineer will observe excavations and bedding prior to laying pipe by Contractor. Notify Engineer in advance of excavating, bedding, pipe laying, and backfilling operations.
4. Minimum cover over buried piping shall be 48 inches for unfinished surfaces. For finished surfaces, a minimum depth shall be maintained of 30 inches for lines 2-21 inches or 36 inches for 14 inches or greater. The minimum cover shall be maintained unless otherwise shown and approved by SHSUD.
5. Earthwork is specified in Section 31 23 00, Excavation, Trenching and Fill.
6. Excavation in excess of that required or shown, and that is not authorized by Engineer shall be filled at Contractor's expense with drainage fill furnished, placed, and compacted in accordance with Section 31 23 00, Excavation, Trenching and Fill.
7. Comply with NFPA 24 for "Outside Protection", where applicable to water piping systems used for fire protection.

B. Separation of Potable Water Piping:

1. Right of Way

- i. Water Lines for the water distribution system for a residential or commercial subdivision shall be routed outside road rights-of-way, within a 15-foot minimum utility easement that is dedicated to SHSUD (exclusive or non-exclusive) unless otherwise approved. With SHSUD approval, water lines may be routed 3' - 5' within a public right-of-way.

2. Horizontal Separation:

- i. Maintain a horizontal separation of at least 9 feet between existing or proposed potable water mains or service lines and sanitary sewers. This distance shall be measured from the outside of the water facility to the outside of the sanitary sewer facility. If it is not practical to maintain the 9-foot minimum, an alternative separation method may be submitted to SHSUD for review and approval.
- ii. Maintain a minimum horizontal separation of 5 feet between potable water facilities and all other utilities, including gas, telephone, storm drainage, and electric, measured from outside of the water facility to the outside of the adjacent utility.
- iii. Joint trench installations of potable water lines with electrical, telecommunications, or cable lines are not permitted.

3. Vertical Separation:

- i. Water mains crossing other pipelines shall be laid to provide a minimum vertical distance of 18 inches between the outside of the facilities. This shall be the case where the water main is either above or below the other pipelines. Water main crossings below other pipelines or conduits should be avoided whenever possible.
- ii. At crossings, one full length of water pipe shall be located so both joints will be as far from the other pipelines as possible. All water lines crossing wastewater lines shall follow 30 TAC §290 Subchapter D §290.44(e) through 290.44(e)(5) whichever may be applicable.
- iii. Natural or propane gas lines shall be encased in concrete which shall extend 12" above and below the gas line and shall have a minimum separation of 18" from outside of pipe to outside of pipe.
- iv. If a minimum of 18 inches cannot be maintained, a 6-inch concrete encasement is required to protect the waterline.
 - a. Concrete encasement shall extend from 6 inches below to 6 inches above the outer projections of the pipe over the entire width of the trench in accordance with Standard Detail WA-2," Concrete Encasement".

C. Plugs:

1. Temporarily plug the open end of installed pipe at the close of each workday or during any interruption in installation to prevent the entry of animals, water, debris, or unauthorized persons.
2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.
3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.
4. Where plugging is required for phasing of the work or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to Engineer.

D. Bedding Pipe: Bed pipe as specified and in accordance with details on the Drawings.

1. Trench excavation, backfill, and bedding materials shall conform to Section 31 23 00, Excavation, Trenching and Fill, as applicable.

E. Laying Pipe:

1. Conform to manufacturer's instructions and requirements of standards and manuals listed below, as applicable:
 - i. Ductile Iron Pipe: ANSI/AWWA C600, ANSI/AWWA C105, AWWA M41.

- ii. Concrete Pipe: AWWA M9.
 - iii. Steel Pipe: ANSI/AWWA C206, AWWA M11.
 - iv. Thermoplastic Pipe: ASTM D2321, ASTM D2774, ANSI/AWWA C605, AWWA M23, AWWA M45, AWWA, M55.
2. Contractor shall cut pipe only as necessary to comply with alignment shown on the drawings.
 3. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by Engineer. Remove and reinstall pipes that are not installed correctly.
 4. Slope piping uniformly between elevations shown.
 5. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.
 6. Start laying pipe at lowest point and proceed towards higher elevations, unless otherwise approved by Engineer.
 7. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by Engineer.
 8. Place concrete pipe containing elliptical reinforcement with minor axis of reinforcement in vertical position.
 9. Excavate around joints in bedding and lay pipe so that pipe barrel bears uniformly on trench bottom.
 10. Deflections at joints shall not exceed the amount allowed by pipe manufacturer, unless otherwise approved by Engineer.
 11. For PVC and CPVC piping with solvent welded joints, 2.5-inch diameter and smaller, and copper tubing, snake piping in trench to compensate for thermal expansion and contraction.
 12. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the site and replace with acceptable products.
 13. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly wire brushed, and wiped clean and dry immediately before pipe is laid.

14. Field cut pipe, where required, with machine specially designed for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.
15. Do not place blocking under pipe, unless specifically approved by Engineer for special conditions.
16. Touch up protective coatings in manner satisfactory to Engineer prior to backfilling.
17. Notify Engineer in advance of backfilling operations.
18. On steep slopes, take measures acceptable to Engineer to prevent movement of pipe during installation.
19. Thrust Restraint: Where required, provide thrust restraint conforming to Section 33 05 05.31, Joint Restraint.
20. Exercise care to avoid flotation when installing pipe in cast-in-place concrete, and in locations with high groundwater.

F. Jointing Pipe

1. Mechanical joints consisting of bell, socket, gland, gasket, bolt, and nuts shall conform to ANSI A21.11.
2. Ductile Iron Mechanical Joint Pipe:
 - i. Immediately before making joint, wipe clean the socket, plain end, and adjacent areas. Taper cut ends and file off sharp edges to provide smooth surface.
 - ii. Lubricate plain ends and gasket with soapy water or manufacturer's recommended pipe lubricant, in accordance with ANSI/AWWA C111, just prior to slipping gasket onto plain end of the joint assembly.
 - iii. Place gland on plain end with lip extension toward the plain end, followed by gasket with narrow edge of gasket toward plain end.
 - iv. Insert plain end of pipe into socket and press gasket firmly and evenly into gasket recess. Keep joint straight during assembly.
 - v. Push gland toward socket and center gland around pipe with gland lip against gasket.
 - vi. Insert bolts and hand-tighten nuts.
 - vii. Bolts and nuts, except those of stainless steel, shall be coated with two coats, minimum dry film thickness of eight mils each, of high build solids epoxy or bituminous coating manufactured by Tnemec, or equal.

- viii. Restrained mechanical joints shall be in accordance with Section 33 05 05.16, Joint Restraint.

3. Ductile Iron Push-On Joint Pipe:

- i. Prior to assembling joints, thoroughly clean with wire brush the last eight inches of exterior surface of spigot and interior surface of bell, except where joints are lined or coated with a protective lining or coating.
- ii. Wipe clean rubber gaskets and flex gaskets until resilient. Conform to manufacturer's instructions for procedures to ensure gasket resiliency when assembling joints in cold weather.
- iii. Insert gasket into joint recess and smooth out entire circumference of gasket to remove bulges and to prevent interference with proper entry of spigot of entering pipe.
- iv. Immediately before assembling the joint, apply a thin, even film of the pipe manufacturer's recommended lubricant to either the surface of the gasket that will contact the entering spigot, or to the outside of the spigot end of the pipe.
- v. To assemble the joint, center the spigot in the bell and push it forward until it contacts the gasket. Once the gasket is compressed, but before fully inserting the pipe, inspect the gasket around the entire joint to ensure proper positioning. Complete the joint by pushing the spigot past the gasket until it contacts the bell stop. If excessive force is needed, withdraw the pipe and verify correct gasket placement. Do not reuse gaskets that are scored, twisted, or otherwise damaged.
- vi. Maintain an adequate supply of gaskets and joint lubricant at the Site when pipe jointing operations are in progress.

4. Ductile Iron Proprietary Joints:

- i. Install pipe that utilizes proprietary joints for restraint, or other such joints, in accordance with manufacturer's instructions.

5. PVC Joints

- i. PVC pipe shall have provisions for expansion and contraction provided in the joints. All joints shall be designed for push-on makeup connection. A push-on joint may be an elastomeric gasket ball end coupling manufactured as an integral part of the pipe barrel consisting of a thickened section with an expanded bell with a groove to retain a rubber sealing ring of uniform cross-section.

6. Thermoplastic Pipe Joints:

- i. Solvent Cement Welded Joints:

- a. Bevel pipe ends and remove all burrs before making joints. Clean pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F. Do not make solvent cement welded joints in wet conditions.
 - b. Use solvent cement supplied or recommended by pipe manufacturer.
 - c. Apply joint primer and solvent cement and assemble joints in accordance with recommendations and instructions of manufacturer of joint materials and pipe manufacturer.
 - d. Take appropriate safety precautions when using joint primers and solvent cements. Allow air to circulate freely through pipelines to allow solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.
 - ii. Bell and Spigot Joints:
 - a. Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joints.
 - b. Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer's recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.
7. Mechanical Coupling Joints:
- i. Mechanical joints consisting of bell, socket, gland, gasket, bolt, and nuts shall conform to ANSI A21.11.
 - ii. Mechanical couplings include: sleeve-type flexible couplings, split flexible couplings, ANSI/AWWA C606 grooved or shouldered end couplings, and plasticized PVC couplings.
 - iii. Prior to installing and assembling mechanical couplings, thoroughly clean joint ends with wire brush to remove foreign matter.
 - iv. For mechanical couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends. After lubrication, install gasket around joint end of previously installed piece and mate joint end of subsequent piece to installed piece. Position gasket and place coupling housing around gasket and over grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand. Tighten bolts uniformly to produce an equal pressure on all parts of housing. When housing clamps meet metal to metal, joint is complete and further tightening is not required.

- v. For plasticized PVC couplings, loosen the stainless steel clamping bands and remove clamps from coupling. Slide coupling over plain ends of pipes to be joined without using lubricants. Place clamps over each end of coupling at grooved section and tighten with torque wrench to torque recommended by manufacturer.
- vi. Tapping sleeves for size-on-size connections shall be mechanical joint split cast iron units and rated for 200 psi working pressure. For less than size-on-size connections, tapping sleeves shall be fabricated steel units with a fusion-bonded epoxy coating and shall be pressure rated as above. The Contractor shall determine the outside diameter of the existing main before ordering the sleeve. Tapping sleeves shall have an outlet flange per ANSI B16.1.

G. Backfilling:

- 1. Conform to applicable requirements of Section 31 23 00, Excavation, Trenching and Fill.

H. Connections to Valves and Hydrants:

- 1. Install valves and hydrants as shown and indicated in the Contract Documents.
- 2. Provide suitable adapters when valves or hydrants and piping have different joint types.
- 3. Provide thrust restraint at all hydrants and at valves located at pipeline terminations.

I. Transitions from One Type of Pipe to Another:

- 1. Provide necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

J. Closures:

- 1. Provide closure pieces shown or required to complete the work.

K. Connection to Existing Mains

- 1. A minimum amount of cement coating shall be removed from cement coated main prior to applying the service clamp or the welded coupling as designated in the Standard Details. When placing a service clamp on wrapped pipe the coating is not to be removed. Care shall be exercised to avoid tearing or scuffing of pipe coating.
- 2. All connections to existing water mains shall be made under the direct supervision of SHSUD.
- 3. Water mains shall be tapped in such a manner as to avoid disturbance or disruption to the operation of the main in service and to protect the potable water supply from contamination.

4. The Contractor shall be responsible for properly backfilling the work area pit after the work is completed.
5. When service must be interrupted to existing customers during construction of a tap or addition of appurtenances the Contractor shall provide 3-day notice to SHSUD.

3.02 THRUST RESTRAINT

- A. Provide thrust restraint on pressure piping systems where shown or indicated in the Contract Documents.
- B. Thrust Restraint shall conform to Section 33 05 05.16, Joint Restraint, as applicable.

3.03 WORK AFFECTING EXISTING PIPING

- A. Location of Existing Underground Facilities:
 1. Locations of existing Underground Facilities shown on the Drawings should be considered approximate.
 2. Contractor to determine the true location of all existing underground facilities to be connected to, crossed, or potentially disturbed or affected by excavation, backfilling, or related work.

3.04 FIELD QUALITY CONTROL

- A. All piping covered under this Section shall be hydrostatically tested in accordance with Section 33 05 05.31 Hydrostatic Testing. Leakage testing shall be performed as part of the hydrostatic test procedure.
- B. For PVC piping, deflection testing shall be conducted as required by applicable standards and pipe manufacturer recommendations. Joint deflection shall not exceed 1 degree unless otherwise approved by SHSUD.
- C. Perform cleaning and disinfection of potable water piping in accordance with Section 33 01 10, Disinfection, after successful completion of hydrostatic testing.
- D. All piping shall be visually inspected prior to backfilling to verify cleanliness, proper alignment, joint assembly, and support.
- E. The Contractor shall notify the Engineer and SHSUD a minimum of 48 hours in advance of any testing. All tests shall be witnessed by SHSUD unless otherwise approved.

3.05 MEASUREMENT

- A. Water main installation will be measured by the linear foot for each pipe size and type, along the centerline of the pipe. Measurement includes:

1. From the center of fittings (tees, crosses, valves) to the end of the pipe.
2. Full length of branches, even if plugged for future use.
3. Lengths of pipe including all fittings and valves.
4. To the center of connections with existing mains.

3.06 PAYMENT

- A. Water main installation will be paid for at the unit contract price per linear foot for each pipe size, installed at the locations shown on the construction plans or as approved by the Owner/Engineer. This price shall be full compensation for all labor, materials, equipment, tools, and incidentals required to provide a complete and functional pipeline in accordance with the plans, specifications, and manufacturer's installation guidelines.
- B. The unit price shall include all associated fittings (e.g., bends, deflections, reducers, and valves), utility locating for tie-ins, coordination with the water system operator to minimize service interruptions, excavation, trench protection, dewatering, bedding, backfill, pipe wrap, testing, and site cleanup—complete and in place.

END OF SECTION

SECTION 33 05 05.16
JOINT RESTRAINT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section governs the supply, installation, and design verification of joint restraint systems for buried piping. Joint restraints shall prevent separation of pipe joints caused by internal pressure, thrust, or external forces. The Contractor shall provide all materials, labor, and calculations required to properly install joint restraints in accordance with Manufacturer recommendations, contract documents, and SHSUD standards.

1.02 REFERENCE STANDARDS

- A. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS

2.01 GENERAL

- A. All joint restraint systems shall be suitable for the pipe material and pressure class specified; and designed to prevent separation of joints due to internal pressure, thrust, or external forces.
- B. The pipe shall be restrained by a split retainer band. The band shall be cast ductile iron, meeting or exceeding ASTM A536-80, Grade 65-45-12. The inside face or contact surface of the band shall be of sufficient width to incorporate cast or machined non-directionally sensitive serration to grip the outside circumference of the pipe. The serration shall provide full (360 degrees) contact and maintain pipe roundness and avoid any localized points of stress. The split band casting shall be designed to “bottom-out” before clamping bolt forces (110 ft-lb minimum torque) can over-stress the pipe and will provide full non-directionally sensitive restraint at the rated pressures.
- C. Bolts and nuts used to attach the split retainer ring shall comply with ANSI B18.2/18.2.2, SAE Grade 5. Tee-bolts, nuts, and restraining rods shall be fabricated from high-strength, low-alloy steel per AWWA C111-90.
- D. The split ring type non-directionally sensitive restrainer system shall be capable of a test pressure twice the maximum sustained working pressure of the specified pipe.
- E. Restraint system sizes six through twelve inches shall be capable of use for both ductile iron and/or PVC C900.
- F. The restraint system may consist of two types: the two split retainer rings, and for new construction use only, the one split and one solid cast backup ring.

2.02 APPROVED MANUFACTURERS AND MODELS

Table 1 Approved Manufacturers and Models for DI Pipe

Joint Restraint System:	Ductile Iron	D.I. 16" above
Ford/Uni-Flange	1390C	1390C
EBAA Iron Sales, Inc	1700	1700
Romac Industries	611	470SJ
Star Pipe Products	1100	1100
Sigma Corporation	PVP/PTP/SLDH	SLDH

Table 2 Approved Manufacturers and Models for PVC Pipe

Joint Restraint System:	PVC C 900/C 909
Ford/Uni-Flange	1390C
EBAA Iron Sales, Inc	1500
Romac Industries	611
Star Pipe Products	1100
Sigma Corporation	PVP/PTP

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. Joint restraints shall be provided at all the following main locations:
 1. Dead ends
 2. Plugs, caps
 3. Tees
 4. Crosses
 5. Valves
 6. Bends
- B. Pipe restraints shall be utilized to prevent movement for push-on ductile iron or PVC (C900 & C909) bell and spigot pipe connections, or where a flexible coupling has been used to join two sections of plain-end pipe. The restrainer may also be adapted to connect a plain-end ductile iron or PVC pipe to a mechanical joint (MJ) ductile iron bell fitting. The restrainer must not be directionally sensitive.
- C. All mechanical (joint) restraints shall be bidirectional.
- D. If the restraint limits do not fall on a joint, extend restraint to the next joint beyond the calculated length.
- E. Cutting of pipe to install joint restraints is not permitted.

- F. Pipe restraint devices shall be installed according to the lengths prescribed herein, recommended by pipe manufacturer, or as noted in the contract documents, whichever is more restrictive.
- G. The length of pipe to be restrained shall be calculated as required and is subject to review and approval by SHSUD staff. SHSUD recommends using a free software package from www.ebaa.com as a starting point for determining restraint calculations. Calculations must be shown to support drawings.
- H. Contractor shall include a restraint table and calculations within the plan set.
- I. Plan set note: Restrained length shall be designed based upon the conditions encountered during the installation.

3.02 MEASUREMENT

- A. Joint Restraints are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.

3.03 PAYMENT

- A. Joint Restraints are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.

END OF SECTION

**SECTION 33 05 05 .31
HYDROSTATIC TESTING**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies the general requirements for hydrostatic testing of the various piping systems shown on the construction plans and as specified elsewhere in SHSUD's Standard Specifications. Hydrostatic testing shall be used to verify structural integrity and check for leaks.

1.02 RELATED WORK

- A. Division 33 – Utilities

1.03 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - 1. AWWA C600: Installation of Ductile-Iron Water Mains and Their Appurtenances — Hydrostatic Testing
 - 2. AWWA C605: Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Polyethylene (PE) Pressure Pipe and Tubing — Testing
- B. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

1.04 SUBMITTALS

- A. Contractor shall submit test records of all hydrostatic testing performed on the project.
 - 1. Test Records shall be maintained by the Contractor and furnished to SHSUD for review and acceptance.
 - 2. Each test record shall include the following information:
 - a. Date of testing
 - b. Identification of piping tested
 - c. Test fluid
 - d. Test pressure
 - e. Signatures of contractor and engineer
 - 3. If leaks are found, they shall be noted on the record. After correction, retesting as specified for original test.

- B. Valves specified to be manufactured in accordance with AWWA and/or other standards must be submitted with an appropriate affidavit of compliance.

1.05 QUALITY ASSURANCE

- A. Hydrostatic tests consisting of pressure tests and leakage tests shall be conducted on all newly installed water distribution system pressure pipes and appurtenances. The tests shall be in accordance with the provisions listed in this specification and with the provisions of AWWA C600 and AWWA C605 as applicable.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All materials associated with hydrostatic testing operations, including installation and adjustment, shall comply with the most recent revision of the SHSUD Standard Specifications.

PART 3 EXECUTION

3.01 HYDROSTATIC TEST

- A. Testing shall be conducted in the presence of SHSUD Personnel, unless otherwise approved in writing.
- B. The Contractor shall provide written notice to SHSUD Personnel at least 48 hours in advance of all scheduled tests.
- C. The test fluid shall be clean, potable water in accordance with AWWA standards.
- D. Use of fluids other than potable water, or the use of compressed air or gas, is strictly prohibited due to safety and water quality concerns.
- E. All testing equipment and components in contact with the test water shall be made of materials compatible with potable water and suitable for use at the test pressure.
- F. The test shall be performed at ambient temperature unless otherwise specified.
- G. Final hydrostatic testing shall be conducted only after all meter boxes have been set to final grade, with the test performed against the angle stops.
- H. Water mains shall be tested either as complete sections or in segments between valves, with no single test exceeding 2,000 feet in length.
- I. The test pressure shall be at least 150 psi or 1.5 times the working pressure, whichever is greater, maintained for a minimum duration of 2 hours using a 300-psi gauge.
- J. All valves within the test section shall be exercised and verified for secure closure prior to and during testing.
- K. Preparation For Test:

1. Vents shall be provided at the high points of the system and drains provided where means of venting or draining do not exist.
2. Remove or block off all relief valves, rupture discs, alarms, control instruments, etc. that shall not be subjected to the test pressure.
3. All discs, balls, or pistons from check valves shall be removed if they interfere with filling of the system. Open all valves between inlet and outlet of the section to be tested.
4. Connect pump and provide temporary closures for all of the external openings in the system. Use caution to ensure that the closures are properly designed and strong enough to withstand the test pressure.
5. All joints are to be left uninsulated and exposed for examination during test.
6. A joint previously tested in accordance with this specification may be covered or insulated.
7. All pumps, gauges and measuring devices shall be furnished, installed, and operated by the Contractor and all such equipment and devices and their installation shall be approved by SHSUD. All water for testing and flushing shall be potable water provided by SHSUD, at the Contractor's expense.
8. All restrained sections of the buried main shall be completely backfilled before such sections are tested. The entire pressure and leakage process shall be done in the presence of a SHSUD Inspector.
9. When leakage occurs in excess of the specified amount, defective pipe, pipe joints or other appurtenances shall be located and repaired at the expense of the Contractor. If the defective portions cannot be located, the Contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a water main within the allowable leakage limits upon retesting.

L. Test Procedures:

1. Allow the test fluid to enter the system. Open vents to allow displacement of all entrapped air. For all pipelines exceeding 500-ft in length, the maximum rate of filling shall be limited to that which produces a maximum nominal flow velocity of one foot per second in the pipe to be tested.
2. Close vents and restrict personnel in the test area to those involved in the test.
3. Raise the pressure slowly with the pump until the predetermined test pressure is reached. Maintain pressure for a minimum duration of 2 hours.
4. If defects are found, the pressure shall be released, the system drained, the defects corrected and the test repeated.
5. After a satisfactory test has been completed, the line shall be completely drained.

6. Following drainage, the lines shall be thoroughly flushed to remove any debris or foreign material prior to disinfection or placing into service.

M. Allowable Leakage Rates:

1. Leakage is defined as the quantity of water supplied to a pipe segment during the test period to maintain the test pressure within five (5) psi of the specified value.
2. Allowable leakage rates shall conform to the applicable AWWA standards based on pipe material and joint type.

3.02 SERVICE PRESSURE TEST

- A. This test specification applies to water piping systems and is intended to verify integrity under normal service pressure.
- B. Insulated lines shall have all joints exposed until the test has been successfully completed.
- C. The test pressure shall be equal to the maximum pressure that the line will be subjected to under normal operating conditions as determined by the Engineer.
- D. Test Procedures:
 1. See that all personnel, not involved in the test, vacate the area.
 2. Allow the system fluid to enter the system slowly while venting the air at the extreme far and uppermost points. For all pipelines exceeding 500-ft in length, the maximum rate of filling shall be limited to that which produces a maximum nominal flow velocity of one foot per second in the pipe to be tested.
 3. When the system is full and all air is vented, close the vents.
 4. Allow the pressure in the system to build up to the full line pressure.
 5. Inspect entire system for leaks.

3.04 MEASUREMENT

- A. Hydrostatic Testing is considered subsidiary to the work and no separate measurement will be made by the Contractor for this work.

3.05 PAYMENT

- A. Payment for "Hydrostatic Testing" is considered subsidiary to the work and no separate payment will be made to the Contractor for this work. The Contractor is required to provide all appurtenances to the pipe to allow for hydrostatic testing at no additional cost or separate pay item.

END OF SECTION

SECTION 33 05 07
TRENCHLESS WATER MAIN INSTALLATION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This item shall govern the furnishing and installation of casing and/or pipe by the method of pipe jacking. Such methods include auger boring, guided boring, pilot pipe jacking, hand mined pipe jacking, and direct pipe jacking as shown in the contract documents and in conformity with this specification. This specification does not cover tunneling of any kind such as would involve liner plate or any other method employing a fixed in place liner. This specification does not cover microtunneling. All methods not included in this specification require separate special specifications to be developed that are unique to each individual project.

1.02 SUBMITTALS

- A. Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications including, but not limited to, shop drawings identifying proposed pipe jacking method, installation of pits or shafts, installation of jacking supports/back stop, arrangement and position of jacks and pipe guides, runners, casing spacers, and grouting plan.

1.03 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
- B. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering
- C. American Society for Testing and Materials (ASTM)
 - 1. ASTM A 36 - Standard Specifications for Carbon Structural Steel
 - 2. ASTM A 134 - Standard Specification for Pipe, Steel, Electric-Fusion (Arc)- Welded (Sizes NPS 16 and Over)
 - 3. ASTM A 283 - Standard Specifications for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 4. ASTM A 307 - Standard Specifications for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- D. Occupational Safety and Health Administration (OSHA)
- E. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- F. Springs Hill Special Utility District (SHSUD)

1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS

2.01 MATERIALS

- A. Carrier Pipe: Carrier pipe shall be of the type and size shown in the Contract Documents and shall conform to the applicable material specifications contained herein. If PVC pipe is used, it shall conform to SHSUD standard requirements for PVC water pipe.
 - 1. Carrier pipe shall conform to AWWA C900 for sizes 4" through 12" and AWWA C909 for sizes 14" through 24", with restrained joints suitable for installation inside a casing.
 - 2. All joints within the casing shall be restrained. Bells and joints shall not support the pipe. Tracer wire shall be continuous through the casing.
- B. Casing Pipe: Where required, casing pipe shall be steel unless otherwise noted in the Contract Documents.
 - 1. Steel casing pipe shall be new or used in good condition and shall conform to ASTM A36, A135, A139, A568, or other SHSUD-approved standards.
 - 2. All casing pipe shall be coated and lined in accordance with AWWA C210 or approved equal.
 - 3. Joints shall be butt-welded in accordance with AWWA C206. Pipe 36 inches in diameter and larger shall be welded both inside and outside.
 - 4. Casing pipe shall extend a minimum of 10 feet beyond the edge of pavement along TxDOT roadways and 5 feet beyond the edge of pavement along all other roadways, unless otherwise directed by the Engineer or regulatory authority.
 - 5. The casing pipe shall be sized in accordance with the SHSUD standard casing detail, which shall govern in the case of any discrepancy with this specification.
 - 6. Each casing end shall be sealed with neoprene rubber and stainless steel clamps.
 - 7. Casing spacers shall be centered and installed such that they support the carrier pipe within 2 feet of each casing end and at least three spacers per pipe joint. For 4"–14" pipe, spacers shall be placed every 10 feet; for 16"–30" pipe, spacers shall be placed every 8 feet.
 - 8. Casing spacers shall be constructed from T-304 stainless steel with a minimum 14-gauge thickness and shall include a synthetic rubber or PVC liner to insulate the pipe, and 1.5-inch-wide glass-reinforced plastic or UHMW polymer runners to insulate the spacer from the casing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Pipe Jacking: Suitable pits or trenches shall be excavated for the purpose of jacking operations for placing end joints of the pipe.
1. When trenches are cut in the side of embankment, such work shall be securely sheeted and braced.
 2. Jacking operations shall in no way interfere with the operation of railroads, streets, highways or other facilities and shall not weaken or damage such facilities.
 3. The pipe to be jacked shall be set on guides to support the section of pipe being jacked and to direct it in the proper line and grade in accordance with submittal.
 4. Embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the opening thus provided.
 5. The excavation for the underside of the pipe, for at least $\frac{1}{3}$ of the circumference of the pipe, shall conform to the contour and grade of the pipe.
 6. A clearance of not more than 2 inches may be provided for the upper half of the pipe.
 7. The distance that the excavation shall extend beyond the end of the pipe shall depend on the character of the material, but it shall not exceed 2 feet in any case.
 8. The pipe shall be jacked from the downstream end.
 9. Permissible lateral or vertical variation in the final position of the pipe from line and grade will be as shown in the contract documents or as determined by the Engineer.
 10. Any pipe that cannot be repaired to its original condition or is damaged in jacking operations shall be removed and replaced at the Contractor's expense. Jacking pits shall be backfilled immediately upon completion of jacking operations.
 11. Boring operations may include a pilot hole which shall be bored the entire length of crossing and shall be used as a guide for the larger hole to be bored. Water or drilling fluid may be used to lubricate cuttings.
 12. Jacking shall proceed on a continuous 24-hour basis until the casing is complete, except for adding pipe lengths.
 13. Thrust blocks and jacking frames shall be aligned to avoid excessive soil loading or misalignment.
 14. Jacking pressure shall be monitored to remain within pipe design limits.
 15. Excavation over-cut shall not exceed $\frac{1}{2}$ -inch outside the casing.

- B. Joints: Joints for pipe for Pipe Jacking shall be as specified in Section 33 05 05, "Buried Water Main Installation," or as shown in the contract documents, shop drawings, or as per additional pipe manufacturer's recommendations.
- C. Grouting of Casing and/or Direct Jack Pipe: The annular space between casing pipe or direct jack pipe and limits of excavation (borehole) shall be pressure grouted unless otherwise specified in the contract documents.

3.02 MEASUREMENT

- A. Pipe Jacking shall be measured by the linear foot of bore as measured from face to face of jacking pits.
 - 1. Carrier pipe measured per linear foot from end to end
 - 2. Casing measured per linear foot installed

3.03 PAYMENT

- B. Payment includes all materials, labor, excavation, grouting, backfilling, end caps, disposal of excess material, and restoration.
 - 1. No additional compensation will be made for Contractor's choice to use thicker casing or longer casing than shown.
 - 2. Payment includes full compliance with all permitting agency requirements and any required restoration due to construction impacts.

END OF SECTION

SECTION 33 05 09.43
WATER TIE-INS, TAPPING SLEEVES AND SADDLES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This item shall consist of water main tie-ins installed in accordance with these specifications and as directed by the Engineer. A Water Tie-In is defined as a connection between a new main and an existing main that is no longer than one joint of pipe.

1.02 SUBMITTALS

- A. Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer's requirements and submittals shall be approved prior to delivery.

1.03 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
 - 1. ANSI/NSF Standard 61 - Drinking Water System - Health Components.
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A 536 - Ductile Iron Castings.
 - 2. ASTM A 126 - Gray Iron Castings
 - 3. ASTM F 1674 - Joint Restraint Products
- C. American Water Works Association (AWWA)
 - 1. AWWA C 800 - Standard for Underground Service Line Valves and Fittings.
- D. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- E. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS

2.01 MATERIALS

- A. Tapping Sleeves:
 - 1. For size-on-size connections, tapping sleeves shall be mechanical joint, split cast iron units rated for 200 psi working pressure.

2. For connections smaller than size-on-size, tapping sleeves shall be fabricated steel units with a fusion-bonded epoxy coating and shall also be rated for 200 psi working pressure.
3. The Contractor shall verify the outside diameter of the existing main prior to ordering the tapping sleeve.
4. Tapping sleeves shall include an outlet flange conforming to ANSI B16.1.

B. Service Saddles:

1. Service saddles shall have brass bodies suitable for either wet or dry installation.
2. Sealing gaskets shall be O-ring type, manufactured from EPDM or Buna-N, and suitable for potable water applications.
3. Outlet flanges shall conform to ANSI B16.1.

C. Tapping Valves:

1. Tapping valves shall be non-rising stem, resilient seat gate valves with a mechanical joint outlet. Valves shall be designed specifically for pressure tapping, with a clear opening that permits full-diameter taps.
2. Valves shall comply with AWWA C509 for resilient seat gate valves and be factory-coated with fusion-bonded epoxy in accordance with AWWA C550.
3. Valve ends shall be compatible with the existing and proposed pipe material and joint configuration.

PART 3 EXECUTION

3.01 INSTALLATION

- B. The Contractor shall make tie-ins from new water mains to existing water mains as shown in the contract documents or as directed by the Engineer.
1. All connections to existing water mains shall be made under the direct supervision of the SHSUD Inspector.
 2. Water mains shall be tapped in a manner that minimizes disruption to the main in service and protects the potable water supply from contamination
 3. Valves on existing mains shall only be operated by SHSUD personnel.
 4. The Contractor shall be responsible for properly backfilling the work area pit after the work is completed.
 5. When service must be interrupted to existing customers during construction of a tap or addition of appurtenances the Contractor shall provide 3-day notice to SHSUD.

6. A cut-in valve may be required to facilitate the shutdown. If approved by SHSUD and not included in the bid schedule, a separate pay item will be established and negotiated.
7. Prior to installation of tie-ins, all materials and equipment to complete tie-in work shall be on-site and verified by the inspector prior to beginning any associated work.
8. If System allows, multiple tie-ins must be coordinated and approved in advance with SHSUD Inspector, but multiple tie ins may not be guaranteed.
9. SHSUD cannot guarantee a complete shutdown of the water system. The Contractor shall be responsible for implementing adequate dewatering measures to complete the tie-in work.

3.02 MEASUREMENT

- A. Water tie-ins will be measured by the unit, for each completed tie-in assembly of the various sizes installed between the proposed and existing mains.

3.03 PAYMENT

- A. Payment for "Tie-ins" will be made at the unit price bid for each tie-in of the various types and sizes completed from an existing main to the proposed main to be accepted.
 1. The unit price shall include full compensation for all labor, equipment, and materials required to complete the work, including the shutdown and isolation of the existing main, cutting of pipe for the connection, dewatering of the excavation and main, excavation, assembly, placement of selected embedment material, anti-corrosion embedment when specified, backfill, compaction and compaction testing, installation of transition couplings, all required restraints, accessories and appurtenances, hauling and disposal of surplus excavated material, removal and proper handling of existing pipe, fittings, and appurtenances to be abandoned, surface and pavement restoration, installation of an all-weather surface, all required testing, temporary service connections, and all customer coordination and notification associated with service interruptions.
 2. Cut-in valves, if required and approved, will be paid for under a separate bid item.
 3. Removal and handling of asbestos cement (AC) pipe required for tie-ins will be paid under a separate bid item, in accordance with Section 02 82 00, Handling Asbestos Cement Pipe.

END OF SECTION

SECTION 33 14 17
WATER SERVICE LINE**PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. This section includes furnishing and installing new water service supply lines in accordance with these specifications and as directed by SHSUD.

1.02 SUBMITTALS

- A. Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer's requirements and submittals shall be approved prior to delivery.

1.03 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - 1. AWWA C800 – Underground Service Line Valves and Fittings
 - 2. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, ½ in. through 3 in.
 - 3. ANSI/NSF 61 – Drinking Water System Components
- B. American Society for Testing and Materials (ASTM) International:
 - 1. ASTM B88 – Seamless Copper Water Tube
 - 2. ASTM D3350 – PE Plastic Pipe and Fittings Materials
- C. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- D. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Services Lines:
 - 1. Service lines shall be either copper tubing or HDPE tubing as approved by SHSUD. No other materials shall be used.
- B. Sleeving:

1. All service lines installed beneath pavement shall be installed in a suitable sleeve sized to allow removal and replacement of the service line without disturbing the pavement.

PART 3 EXECUTION

3.01 INSTALLATION

A. Service Lines

1. Service installation includes all necessary components from the main tap to the meter box. The Contractor shall provide all labor, materials, and equipment required for complete installation.
2. Service installation shall follow the latest SHSUD Standard Details. Materials used shall conform to those specified in the details.
3. A curb location "X" marker shall be installed over all SHSUD main line valves per service detail.
4. Service lines shall have not less than 30 inches of cover from final grade unless otherwise approved by SHSUD.
5. The service pipe shall rise vertically for connection to the angle meter stop. The meter stop shall be installed vertically, with outlet oriented horizontal and perpendicular to the roadway or curb.

B. Service Sleeves

1. Water service lines crossing any public or private roadway shall be installed in a sleeve.
2. A 2-inch nominal sleeve shall be provided for 1-inch service lines.
3. Sleeves for service lines greater than 1-inch shall be 4-inch minimum, or as approved by SHSUD prior to installation.
4. Sleeves shall extend a minimum of 5 feet beyond the edge of pavement or back of curb.
5. Service sleeve casing shall conform to SHSUD Standard Detail WA-34.

C. Service Saddles

1. Service saddles shall comply to the requirements of Section 33 05 09.43, Water Tie Ins, Tapping Sleeves and Saddles.

3.02 MEASUREMENT

- A. The new services will be measured by unit, classified by length and size (e.g., short 1-inch or long 3/4-inch service).

3.03 PAYMENT

- B. Payment for new water service lines will be made at the unit price for each service installed, based on the size and length classification as specified.
- C. The unit price shall be full compensation for all labor, materials, equipment, excavation, trench protection, backfill, hauling and disposal of surplus materials, cutting and restoration of pavement and surface structures, tubing, fittings, and any other work necessary to complete the service line installation.

END OF SECTION

SECTION 33 19 00**METERS AND METER BOX INSTALLATION****PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. This section includes furnishing and installing water meters and meter boxes, including adjustments to grade as necessary, in accordance with these specifications and as directed by SHSUD.

1.02 SUBMITTALS

- A. Submit manufacturer's product data, installation instructions, certifications, and shop drawings. All submittals must comply with SHSUD requirements and be approved prior to delivery.

1.03 REFERENCED STANDARDS

- A. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- B. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Meter boxes shall be compatible with Automatic Meter Reading (AMR) systems.
- B. The meter will be provided and installed in accordance with SHSUD's latest Service Policy.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Meter Boxes
 - 1. Meter boxes shall be equipped for AMR, set square and level, and raised 1 inch above finished grade to prevent surface water intrusion.
 - 2. Boxes shall be located 6 inches behind the curb or sidewalk, aligned parallel to it.
 - 3. Where no curb or sidewalk exists, meter box placement shall follow SHSUD direction or construction drawings, typically at property lines.
 - 4. No meter box shall be installed in a driveway or paved area.

5. Boxes shall be rectangular, installed with the long side perpendicular to the roadway or right-of-way, and the notched end facing the customer piping.

3.02 MEASUREMENT

- A. Meter and box installations and relocations will be measured by the unit, categorized by meter and box size and type.

3.03 PAYMENT

- A. Payment for meter and meter box installation will be made at the unit price bid, and shall include:
 1. Excavation, placement, backfill, and surface restoration.
 2. Installation of the meter box and meter per SHSUD specifications.
 3. Coordination with SHSUD for AMR equipment compatibility and location approval.

END OF SECTION

SECTION 33 71 23
DUCTILE IRON FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This item shall consist of furnishing, installing, and adjusting ductile-iron and gray-iron fittings for use in water main systems. Work includes all bends, tees, reducers, crosses, sleeves, plugs, and other fittings necessary to complete the pipeline in accordance with the Drawings, SHSUD Standard Details, and these Specifications.

1.02 SUBMITTALS

- A. The Contractor shall submit manufacturer's product data, including physical and mechanical properties, pressure ratings, lining and coating descriptions, gasket and joint system details, installation recommendations, and detailed weight information based on manufacturer's published data or certified weights for all fittings to be installed. All submittals must be approved by SHSUD prior to procurement or delivery.

1.03 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - 1. AWWA C104 (ANSI A21.4) – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C110 (ANSI A21.10) – Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch.
 - 3. AWWA C153 (ANSI A21.53) – Ductile Iron Compact Fittings, 3-inch through 24-inch and 54-inch through 64-inch.
 - 4. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 5. AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.
- B. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- C. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS

2.01 MATERIALS

- A. All ductile-iron pipe and fittings shall have exterior bituminous coating per ANSI A21.51 and interior cement mortar lining with asphaltic seal coat per ANSI/AWWA C104.

- B. All ductile-iron fittings shall be mechanical joint type with a minimum pressure rating of 350 psi and comply with ANSI/AWWA C110 or C153.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All fittings shall be mechanical joint type, unless otherwise specified in the contract documents.
- B. Mechanical joint fittings shall be installed using approved joint restraint per Section 33 05 05.16, Joint Restraint. No separate payment will be made for joint restraint.
- C. Adapters used to transition between pipes or fittings of differing materials or diameters shall be compatible with the piping system, comply with applicable standards, and be approved by SHSUD prior to installation.
- D. Thrust blocking shall not be used or installed unless specifically authorized in writing by SHSUD.

3.02 MEASUREMENT

- A. Ductile-Iron and Grey-Iron fittings will be measured by weight. The weights shall be determined based on the manufacturer's published data or certified weights provided by the contractor at the time of installation.

3.03 PAYMENT

- A. Payment for ductile-iron and grey-iron fittings will be made at the unit price bid per pound of fittings installed and accepted. Such payment shall be full compensation for all labor, materials, equipment, and incidentals necessary for the proper installation of fittings, including excavation, backfill, compaction, restraints, accessories, hauling and disposal of surplus materials, surface restoration, and coordination with SHSUD.
- B. Cut-in valves, if required, will be paid for as a separate pay item.
- C. Removal and handling of asbestos cement pipe, if required for fitting installations, will be paid for as a separate pay item in accordance with Specification Section 02 82 00, Handling Asbestos Cement Pipe.

END OF SECTION

SECTION 40 05 61**Valves****PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. This item includes furnishing, installing, and adjusting all valves. Work shall be performed in accordance with these specifications, applicable standards, and as directed by the Engineer.

1.02 SUBMITTALS

- A. Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with SHSUD's requirements and submittals shall be approved prior to delivery.

1.03 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - 1. AWWA C 500 – Metal-Seated Gate Valves for Water Supply Service
 - 2. AWWA C 509 – Resilient-Seated Gate Valves for Water Supply Service
 - 3. AWWA C 515 – Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service
 - 4. AWWA C 550 – Protective Epoxy Interior Coatings for Valves and Hydrants
- B. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply
- C. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Gate Valves
 - 1. Valves shall be American Flow Control or Clow Company gate valves.
 - 2. Underground gate valves shall be of the resilient seat type meeting the requirements of AWWA C509 and coated per AWWA C550.
 - 3. Valves shall have non-rising stems and be equipped with 2-inch square AWWA operating nuts. Valves shall open by turning the nut counterclockwise.

4. Valves shall have mechanical joint ends and shall be furnished complete with all joint accessories.
 5. Exposed or above-ground gate valves shall be outside screw and yoke (OS&Y) type with flanged joints.
- B. Pressure Reducing Valves (PRV)
1. SHSUD requires PRV's to be installed with oil filled pressure gauges on both sides of the PRV to record incoming and outgoing pressures.
- C. Air Release Valve Assembly
1. Air Release Valves shall be manufactured and tested in accordance with AWWA Standard C512.
 2. Air release valves shall automatically release small pockets of air which accumulate at the high points of a system after it is filled and under pressure.
 3. Air release valves shall be ½" APCO Model #50 or equivalent, subject to SHSUD approval.
 4. Larger air valves may be required for mains 12" and larger.
- D. Ball Valves
1. Ball valves shall be full-port, forged brass or stainless steel, with a chrome-plated brass or stainless steel ball.
 2. Valves shall be rated for a minimum working pressure of 150 psi or as specified on the plans.
 3. Valves shall be lever-operated unless otherwise indicated and shall provide positive shutoff in both directions.
 4. All ball valves shall be suitable for buried or above-ground installation as shown on the drawings and shall be subject to approval by SHSUD.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Valves on existing mains shall only be operated by SHSUD personnel.
2. No valves shall be constructed within curbs, sidewalks, driveways, or roadways. SHSUD will not be responsible for any damages to concrete or paved areas if developer does not comply.
3. Valve installation shall include the valve and valve box.

4. Valves shall be installed plumb and centered within the valve box, with adequate clearance for operation and maintenance.
 5. Valve marker requirements may be imposed at the direction of the inspector and must be provided at no additional cost.
- B. Gate valves:
1. All gate valves shall have an operational nut no more than six feet below finished grade.
 2. Local SHSUD main line gate valves shall have a “V” curb location decal per the Water Infrastructure Marker detail.
 3. All SHSUD cross-country main line gate valves shall be marked in accordance with the Water Infrastructure Marker detail.
- C. PRVs
1. Stainless steel braided lines from PRV to regulator must be installed on the pilot system.
 2. The PRV is to be installed as a bypass of the main and can be one standard size smaller than the main.
 3. All main line PRV's shall have an additional PRV bypass for low flows. The bypass can be as much as 2 standard sizes smaller than the main line PRV.
 4. Gate valves with a 2" operating nut must be installed to isolate PRV on main line and PRV on the bypass.
 5. All PRV's shall be approved by SHSUD.
- D. Air Release Valves
1. Air release valves shall be located at high elevation points on the pipeline and operate automatically.
- E. Ball Valves
1. Install ball valves in accordance with the manufacturer's instructions, project plans, and applicable codes. Ensure proper orientation, access, and support for all valves.
- F. Valve Box
1. The valve box shall be placed in such a manner to prevent shock or stress being transmitted to the valve or piping.
 2. Valve boxes for all valves installed below ground shall consist of a PVC riser, and a cast iron “Lincoln Hat” box and lid.

3. Valve box extensions shall be installed to reserve a minimum of 50% of the adjustment for a future extension.
4. The operating nut should not exceed 36 inches below finished grade. However, if conditions require that the operating nut exceeds 36 inches, then an extension, mechanically attached to the valve, shall be added, and the top of the extension shall not exceed 12 inches below finished grade.

G. Valve Vaults

1. Vaults shall be precast concrete with 3' x 5' Aluminum access hatch with latch and fall protection. Vaults are sized in order to house PRV, bypass and gate valves.
2. Vaults need to be set 2" above finished grade - but should not exceed 6" above finished grade without SHSUD Engineering staff approval.
3. Each end of the vault shall have a circular opening sized to allow for pipe penetration around the PRV. These openings shall be sealed with non-shrink grout.
4. The vault floor shall consist of washed gravel placed to provide a minimum of 12 inches of clearance beneath all valves. This gravel shall also serve as the foundation layer and extend at least 12 inches above the bottom of the vault as part of the backfill.

3.02 MEASUREMENT

- A. Valves, valve boxes, and valve vaults will be measured by the unit, for each complete assembly of the various valve sizes installed to finished grade.

3.03 PAYMENT

- A. Payment for each valve assembly, complete with valve box or vault, will be made at the unit price bid for the specified size. Payment includes all related work and materials such as excavation, embedment, anti-corrosion materials, hauling/disposal of surplus material, backfill, flowable fill, tracer wire, concrete collars (where traffic applies), riser pipe, cast iron boot, packing, tar paper, grout, reaction blocking, protective coatings, valve markers, and polyethylene sleeves.

END OF SECTION

**SECTION 40 05 81.13
FIRE HYDRANTS****PART 1 GENERAL****1.01 SCOPE OF WORK**

- A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to install all fire hydrant assemblies.

1.03 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - 1. AWWA C502 – Standard for Dry Barrel Fire Hydrants
 - 2. AWWA C550 – Standard for Protective Epoxy Interior Coatings for Valves and Hydrants
- B. International Fire Code (IFC)
 - 1. IFC 2006 – International Fire Code Standards
- C. Springs Hill Special Utility District (SHSUD)
 - 1. Design Criteria Manual and Standard Specifications
- D. Texas Commission of Environmental Quality (TCEQ)
 - 1. 30 Texas Administrative Code (TAC) §290– Public Water Supply

PART 2 PRODUCTS**2.01 MATERIALS**

- A. The Fire Hydrant Assembly shall include the following components:
 - 1. Tee fitting sized as [main size] × 6 inches, where [main size] matches the diameter of the main to which the hydrant is connected.
 - 2. 6-inch ductile iron branch line pipe.
 - 3. 6-inch gate valve and valve box for the branch line.
 - 4. Joint restraints and concrete blocking.
 - 5. Fire hydrant.
- B. The exterior of the hydrant shall be shop-coated by the manufacturer.
- C. All hydrants shall be dry barrel, traffic-model (breakaway) post-type hydrants with compression-type main valves having a 5¼-inch or 6-inch opening that close with line pressure.

- D. SHSUD reserves the right to limit purchases of fire hydrants to traffic models equipped with safety flanges on the hydrant barrel and stem. Acceptable manufacturers and models include:
 - 1. American-Darling Valve and Manufacturing Company – Model B-84-B (6-inch)
 - 2. Clow Valve Company – Clow Medallion
- E. All fire hydrants shall include one Hydra-Storz adapter (HYST-5.0-4.5NH-NS) with stainless steel butterfly vanes to allow full functional water flow.
- F. Hydrants shall have a rated working pressure of 250 psi and shall be hydrostatically tested to a pressure of 500 psi, unless otherwise approved by SHSUD.
- G. The hydrant main valve shall have a 5¼-inch or 6-inch inside diameter. The valve stem design shall conform to AWWA C502.
 - 1. The operating nut shall be pentagonal, measuring 1½ inches point-to-flat at the base, 1-7/16 inches at the top, and a minimum of 1 inch in height.
 - 2. The valve shall close when the nut is turned clockwise.
- H. The seat ring shall be bronze (bronze-to-bronze threading) and shall be removable with a lightweight stem wrench.
- I. Valve mechanisms shall be flushed during each operation. A minimum of two (2) drain ports shall be provided.
- J. Hydrants shall be of dry-top construction and factory-lubricated with grease or oil. The lubricant plug shall be readily accessible.
- K. The inlet shall be a side-connection hub end for mechanical joint per ANSI/AWWA C111/A21.11 (latest revision) and shall be rigidly designed to prevent breakage.
- L. Hydrants shall have double O-ring seals in a bronze stem sheath housing to ensure separation of lubricant from water. A weather cap, seal, or both shall be provided to ensure complete weather protection, as approved by SHSUD.
- M. The traffic feature shall consist of a replaceable breakaway ferrous metal stem coupling secured by removable Type 302 or 304 stainless steel fasteners.
 - 1. Breakaway flanges or frangible lugs shall be designed to ensure failure occurs above ground.
 - 2. Breakaway or frangible bolts shall not be acceptable.

- N. Nozzles shall be threaded or cam-locked, O-ring sealed and secured with Type 302 or 304 stainless steel locking devices.
- O. The cap nut shall match the hydrant operating nut, except the Storz cap, which shall not be pentagonal and shall be attached to the hydrant by cable.

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. Hydrants shall be connected to the water mains as shown in the contract documents or as directed by the Engineer.
- B. Hydrants shall be installed in accordance with Standard Drawing WA-20.
- C. The hydrant lower barrel shall be rigid to ensure above-ground break at the traffic flange. Bury length shall be minimum 4 feet, maximum 5 feet. Lead pipe may be elbowed from main using restrained joints. Flanged joints in lead pipes are not permitted.
- D. Outlet Nozzles shall be located approximately 18 inches above ground.
- E. An inline gate valve shall be installed on one side of the tee connecting the hydrant assembly to the water main.
- F. Each hydrant shall stand plumb, with nozzles and pumper connections horizontal facing the street. The hydrant shall be placed so the flange joining the upper and lower sections of the barrel shall be at least 3 inches but not more than 6 inches above the finished line of the curb or grade.
- G. The interior of the hydrant shall be thoroughly inspected and cleaned of all foreign matter before being set in place.
- H. Hydrants shall typically be located within one foot of the side lot lines, between adjacent properties in residential areas, or in front of commercial and industrial properties as required.
- I. Hydrants shall be a minimum of 2 feet from edge of rights-of-way or curb in areas without sidewalks and shall not obstruct sidewalks.
- J. Each hydrant shall be marked with a blue reflective pavement marker located in the roadway, centered in the lane closest to the hydrant, and perpendicular to the hydrant's location.
- K. Hydrants must be a minimum of 5 feet from all possible obstructions.
- L. The Contractor shall protect all existing utilities during installation and shall be responsible for any resulting damages.
- M. No hydrants or valves shall be placed within curbs, sidewalks, driveways, or roadways. SHSUD shall not be responsible for damage to concrete or pavement caused by installations in these areas.

3.02 MEASUREMENT

- A. Measurement for fire hydrant installations will be made per each complete Fire Hydrant Assembly installed, including all specified components and work.

3.03 PAYMENT

- A. Payment for each Fire Hydrant Assembly shall include all labor, materials, and equipment for excavation, backfill, branch pipe, valve and box, hydrant, coatings or painting, joint restraints, concrete blocking or pad, and guard post(s).

END OF SECTION