

PROJECT MANUAL
Technical Specifications
CITY OF SPRING HILL, TENNESSEE
STANDARD SPECIFICATIONS
FOR
WATER ADDITIONS

MAYOR
HONORABLE JIM HAGAMAN

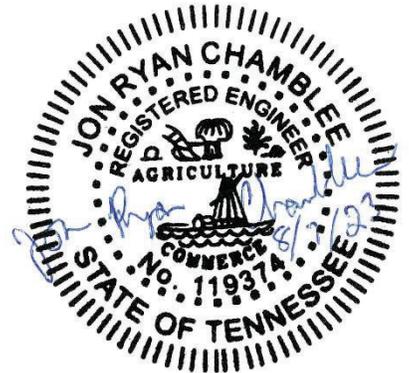
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APPROVED WATER SPECIFICATIONS

THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

AND IS HEREBY APPROVED FOR USE IN CONSTRUCTION BY THE COMMISSIONER

08/23/2023

THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

CITY OF SPRING HILL, TENNESSEE

APPROVED BY: J.C. Norman

TITLE: Water Dept Superintendent

DATE: 8-7-2023

Date: August, 2023

File No.: 0100-000

INDEX TO PROJECT MANUAL

These specifications give the minimum requirements for installation of water and sewer additions in the City of Spring Hill, Tennessee. Any special construction problems or conditions not covered under these specifications shall be submitted in writing to the City of Spring Hill for approval.

The Standard Drawings are part of these specifications and all construction shall conform to the details shown on these drawings.

	PAGES	
<u>General Specifications</u>		
DIVISION 1: GENERAL REQUIREMENTS		
01010	General Guidelines Covering Installation Of Water Lines and Appurtenances	14
-----	Fire Sprinkler Specification	2
01031	Special Project Procedures	4
01090	Reference Standards	5
01400	Quality Control	3
01568	Erosion Control	2
01620	Storage and Protection	1
<u>Technical Specifications</u>		
DIVISION 2: SITE WORK		
02221	Unclassified Excavation for Utilities	10
02260	Finish Grading	2
02485	Seeding	3
02575	Pavement Repair	4
02640	Valves and Hydrants	5
02713	Water Lines	20
02718	Service Assemblies	3
02725	Boring and Casing for Water Lines	3
DIVISION 3: SITE WORK		
03303	Concrete for Utility Lines	1

STANDARD DRAWINGS

EC-1	Temporary Silt Fence Detail
PR-1A	Pavement Replacement Detail
W-1	Concrete Valve Box Setting Detail
W1.2	Water Valve Marker Detail
W-2.1	Fire Hydrant with Valve Detail
W-2.2	Fire Hydrant End-of-Line Detail
W-3	Concrete Cap Detail
W-4	Concrete Thrust Blocking (Sheet 1 of 2)
W-5	Concrete Thrust Blocking (Sheet 2 of 2)
W-6	Concrete Protection for Water Lines
W-7.5A	3/4" Service Assembly with Pressure Reducing Valve
W-7.5B	1" Water Meter Service Assembly Detail
W-7.5C	2" Water Meter Service Assembly and Vault Detail
W-7.5D	3" Water Meter Service Assembly and Vault Detail
W-7.5E	2" Fire Line and Water Meter Detail for Townhomes and Apartments
W-8.1	Automatic Air Release Assembly
W-9	Fire Line Backflow Preventer Vault
W-9A	4", 6", or 8" Master Meter Assembly Detail with By-Pass and Irrigation Service
W-9B	Townhome/Commercial Service with Backflow and Domestic and Irrigation Service
W-10	Casing Pipe Detail
W-11	Bridge Hangar Assembly Detail

Detail Revision List

ITEM		DATE
W-2.2	Fire Hydrant End of Line Detail	11/15/2022
W-7.5A	¾" Service Assembly w/ Pressure Reducing Valve	11/15/2022
W-7.5B	1" Water Meter Service Assembly Detail	11/15/2022
W-7.5C	2" Water Meter Service Assembly and Vault Detail	11/15/2022
W-7.5D	3" Water Meter Service Assembly and Vault Detail	11/15/2022
W-7.5E	2" Fire Line and Water Meter Detail for Townhomes and Apartments	11/15/2022
W-9	Fire Line Backflow Preventer Vault	11/15/2022
W-9A	4", 6" or 8" Master Meter Assembly Detail with By-Pass And Irrigate Service	11/15/2022
W-11.0	Bridge Hanger Assembly Detail	08/07/2023

WATER LINE SPECIFICATIONS

CITY OF SPRING HILL
MAURY COUNTY, TENNESSEE

GENERAL GUIDELINES
COVERING THE INSTALLATION OF UTILITY LINES
AND APPURTENANCES
(Revised April, 2022)

A. GENERAL GUIDELINES

The purpose of these guidelines is to provide a guide to the Developers and their engineers and contractors in order to achieve an acceptable installation for furnishing of utility service to subdivisions and other developments. The words "A/E," "Owner," "City of Spring Hill," and "Superintendent of Water and Sewer Systems" are to be used interchangeably. Summarized below are requirements and conditions that apply to the granting of utility service by the City of Spring Hill. These regulations apply to both public and private water systems within any proposed developments and/or improvements to existing properties located within the City of Spring Hill's Water Distribution System.

1.1 Prior to the design of any utility line extension or expansion, the design engineer should first confer with the City of Spring Hill Planning Commission in regard to growth potential and density that may be expected in the general area of the extension being planned. A conference with the Superintendent of Water and Sewer Systems should follow to discuss system standards and requirements, as well as any problems related to the mains being extended.

1.1.1. Construction of utility lines, including individual service connections, will not begin prior to approval by the City of Spring Hill and Tennessee Department of Environment and Conservation (TDEC) Division of Water Supply.

1.2 No connection to an existing utility shall be made until all lines have been completely tested and the tie-in is approved by the Project Inspector.

1.3 The City of Spring Hill will not accept utility lines that were not approved in accordance with any City Specifications, City Regulations, TDEC, and constructed in accordance with these specifications.

1.4 The City of Spring Hill requires the following bonds (or

certified cashier's check):

1.4.1 Maintenance Bond - Contractor/Developer will be required to provide a Maintenance Bond for one (1) year after inspection and acceptance by the City of the improvements in the amount of 25% of construction cost.

1.4.2 Road Repair Bond - 100% of estimated roadway (public) repair cost, amount to be set by codes department, to be returned to Contractor/Developer upon acceptance by the Public Works Director of the repaired/replaced roadway.

1.4.3 A Performance Bond - should the developer choose to record the plat prior to installation of infrastructure then the developer/owner shall provide a performance bond in the amount of 110% of all infrastructure cost to be posted with the City in accordance with the City's Subdivision Regulations.

1.5 Service connection and service line construction to property line or right-of-way (only) is covered herein. Service line constructed from property line or right-of-way to structure is covered in the latest edition of the Standard Plumbing Code.

1.6 Under the terms of the Spring Hill Municipal Code, water service may be denied to structures connected to a sewer line or service not accepted by the City.

1.7 All utility lines and services (to property line or right-of-way only) constructed utilizing these specifications become the property of the City of Spring Hill upon acceptance by the City. Utility lines and services (to property line or right-of-way only) will not be accepted by the City unless and until they are in strict conformance with these specifications.

1.8 Three (3) sets of plans and specifications, including a vicinity map, shall be submitted for the initial review. If the plans are in order, with no major changes, the Developer or his Engineer will submit the number of additional sets of plans needed for the project for approval.

1.9 Five (5) sets of drawings including vicinity map shall be submitted for approval. Submittals shall be at least fourteen (14) days prior to a scheduled meeting in order to be considered at that meeting. Contractor's developers and others are asked to submit drawings as far in advance as possible in order to conserve time at

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01010-2

planning and commission meetings. After approval, four (4) sets of drawings shall be submitted to the Tennessee Department of Environment and Conservation for their approval. Approval of the plans and specifications by the Tennessee Department of Environment and Conservation, Tennessee Department of Transportation, Railroads, Corps of Engineers, Tennessee Valley Authority, and any other agency having jurisdiction is required before beginning construction. One (1) state approved set of drawings and one (1) copy of the State approval letter shall be provided to the Superintendent of Water and Sewer Collection Systems prior to beginning construction. Prior to acceptance of lines by the City, one set of reproducible "Record Drawings" showing all work, changes, service locations, and other data not shown on the original set shall be given to the Superintendent of Water and Sewer Collection Systems after each project or phase of a project is completed.

1.10 Detail drawings and specifications shall be submitted by the A/E employed by the Developer for any special condition or structures such as pump stations, creek crossings, etc., and approved by the City before beginning any construction.

1.11 Easements required across private property or in roads are to be acquired by the Developer in the name of the City. Easements shall have a minimum width of 20 feet. Wider easements may be required for sewer lines over 12 feet deep.

1.12 All applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the construction throughout.

1.13 Sizes and locations of all water and sewer lines and appurtenances, and all construction shall be in accordance with the plans approved by the City.

1.14 Permits for pavement cuts or crossing of public roads, including any special backfill and pavement repair as required by the agency having jurisdiction, are the responsibility of the Developer. A bond is required from the Developer to cover all costs of repair and maintenance for a period of one (1) year from the date of acceptance of the project for all work performed in existing rights-of-way of all roads,

1.15 If construction has not started within one (1) year from the date of approval, utility plans shall be resubmitted to both TDEC

and the City of Spring Hill to renew approval. Renewal is not guaranteed, additional revisions may be required after review.

1.16 The Contractor's name, project cost, and estimated working time for each project shall be submitted to the City.

1.17 Laboratory test reports shall be provided on all pipe to assure that it meets the requirements of the City's specifications.

1.18 Shop drawings for utility materials shall be submitted to the City of Spring Hill for review after being thoroughly checked by the Contractor and stamped with his approval.

1.19 The City reserves the right to relocate water and sewer lines on the construction plans to facilitate maintenance.

1.20 All utility construction shall be in accordance with regulations and specifications of the City of Spring Hill.

1.21 All grading work shall be completed and all roads constructed to subgrade and lot corners are to be marked prior to the installation of utility lines.

1.22 The contractor shall be responsible for locating and verifying the elevations of existing utilities prior to construction.

1.23 The Developer's Engineer shall provide a complete set of Record Drawings on one set of reproducible and two sets of blue line/black line drawings, upon completion of construction and they shall include actual field angles between lines, all actual service lines and tee locations, the distance of the end of service lines to property corners and lines, the depth to top of the end of the service line, and shall reflect all alignment and grade changes. This item must be completed and submitted prior to acceptance of the sewers or water mains into the public system and any connections being made thereto.

1.24 The Contractor shall provide a set of construction cut sheets prior to the preconstruction meeting and the cut sheets shall include the stations of all proposed service connections.

1.25 A one-(1) year warranty period will begin upon the date of acceptance of the project by the City.

1.26 Any special requirements shall be transmitted as a part of

the approval.

1.27 All plans shall be stamped by a Tennessee Licensed Professional Engineer.

2. Initial Plan Submittals: The plans must be submitted at least twenty-one (21) days prior to the date on which action is desired. The initial submittal should include, but not be limited to the following:

2.1 Three (3) copies of the plan.

2.2 Specifications.

2.3 Engineering reports including design criteria used in sizing mains, and/or pumping stations.

2.4 Drainage calculations for pre- and post-development of the site. Drainage calculations shall be prepared in accordance with the City's Unified Development Code (UDC).

3. Easements

3.1 When utility lines are constructed outside a public right-of-way, easements must be a minimum of 20 feet in width.

3.2 Easements for utility line extensions may be provided in either of two (2) ways.

3.2.1 Easement Document on form, approved by the City, which must include legal description of the easement(s), legal owner's name and Book and Page where deed is recorded, and must be signed by the Owner, and then notarized.

3.2.2 Record with Subdivision Plat - If this method of recording easements is chosen, a preliminary plat of the subdivision must be provided at the time of plans submittal, which clearly defines the easements to be recorded, along with a letter of intent from the Licensed Engineer or Licensed Surveyor who will stamp the final subdivision plat, assuring that easements will be recorded as shown on the preliminary plat.

3.3 All easements must be obtained and recorded in developed areas before construction can begin. In new subdivisions the letter of intent and preliminary plat showing the easements will be

sufficient to start construction. However, the Final Plat must be recorded prior to final acceptance of the new facilities.

3.4 Special easements such as Railroad Crossings, T.V.A. crossings and State Highway crossings must be prepared by the Developer's Engineer.

4. Pre-Construction Meeting

4.1 Before beginning any construction, the Developer shall contact the City and execute a contract with them paying all tapping privilege fees as required. After this contract is executed and before beginning any construction, the Developer or his Engineer shall schedule a pre-construction conference to be held between the Contractor, Developer, Developer's Engineer, and the City and their Engineer. At this meeting, the Contractor will be informed of the City's policies and any special requirements. Listed below is a CHECKLIST of items relating to the project:

4.2 BEFORE Pre-Construction Conference:

- 4.2.1 Developer is to coordinate conference.
- 4.2.2 Developer, or his Engineer, is to have project plans approved by all agencies.
- 4.2.3 Developer is to have a contract with the utility contractor prior to the preconstruction meeting.
- 4.2.4 Contractor is to have shop drawings approved by the City.
- 4.2.5 When submitting plans and shop drawings to the City's Engineers, they will retain one (1) copy and the City will retain two (2) copies. Shop drawings will not be reviewed unless they have been checked by the Contractor and stamped by him to indicate that they meet the specifications.
- 4.2.6 Developer is to have at conference:
- 4.2.7 Approved plans.
- 4.2.8 Copy of Contractor's contract (both off-site and on-site).

4.2.9 Tap fees and impact fees. All fees are subject to final approval by the City of Spring Hill Board of Mayor and Aldermen.

4.3 To Attend Conference:

4.3.1 Developer.

4.3.2 Developer's Engineer.

4.3.3 Developer's Contractor.

4.3.4 Representative of the City's Engineer.

4.3.5 Representative of the City of Spring Hill and the Project Inspector.

B. GENERAL GUIDELINES FOR WATER LINES

1. The purpose of these specifications is to provide a guide to the Developers and their Contractors in order to achieve an acceptable installation for furnishing of water to subdivisions or other areas in the City. Summarized below are the requirements and conditions that apply to the granting of water service by the City.
2. No valve or cutoff shall be operated except by a City Representative.
3. No utility plans will be reviewed until the development plans have received preliminary approval by the planning commission having jurisdiction.
4. Sizes and locations of mains, valves, fittings, plugs, and hydrants, shall be in accordance with the plans approved by the City.
5. Detailed plans and specifications shall be submitted by the Engineer employed by the Developer for any special condition or structures such as pump stations, creek crossings, etc., and shall be approved by the City before beginning any construction.
6. Water lines shall be designed and constructed to provide a minimum of two water feeds to each development. This will allow uninterrupted water conveyance to the

development should one feed connection line experience a break or require maintenance and shall provide adequate pressures and system flows.

7. "Cut-ins" or taps to live mains shall be made only in the presence of a City Representative.
8. Meters (5/8" x 3/4") shall be provided by the City to the Developers for each lot after builder pays connection fee. The meter box will be installed by the Contractor. After installation, the water meter assembly shall be identified by four (4) foot long wooden stakes a minimum of two (2) feet around the meter box with orange ribbon wrapped around the stakes.
9. Permits for pavement cuts or crossing of public roads, including any special backfill and pavement repair as required by the agency having jurisdiction, are the responsibility of the Developer. A bond shall be provided to the City by the Developer to cover all costs of repair and maintenance for a period of one (1) year from the date of acceptance of the project for all work performed in existing rights-of-way of all roads in Maury County and all State highways. The amount of this bond shall be determined by the City after it receives all requirements for repairs from the appropriate County Highway Department or the Tennessee Department of Transportation.
10. Water mains are not generally permitted in easements, however, when special conditions require them, easements; must be provided with a minimum width of twenty (20) feet.
11. Centerlines of roads shall be staked before beginning construction. The road section and water line relation to the centerline of the road shall be shown on the plans. Front-lot corners shall be marked before services are installed in order for services to be properly located.
12. Hydraulic calculations and data should be submitted for the proposed system.
13. Where the static water pressure exceeds 80 psi, the developer shall provide a water-reducing valve on the

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service line. This pressure-reducing valve shall be installed in accordance with the detail in the Standard Drawings section of this document.

14. Protection of Water Supplies

(a) Water Supply Interconnections: There shall be no physical connection between a potable water supply line and a sewer or appurtenance thereto which would permit the passage of any wastewater or polluted water into the potable supply.

(b) Relation to Water Mains:

1. Horizontal Separation: Whenever possible, sewers should be laid at least ten (10) feet horizontally from any existing or proposed water pipe. Should local conditions prevent a lateral separation of ten (10) feet to the water main if it is laid in a separate trench and if the elevation of the top of the sewer pipe is at least 18 inches below the bottom of the water pipe.

2. Vertical Separation: Whenever a sewer must cross under a water main, the sewer shall be laid at such elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirement, the water main shall be relocated to provide the separation or reconstructed with ductile iron pipe for a minimum distance of ten (10) feet on each side of the sewer. At least one (1) full length of water main should be centered over the sewer so that both joints shall be as far from the sewer as possible.

3. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and the sewer shall be constructed of ductile iron pipe and shall be pressure-tested to assure watertightness.

15. Minimum Distribution Pipe Size

- (a) The minimum size pipe shall be eight (8) inch diameter except six (6) inch pipe will be permitted when looped in a grid and no leg of such grid exceeds 800 feet in length or as directed by the City or the City 's Engineer.
- (b) The size of pipe shall be justified by hydraulic analysis performed by an engineer who holds a valid license to practice in the State of Tennessee. Distribution pipes should be capable of providing a minimum flow of 750 gallons per minute.
- (c) All assumptions and any flow data used by the design engineer must be clearly documented and submitted with the hydraulic calculations. If actual flow data are not available, theoretical calculations shall be based on all storage facilities being half-full and the appropriate Hazen and Williams friction factor shall be applied for the type pipe being used, but in no case shall such friction factor be greater than 130.
- (d) Distribution pipes should be sized for an instantaneous peak demand of 750 gallons per minute except in cases where two (2) inch service pipe is used as provided for under section 2.0.4 (a) of these standards. When using two (2) inch service pipe, instantaneous peak demand of 5 gallons per minute per connection shall be assumed.

16. Fire Protection

- (a) Fire hydrants should not be connected to distribution pipes which are not capable of providing a flow of 750 gallons per minute at a residual pressure of 30 psi.
- (b) Where variations in allowable hydrant spacing exists, the most stringent of the codes shall be enforced. Hydrant(s) will be added to the end of dead-end cul-de-sacs and are not to be considered as part of the hydrant spacing along a main street

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where hydrant to hydrant distance is a maximum of 1,000 ft.

- (c) The minimum pipe size to which a fire hydrant may be connected is six (6) inches.
- (d) The minimum standards for privately-owned sprinkler service lines shall be the following:
 - i. Constructed of Class 50 ductile iron pipe.
 - ii. Backflow prevention device shall be installed at tie in. Install backflow prevention device in a valve vault.

17. Dead Ends

- (a) Dead ends shall be minimized in water line extensions.
- (b) Where dead end distribution pipes occur, they should be provided with a fire hydrant when fire protection is being provided.
- (c) Dead end water lines shall extend to the property line, with a line size gate valve with reverse restraint rodding and end with a hydrant.

18. Valves

- (a) Unless otherwise specified by the Superintendent of Water and Sewer Systems, valves shall be placed at all intersections of distribution pipes. Gate valves shall be utilized on water line up to 10-inch in diameter. Butterfly valves shall be placed on all water lines 12-inches in diameter and larger. Three (3) valves shall be placed at each tee; one (1) installed on each run leg and the third installed on the branch leg. Four valves (4) valves shall be placed at each cross. Valves should be positioned in the pipeline approximately three (3) feet distance from the tee or cross.
- (b) Valves shall be placed on lead-outs approximately three (3) feet from fire hydrants except those

having lead-outs to be connected to fire hydrant type tees, in which case, the valves may be connected to such fire hydrant tee.

- (c) A valve (gate or butterfly) shall be located on water lines at a maximum distance of 1,000 feet apart as to allow water line segment isolations in case of water line breaks or maintenance.
- (d) Megalugs are required on all fittings (valves, tees, reducers, hydrants, elbows, vertical and horizontal bends).
- (e) All water mains 10-inch and above must have a minimum of four (4) galvanized rods at all fittings. All water mains 8-inch and below must have a minimum of three (3) galvanized rods at all fittings.

19. Means of Detecting PVC pipe

When PVC pipe is installed a minimum size 12 gauge copper wire shall be installed along the pipe. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached.

20. Separation of Water Mains and Sewers

(a) General:

The following factors should be considered in providing adequate separation:

- 1. Materials and type of joints for water and sewer pipes.
- 2. Soil conditions.
- 3. Service and branch connections into the water main and sewer line.
- 4. Compensating variations in the horizontal and vertical separations.
- 5. Space for repair and alterations of water and

sewer pipes.

6. Off-setting of pipes around manholes.
7. Water mains and sanitary or storm sewers shall not be laid in the same trench.

(b) Parallel Installation:

1. Normal conditions-Water mains shall be laid at least ten (10) feet horizontally from any sanitary sewer, storm sewer or sewer manhole. Whenever possible; the distance shall be measured edge-to-edge.
2. Unusual conditions-When local conditions prevent a horizontal separation of ten (10) feet, a water main may be laid closer to a storm or sanitary sewer provided that:
 - i. The bottom of the water main is at least 18 inches above the top of the sewer.
 - ii. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure watertightness prior to backfilling.

(c) Crossing:

1. Normal conditions-Water mains crossing house sewers, storm sewers, or sanitary sewers will be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, whenever possible.
2. Unusual conditions when local conditions prevent a vertical separation as described hereinbefore, the following shall be used:
 - i. Sewers passing over or under water mains should be constructed of ductile iron.
 - ii. Water mains passing under sewers shall,

in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main; adequate structural support for the sewers to prevent excessive deflection of joints and settling on the breaking the water mains; that the length of water pipe be centered at the point of crossing so that the joints will be equidistant as far as possible from the sewer. Both the sewer and the water main shall be constructed of water pipe and tested in accordance with these Standards.

21. Surface Water Crossings

Surface water crossings, both under and over water, present special problems which should be discussed with the City of Spring Hill; the Tennessee Department of Environment and Conservation, Division of Water Supply and division of Water Pollution Control; and the U.S. Army Corps of Engineers before the plans are prepared.

All surface water crossings shall be in accordance with the requirements of the General Permits for an Aquatic Resource Alteration Permit. (ARAP)

(a) Above Water Crossings the pipe shall be:

1. Adequately supported.
2. Protection from damage and freezing.
3. Accessible for repairs and replacement.
4. Valves shall be provided at both ends of the water crossing so that the section can be isolated for test or repair, the valves shall be easily accessible and not subject to flooding;

(b) When Crossing Water Courses Which are Greater than 15 feet in width:

1. The pipe shall be of special construction, having flexible, watertight joints;

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2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for test or repair, the valves shall be easily accessible and not subject to flooding;
3. Sampling taps should be available at each end of the crossing;
4. Permanent taps should be made for testing and locating leaks.

22. Cross Connections

- (a) There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system.
- (b) The approval of the Tennessee Department of Environment and Conservation, Division of Water Supply, shall be obtained for the interconnections between potable and water supplies.
- (c) Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply

23. Water Services and Plumbing

- (a) Water services and plumbing shall conform to the Standard Plumbing Code as may be revised and adopted from time to time by the City of Spring Hill.

END OF SECTION

18. Valves

- (a) Unless otherwise specified by the Superintendent of Water and Sewer Systems, valves shall be placed at all intersections of distribution pipes. Gate valves shall be utilized on water line up to 10-inch in diameter. Butterfly valves shall be placed on all water lines 12-inches in diameter and larger. Three (3) valves shall be placed at each tee; one (1) installed on each run leg and the third installed on the branch leg. Four valves (4) valves shall be placed at each cross. Valves should be positioned in the pipeline approximately three (3) feet distance from the tee or cross.
- (b) Valves shall be placed on lead-outs approximately three (3) feet from fire hydrants except those having lead-outs to be connected to fire hydrant type tees, in which case, the valves may be connected to such fire hydrant tee.
- (c) A valve (gate or butterfly) shall be located on water lines at a maximum distance of 1,000 feet apart as to allow water line segment isolations in case of water line breaks or maintenance.
- (d) Megalugs are required on all fittings (valves, tees, reducers, hydrants, elbows, vertical and horizontal bends).
- (e) All water mains 10-inch and above must have a minimum of four (4) galvanized rods at all fittings. All water mains 8-inch and below must have a minimum of three (3) galvanized rods at all fittings.

19. Means of Detecting PVC pipe

When PVC pipe is installed a minimum size 12 gauge copper wire shall be installed along the pipe. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached.

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20. Separation of Water Mains and Sewers

(a) General:

The following factors should be considered in providing adequate separation:

1. Materials and type of joints for water and sewer pipes.
2. Soil conditions.
3. Service and branch connections into the water main and sewer line.
4. Compensating variations in the horizontal and vertical separations.
5. Space for repair and alterations of water and sewer pipes.
6. Off-setting of pipes around manholes.
7. Water mains and sanitary or storm sewers shall not be laid in the same trench.

(b) Parallel Installation:

1. Normal conditions-Water mains shall be laid at least ten (10) feet horizontally from any sanitary sewer, storm sewer or sewer manhole. Whenever possible; the distance shall be measured edge-to-edge.
2. Unusual conditions-When local conditions prevent a horizontal separation of ten (10) feet, a water main may be laid closer to a storm or sanitary sewer provided that:
 - i. The bottom of the water main is at least 18 inches above the top of the sewer.
 - ii. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of

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construction and shall be pressure tested to assure watertightness prior to backfilling.

(c) Crossing:

1. Normal conditions-Water mains crossing house sewers, storm sewers, or sanitary sewers will be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, whenever possible.
2. Unusual conditions when local conditions prevent a vertical separation as described hereinbefore, the following shall be used:
 - i. Sewers passing over or under water mains should be constructed of ductile iron.
 - ii. Water mains passing under sewers shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main; adequate structural support for the sewers to prevent excessive deflection of joints and settling on the breaking the water mains; that the length of water pipe be centered at the point of crossing so that the joints will be equidistant as far as possible from the sewer. Both the sewer and the water main shall be constructed of water pipe and tested in accordance with these Standards.

21. Surface Water Crossings

Surface water crossings, both under and over water, present special problems which should be discussed with the City of Spring Hill; the Tennessee Department of Environment and Conservation, Division of Water Supply and division of Water Pollution Control; and the U.S. Army Corps of Engineers before the plans are prepared.

All surface water crossings shall be in accordance with the requirements of the General Permits for an Aquatic Resource Alteration Permit. (ARAP)

- (a) Above Water Crossings the pipe shall be:
 - 1. Adequately supported.
 - 2. Protection from damage and freezing.
 - 3. Accessible for repairs and replacement.
 - 4. Valves shall be provided at both ends of the water crossing so that the section can be isolated for test or repair, the valves shall be easily accessible and not subject to flooding;

- (b) When Crossing Water Courses Which are Greater than 15 feet in width:
 - 1. The pipe shall be of special construction, having flexible, watertight joints;
 - 2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for test or repair, the valves shall be easily accessible and not subject to flooding;
 - 3. Sampling taps should be available at each end of the crossing;
 - 4. Permanent taps should be made for testing and locating leaks.

22. Cross Connections

- (a) There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system.

- (b) The approval of the Tennessee Department of Environment and Conservation, Division of Water Supply, shall be obtained for the interconnections between potable and water supplies.

- (c) Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall

be returned to the potable water supply

23. Water Services and Plumbing

- (a) Water services and plumbing shall conform to the Standard Plumbing Code as may be revised and adopted from time to time by the City of Spring Hill.

END OF SECTION



Spring Hill Fire Department

FIRE SPRINKLER SPECIFICATIONS

1. Detailed drawings of site plans and construction plans (showing all exterior and interior components of the fire sprinkler system) are to be submitted to the City of Spring Hill Tennessee Building Department for approval prior to any construction taking place. All Development will follow the adopted International Fire Code (IFC) requirements. These plans shall be included within the construction plans submittal to be approved by the City of Spring Hill Planning Commission. The detail drawings of site plans and construction plans shall also be submitted to the Tennessee Department of Commerce and Insurance Division of Fire Prevention as per rules of T.C.A.68-102-113, Chapter 0780-2-3 (Review of Construction Plans and Specifications). Also, an electronic copy of said fire sprinkler plans shall be submitted, to the City of Spring Hill Codes and Planning Department, the electronic plans shall be in one of the following formats; AutoCAD, AutoSketch, Visio, or Generic CADD.
2. All piping for fire sprinkler systems will conform to the most current editions of N.F.P.A. 24, N.F.P.A. 13, and N.F.P.A 13D.
3. Piping shall be of sufficient size as called for by hydraulic calculations performed and signed by a registered Engineer of the State of Tennessee, for the fire sprinkler system. Piping shall meet minimum standards as set forth by the City of Spring Hill Water Department standard specifications. The City of Spring Hill Water Department will determine, on a case by case basis, whether C-900 PVC can be utilized in place of the required ductile iron pipe.
4. All fire sprinkler components and piping installation work shall be performed by a licensed fire sprinkler contractor.
5. All underground work shall be inspected, prior to being backfilled, by the appropriate official for the City of Spring Hill, Tennessee.

SPRING HILL FIRE DEPT.
4000 Campbell Station Parkway
Spring Hill, TN. 37174

STATION 3. 615-302-3462
Fax. 931-486-0516
fire@springhilltn.org



Spring Hill Fire Department

6. A double detector check valve Watts Model 757DCDA, AMES Model 2000SS, or an approved equal shall be installed in a backflow preventer vault at the point of connection to the water main. As an option, above ground hot boxes with 110 volt heaters are allowed.
7. A dedicated water line for each fire suppression system shall be installed. Domestic potable water line and the dedicated fire protection line shall be two separate lines and shall be tapped at two different locations on the water main.
8. A fire hydrant shall be available with-in 100 feet of any Fire Department Connection (F.D.C.). The fire hydrant shall meet A.W.W.A. Standard C-502 and shall be as manufactured by Mueller or an approved equal. The fire hydrant shall be white in color as received from the manufacturer. Painting of fire hydrant white after received from the supplier will not be allowed.
9. Fire hydrants shall be located to provide a minimum of three feet of clearance around the hydrant in all directions, as to provide access for firefighter use.
10. Any fire hydrant that may be subject to impact by vehicles or located adjacent to vehicular traffic shall have impact protection bollards installed. The impact protection shall meet minimum clearance specifications.
11. F.D.C.'s shall be installed for each building on the address side, and locking Knox-Caps shall be installed.
12. Water gong (alarm indicator) shall be installed on the exterior address side of the building.
13. All water line taps shall be performed by a licensed contractor of the state of Tennessee. These taps shall be supervised and inspected by City of Spring Hill Tennessee Water Department.
14. Townhomes, apartments and condominiums shall require a meter installed on the fire line, see standard detail drawing.

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SECTION 01031

SPECIAL PROJECT PROCEDURES

1. SMOKING AND FIRE PRECAUTIONS

1.1 No smoking, fire or use of any fire- or explosion-producing tools or equipment will be permitted on the properties of oil companies or other concerns prohibiting same on their premises or at any locations where such may endanger said premises or the current operations thereon.

2. MANUFACTURERS' QUALIFICATIONS

2.1 The manufacturers of all materials and equipment used must be reputable and regularly engaged in the manufacture of the particular material or equipment for the use and service to which it will be subjected.

3. DEVELOPER SHALL PAY FOR ALL LABORATORY INSPECTION SERVICE

3.1 All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Developer and approved by the Owner and A/E. The Developer shall pay for all laboratory inspection services as a part of the Contract. Submit all material test reports to the A/E in triplicate.

4. COMPLIANCE WITH STATE AND LOCAL LAWS

4.1 Comply with all applicable requirements of state and local laws and ordinances to the extent that such requirements do not conflict with federal laws or regulations.

5. MARKERS

5.1 Preserve all Corps of Engineers, USGS, TVA, State of Tennessee, property pins and private markers; do not remove or disturb any such markers without prior approval from the A/E. Any removal and replacement of such markers shall be at the expense of the Developer.

6. PAVEMENT REPAIR AND/OR REPLACEMENT

6.1 Whenever pipe trenches are cut across or along existing pavement or shoulders, backfill same and restore traffic over the cuts as quickly as possible by constructing a temporary twelve-inch (12") surface of Class A, Grade D crushed stone. Add material and

otherwise maintain such surface until the permanent pavement is restored or until the entire project is accepted.

7. APPROVED CHEMICALS

7.1 All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either EPA or USDA. The use of all such chemicals and the disposal of residues shall be in strict conformance with all applicable instructions and regulations.

8. DEPARTMENT OF TRANSPORTATION PERMITS

8.1 Spring Hill will assist in securing any permits and provide bond as required by the Tennessee Department of Transportation for the installation of permanent facilities on State highway right-of-ways. The costs for such bonds and/or permits, if applicable, shall be paid by the Developer. All such work shall be coordinated with and be subject to the approval of the Tennessee Department of Transportation, in addition to the approval of the A/E.

8.2 The Developer will secure any permits as required by the local highway department for the installation of water lines within the rights-of-way of county roads. The Developer shall be responsible for complying with the requirements of the local highway department, and all such work shall be coordinated with and be subject to the approval of the local highway department, in addition to the approval of the Owner.

9. DEPARTMENT OF ENVIRONMENT AND CONSERVATION PERMITS

9.1. The Developer shall be responsible for obtaining any and all Tennessee Department of Environment and Conservation Permits, including, but no limited to, Aquatic Resource Alteration Permits (ARAP). If an individual ARAP Permit is not required, the Developer shall provide to Spring Hill written evidence of this situation.

10. INSTALLATION, TESTING, AND GUARANTEE

10.1 The completely installed system shall be guaranteed against any and all defects of manufacture, materials, workmanship, or installation for a period of one year from the date of acceptance.

11. DRAWINGS OF RECORD

11.1 The Developer shall provide and keep up-to-date a complete record set of blue-line prints, which shall be corrected daily to show every change, and the approved shop drawings. Keep this set

of prints at the job site, and use only as a record set. This shall not be construed as authorization for the Developer to make changes in the approved layout without definite instructions in each case. Turn the set over to the Owner upon completion of the project.

12. DETECTION WIRE

12.1 For detection purposes, a 12 gauge solid strand copper tracing wire (shielded) shall be installed as per the manufacturer's instructions. Connections between wires shall be soldered or connected with wire nut fasteners and wrapped.

13. UTILITIES

13.1 The Developer shall contact the owner of all underground utilities before beginning construction in the area. Carefully protect from damage all utilities in the vicinity or the work at all times. If it is necessary to repair, remove, and/or replace any such utility in order to complete the work properly, do so in compliance with the rules and regulations of the particular utility involved. Any such work shall be considered incidental to the construction of the project, and no additional payment will be allowed therefor.

14. INSURANCE

The Contractor shall procure, maintain, and furnish an Owner's protective policy as hereinafter specified:

Owner's General Public Liability and Property Damage Insurance including vehicle coverage issued to the Owner and protecting the Owner from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the Contract Documents, whether such operations be by the Contractor or by any Subcontractor employed by the Contractor or anyone directly or indirectly employed by the Contractor or by a Subcontractor employed by the Contractor. Insurance shall be written with a limit of liability of not less than \$1,000,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than \$1,000,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than \$500,000 for all property damage sustained by any one person in any one accident; and a limit

of liability of not less than \$500,000 aggregate for any such damage sustained by two or more persons in any one accident.

This requirement for an Owner's protective policy shall be in addition to any and all other insurance requirements as set forth in the Contract Documents, if applicable.

END OF SECTION

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SECTION 01090

REFERENCE STANDARDS

PART 1. GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Applicability of Reference Standards.
- B. Provision of Reference Standards at site.
- C. Acronyms used in Contract Documents for Reference Standards.
Source of Reference Standards.

1.2 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the Bid date, or date of Owner-Contractor Agreement when there are bids, except when a specific date is specified.
- C. When required by individual Specifications section, obtain copy of standard. Maintain copy at job site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.3 SCHEDULE OF REFERENCES

AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street NW, Suite 249 Washington, DC 20001
ACI	American Concrete Institute 38800 Country Club Drive Farmington Hills, MI 48331
AGC	Associated General Contractors of America 2300 Wilson Blvd., Suite 400 Arlington, VA 22201

AI Asphalt Institute
2696 Research Park Drive
Lexington, KY 40511

AISC American Institute of Steel Construction
One East Wacker Drive, Suite 700
Chicago, IL 60601

AISI American Iron and Steel Institute
1140 Connecticut Ave. NW, Suite 705
Washington, DC 20036

AFPA American Forest Products Association
1111 Nineteenth Street NW, Suite 800
Washington, DC 20036

ANSI American National Standards Institute
1819 L Street, NW, 6th Floor
Washington, DC 20036

ASHRAE American Society of Heating, Refrigerating and
Air Conditioning Engineers
1791 Tullie Circle, NE
Atlanta, GA 30329

ASME American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016

ASTM American Society for Testing and Materials
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

AWWA American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

AWPA American Wood-Preservers Association
100 Chase Park South, Suite 116
Birmingham, AL 35244

AWS American Welding Society
550 NW LeJeune Road
Miami, FL 33126

CLFMI Chain Link Fence Manufacturers Institute
10015 Old Columbia Road, Suite B-215
Columbia, MD 21046

CRSI Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, IL 60173-4758

EJCDC Engineers Joint Contract Documents Committee
American Council of Engineering Companies
1050 15th Street, NW, 8TH Floor
Washington, DC 20005

EJMA Expansion Joint Manufacturers Association
25 North Broadway
Tarrytown, NY 10591

FM Factory Mutual System
1151 Boston-Providence Turnpike
Norwood, MA 02062

FS Federal Specification
General Services Administration
Federal Supply Service Product Acquisition Center
Supply Standards Division (FLAS)
Arlington, VA 22202

GA Gypsum Association
6525 Belcrest Road, Suite 480
Hyattsville, MD 60201

IEEE Institute of Electrical and Electronics Engineers
3 Park Avenue, 17th Floor
New York, NY 10016-5997

IGMA Insulating Glass Manufacturers Association
27 North Wacker Drive, Suite 365
Chicago, IL 60606

IMI International Masonry Institute
The James Brice House
42 East Street
Annapolis, MD 21401

MIL Military Specification
Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

ML/SFA Metal Lath/Steel Framing Association
600 S Federal Street, Suite 400
Chicago, IL 60605

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NAAMM National Association of Architectural Metal
Manufacturers
800 Roosevelt Road, Bldg. C
Suite 312
Glen Ellen, IL 60137

NEBB National Environmental Balancing Bureau
8575 Grovemont Circle
Gaithersburg, MD 20877

NEMA National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209

NSWMA National Solid Waste Management Association
4301 Connecticut Avenue, NW, Suite 300
Washington, DC 20036

NTMA National Terrazzo and Mosaic Association
201 North Maple, Suite 208
Purcellville, VA 20132

PCA Portland Cement Association
5420 Old Orchard Road
Skokie, IL 60077

PCI Prestressed Concrete Institute
209 West Jackson Blvd., #500
Chicago, IL 60606

PS Product Standard
U. S. Department of Commerce
1401 Constitution Ave., NW
Washington, DC 20230

SDI Steel Deck Institute
P.O. Box 25
Fox River Grove, IL 60021

SIGMA Sealed Insulating Glass Manufacturers Association
111 East Wacker Drive
Chicago, IL 60601

SJI Steel Joist Institute
Administrative Offices
1173 B Lyndon Links Drive
Forest, VA 24551

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SMACNA Sheet Metal and Air Conditioning Contractors
National Association
4201 Lafayette Center Drive
Chantilly, VA 20151-1209

SSPC The Society for Protective Coatings
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656

TAS Technical Aid Series
Construction Specifications Institute
99 Canal Center Plaza, Suite 300
Alexandria, VA 22314

TCNA Tile Council of North America, Inc.
100 Clemson Research Blvd.
Anderson, SC 29625

UL Underwriters Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062-2096

PART 2. PRODUCTS

2.1 Not Used.

PART 3. EXECUTION

3.1 Not Used.

END OF SECTION

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SECTION 01400
QUALITY CONTROL

PART 1. GENERAL

1.1 REQUIREMENTS INCLUDED

- A. General Quality Control.
- B. Workmanship.
- C. Manufacturers' Instructions.
- D. Manufacturers' Certificates.
- E. Mockups.
- F. Manufacturers' Field Services.
- G. Testing Laboratory Services.

1.2 RELATED REQUIREMENTS

- A. General Conditions: Inspection and testing required by governing authorities.
- B. Section 01090 - Reference Standards: Applicability of specified reference standards.
- C. Section 01300 - Submittals: Submittal of Manufacturers' Instructions.
- D. Section 03301 - Concrete Work: Tests required for concrete.

1.3 QUALITY CONTROL, GENERAL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

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1.4 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by utilizing only persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURERS' INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from A/E before proceeding.

1.6 MANUFACTURERS' CERTIFICATES

- A. When required by individual Specification Sections, submit manufacturers' certificate, in duplicate, that products meet or exceed specified requirements.

1.7 MOCKUPS

- A. When required by individual Specifications Section, erect complete, full-scale mockup of assembly at Project site. Tests will be performed in accordance with Section 01400, if applicable. Remove mockup at completion when approved by A/E.

1.8 MANUFACTURER'S FIELD SERVICES

- A. When specified in respective Specification Sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship; startup of equipment; test, adjust, and balance of equipment, as applicable; and, to make appropriate recommendations.
- B. Representative shall submit written report to A/E listing observations and recommendations.

1.9 TESTING LABORATORY SERVICES

- A. Contractor shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by individual Specification Sections.
- B. Services will be performed in accordance with requirements of governing authorities or agencies and with specified standards.
- C. Reports will be submitted to A/E in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.
- D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
 - 1. Notify A/E and Testing Laboratory at least 48 hours prior to expected time for operations requiring testing services.
 - 2. Make arrangements with Testing Laboratory and pay for additional samples and tests for Contractors convenience.

PART 2. PRODUCTS

NOT USED

PART 3. EXECUTION

NOT USED

END OF SECTION

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SECTION 01568

EROSION CONTROL

PART 1. GENERAL

This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding of plant and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction such as excavation work may be delayed until warmer weather or covered to prevent freezing.

PART 2. PRODUCTS

Temporarily stabilize areas from which topsoil has been removed and topsoil stockpiles by seeding fast growing annuals such as rye and annual ryegrass, that provide quick protection. These annual grasses are to be seed certified by the State Department of Agriculture and can be worked into the soil when the site is prepared for final seeding of more permanent species. Use commercial lime and fertilizer on exposed areas, subject to severe erosion.

PART 3. EXECUTION

3.1 Conduct construction so as to provide the site with maximum protection from erosion at all times.

3.2 Conduct excavation activities to provide erosion and sediment control as follows:

3.2.1 Do not start clearing and excavation until a firm construction schedule is submitted to and approved by the A/E. Continuously coordinate the schedule with the clearing and excavation activity.

3.2.2 In streets and other paved areas, remove excavated material from the site as construction progresses to prevent any erosion of this material.

3.2.3 In other areas, place the excavated material so as not to block any drainage area. Replace this excavated material in the

trench immediately after repairs have been completed and are approved by the Owner.

3.2.4 Retain natural vegetation whenever feasible.

3.2.5 Restore and cover exposed areas subject to erosion as quickly as possible by means of seeding and mulching. Use diversion ditches or other methods as appropriate to prevent storm water from running over the exposed area until seeding is established as specified.

3.2.6 Take particular care along streams and drainage ditches so that fallen trees, debris, and excavated material will not adversely affect the streamflow. Exercise care to minimize the destruction of streambanks. Wherever the streambanks are affected by construction, reduce the slope of the streambanks to provide a suitable condition for vegetation protection. Minimize land exposure in terms of area and time.

3.2.7 Cover exposed excavated areas with mulch or vegetation.

3.2.8 Mechanically retard the rate of runoff water.

3.2.9 Trap the sediment contained in the runoff water.

3.2.10 Divert water from erosive areas.

3.2.11 Take care during the pouring of concrete, hauling of materials, etc., to keep vehicles from creating a severe erosion problem. Proper scheduling of operations and prompt repair of ruts created during this operation is necessary from this source.

3.2.12 Control dust by sprinkling or other means as necessary to keep it to a minimum.

3.2.13 Pave or otherwise stabilize roadways and driveways as soon as feasible.

3.2.14 Regrade and reseed surfaces eroded or otherwise damaged during any and all construction operations as necessary.

END OF SECTION

SECTION 01620

STORAGE AND PROTECTION

PART 1. GENERAL

Not Used

PART 2. PRODUCTS

2.1 Not Used.

PART 3. EXECUTION

3.1 STORAGE, GENERAL

- A. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.
- B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

3.2 EXTERIOR STORAGE

- A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.
- B. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
- C. Provide surface drainage to prevent erosion and ponding of water.

3.3 MAINTENANCE OF STORAGE

- A. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.

END OF SECTION

SECTION 02221

UNCLASSIFIED EXCAVATION FOR UTILITIES

PART 1. GENERAL

1.1 The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials (including rock) encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work; the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of satisfactory pipe beds; the backfilling and tamping of trenches, foundations, and other structures; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the A/E, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTIONS

3.1 PREPARATION OF THE SITE

- A. Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the drawings and/or the A/E specifically indicate are to be removed. Dispose of this refuse material in a manner acceptable to the A/E.
- B. In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the drawings, specifically listed in the specifications, marked on the site, or identified by the A/E. In no case damage or remove such growth without written permission from the Owner.
- C. If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth, grub the excavated area, and remove all large roots to a depth of

not less than 2 feet below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the A/E. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.

- D. Trees, cultivated shrubs, etc., that are situated within public rights-of-way and/or construction easements through private property but not directly within the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely and unless their removal is specifically ordered by the A/E. Take special precautions to protect and preserve such growth throughout all stages of the construction.
- E. Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

3.2 UNSUITABLE MATERIALS

- A. Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1 inch to 2 inch lifts of crushed stone up to the level of the lines, grades, and/or cross sections shown on the drawings. The top 6 inches of this refill shall be No. 67 (TDOT) crushed stone for bedding.

3.3 ROCKS AND BOULDERS

- A. Any material that is encountered within the limits of the required excavation that cannot be removed except by drilling and/or blasting, including rock, boulders, masonry, hard pan, chert, shale, street and sidewalk pavements, and/or similar materials, shall be considered as unclassified excavation, and no separate payment will be made therefore.
- B. Should rock be encountered in the excavation, remove it by blasting or otherwise. Where blasts are made, cover the excavation with enough excavation material and/or timber or steel matting to prevent danger to life and property. The Contractor shall secure, at his own expense, all

permits required by law for blasting operations and the additional hazard insurance required. Observe all applicable laws and ordinances pertaining to blasting operations.

- C. Excavate rock over the horizontal limits of excavation and to a depth of not less than 6 inches below the bottom of pipe up to 30 inches in diameter and not less than 12 inches below the bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with No. 67 (TDOT) crushed stone or other approved material, tamp to the proper grade, and make ready for construction. For monolithic concrete sewers and for structures, excavate rock to the outside bottom of the structure or sewer.

3.4 DISPOSAL OF MATERIALS

- A. Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the A/E shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of by the Contractor as specified below.
- B. Waste materials may be deposited in spoil areas at locations approved by the A/E. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 02485, Seeding.
- C. Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workman like condition, as described below.
- D. The disposal of waste materials shall be considered an integral part of the excavation work and one for which no separate payment shall be allowed.

3.5 EXCAVATION FOR TRENCHES, MANHOLES, AND STRUCTURES

- A. Unclassified excavation for pipelines shall consist of the excavation necessary for the construction of water, sewer, and other pipes and their appurtenances (including manholes, inlets, outlets, headwalls, collars, concrete saddles, and pipe protection) that are called for by the drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials, all

of which shall conform to the applicable provisions set forth elsewhere in these specifications.

- B. The Contractor may, if he chooses, use a motor powered trenching machine. If he does, however, he shall be fully responsible for the preservation or repair of existing utility service connections.
- C. Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings or specifically authorized by the A/E, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the A/E on the ground. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall not be more than the distance determined by the following formula: $4/3d + 15$ inches, where "d" represents the internal diameter of the pipe in inches. When approved in writing by the A/E, the banks of trenches from the ground surface down to a depth not closer than 1 foot above the top of the pipe may be excavated to non-vertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the formula given above. Any cut made in excess of the formula $4/3d + 15$ inches shall be at the expense of the Contractor and may be cause for the A/E to require that stronger pipe and/or a higher class of bedding be used at no cost to the Owner.
- D. For rigid pipe, shape the bottom of all trenches to provide uniform bearing for the bottom of the pipe barrel. For plastic sewer lines, provide a minimum of 6 inches of No. 67 (TDOT) crushed stone for bedding.
- E. Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than 2 joints ahead of pipe laying.
- F. Excavation for manholes, inlets, and other incidental structures shall not be greater in horizontal area than that required to allow a 2 foot clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it.

The bottom of the excavation shall be true to the required shape and elevation shown on the drawings. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall, at his own expense, fill the void with either concrete or granular material approved by the A/E.

- G. Do not excavate pipe trenches more than 200 feet ahead of the pipe laying, and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the A/E deems necessary to maintain vehicular or pedestrian traffic.
- H. In all cases where materials are deposited along open trenches, place them so that in the event of rain no damage will result to the work and/or to adjacent property.
- I. Excavation for other structures may be performed with nonvertical banks except beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a 2 foot clearance between the outer surface of the structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings.

3.6 SHEETING, SHORING, AND BRACING

- A. Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.
- B. Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5 feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5 feet deep when examination of

the ground indicates hazardous ground movement may be expected. Guard the walls and faces of all excavations in which employees are exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.

- C. Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional engineer licensed in the State of Tennessee and shall be subject to approval by the A/E. However, such approval does not relieve the Contractor of the sole responsibility for the safety of all employees, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.
- D. Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Underpin adjacent structures wherever necessary, with the approval of the A/E.
- E. Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the A/E, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.
- F. Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.
- G. The Contractor may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater than that of an appropriate shoring system.

3.7 THE DEWATERING OF EXCAVATION

- A. Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the A/E. Give special attention to excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.

3.8 BORROW EXCAVATION

- A. Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations, or whenever the backfill material from such excavations is unsuitable, then obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. In such cases, make suitable arrangements with the property owner and pay all incidental costs, including any royalties, for the use of the borrowed material. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the A/E. All state and local regulations concerning borrow pits, drainage and erosion control shall be strictly followed.
- B. Excavate borrow pits in such a way that the remaining surfaces and slopes are reasonably smooth and that adequate drainage is provided over the entire area. Construct drainage ditches wherever necessary to provide outlets for water to the nearest natural channel, thus preventing the formation of pools in the pit area. Leave the sides of borrow pit cuts at a maximum slope of 2:1 unless otherwise directed by the A/E.
- C. Properly clear and grub borrow pits, and remove all objectionable matter from the borrow pit material before placing it in the backfill.
- D. The taking of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work; no separate payment shall be made for this.

3.9 BACKFILLING

- A. Begin backfilling after the line construction is completed and then inspected and approved by the A/E. Trenches 10-feet deep or less shall contain a 6-inch stone envelope around the pipe. Trenches greater than 10-feet deep shall contain 6-inches of stone under the pipe and on each side with 12-inches of stone placed above the pipe.
- B. Backfill material above the pipe envelopes shall consist either of fine, loose earth like sandy soil or loam or of granular material that is free from clods, vegetable matter, debris, stone, and/or objectionable materials and that has a size of no more than 2-inches. Place this backfill simultaneously on either side of the trench in

even layers that before compaction are no more than 6 inches deep. Thoroughly and completely tamp each layer into place before placing additional layers. When shown on the drawings, this backfill shall, at locations beneath or closely adjacent to pavement, consist of No. 67 (TDOT) crushed stone. Compaction of backfill material layers shall be at 98% by standard proctor test. Where adjacent to and within paved areas the top 12-inches of the trench at subgrade shall consist of crusher-run stone compacted at 98% by standard proctor test. Compaction testing shall be at intervals directed by the site inspector.

- C. From 1 foot above the pipe upward, the backfill material may contain broken stones that make up approximately 3/4 of the backfill's total volume. However, if this type of backfill is used, there must be enough spalls and earth materials to fill all voids completely. The maximum dimension of individual stones in such backfill shall not exceed 6 inches, and the backfill material shall be placed and spread in even layers not more than 12 inches deep. At locations beneath or closely adjacent to pavement or at locations of improvements subject to damage by displacement, tamp and thoroughly compact the backfill in layers that, before compaction, are 6 inches deep. In other areas, the backfill for the upper portion of the trenches may be placed without tamping but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.
- D. If earth material for backfill is, in the opinion of the A/E, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material that the A/E considers too wet or otherwise unsuitable.
- E. Wherever excavation has been made within easements across private property, the top 1 foot of backfill material shall consist of fine loose earth free from large clods, vegetable matter, debris, stone, and/or other objectionable materials.
- F. Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing Class A, Grade D, crushed stone as the top 12 inches of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Owner. On heavily traveled roadways, cold mix or leveling course binder 2 inches

thick shall be installed and maintained until permanent pavement is installed.

- G. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.
- H. Wherever pipes have diameters of 15 inches or less, do not use power operated tampers to tamp that portion of the backfill around the pipe within 1 foot above the pipe.
- I. Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary, whenever directed to do so by the A/E.
- J. Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the A/E's requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.
- K. Compaction Requirements: Unless specified otherwise elsewhere, under buildings and 2 times the depth of pipe beyond, and under roads and 2 times the depth beyond the shoulder, compact to 95% maximum density in accordance with ASTM D698. In all other locations, compact to 90% maximum density.

3.10 MAINTENANCE

- A. Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the Owner.
- B. Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the A/E. Continue such maintenance until final acceptance of the project, or until the A/E issues a written release.

3.11 SLOPES

- A. Neatly trim all open cut slopes, and finish to conform either with the slope lines shown on the drawings or the directions of the A/E. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Contractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

END OF SECTION

SECTION 02260

FINISH GRADING

PART 1. GENERAL

1.1 The work called for by this section shall include, but not necessarily be limited to, finish grading and the spreading any shaping of topsoil to the finished contour elevations indicated by the drawings.

1.2 Refer to other sections for work related to that specified under this heading. Coordinate this work with that specified by other sections for timely execution.

PART 2. PRODUCTS

2.1 Topsoil: Use stripped topsoil that has been stockpiled as specified elsewhere. If the quantity of topsoil on the job is inadequate, furnish enough additional topsoil. Topsoil furnished shall be natural, fertile, friable soil possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic substances that may be harmful to plant growth. Topsoil shall be without admixture of subsoil and shall be cleaned and reasonably free from clay lumps, stones, stumps, roots, or similar substances two (2) inches or more in diameter, debris, or other objects that are a hindrance to planting operations. Such material shall be subject to testing.

PART 3. EXECUTION

3.1 Do not begin work until the earth is dry enough to be tillable.

3.2 Inspect subgrades to see that they generally conform to the standards called for elsewhere in these specifications, particularly with regard to the approximate depths required for the work. After work is completed, inspect it to ensure that all finish grading complies with design requirements.

3.3 Place finished grade stakes wherever necessary to bring the work accurately to the elevations required by the drawings.

3.4 Finish grade all areas outside the building line to the depths required for the work as follows:

- A. Grade uniformly with rounded surfaces at the tops and bottom of abrupt changes of planes.
- B. Hand grade steep slopes and areas that are inaccessible for machine work.
- C. Protect graded areas from undue erosion, and repair and regrade areas where erosion does occur.
- D. Refill areas where noticeable settlement has occurred.
- E. Finish grade areas that are to receive topsoil up to four (4) inches below the finished contour elevations called for by the drawings or, over rock, to 12 inches below these elevations.

3.5 Place topsoil uniformly over disturbed areas that do not receive other work as follows:

- A. Obtain approval of the finish grading from the A/E before starting to place topsoil.
- B. Scarify subgrade to a depth of three (3) inches.
- C. Place the topsoil to a depth of four (4) inches when lightly rolled or, on rock, to a depth of 12 inches.
- D. Level the topsoil so that it slopes uniformly and has no water pockets.
- E. Carefully rake the topsoil by hand to remove all clods, roots, sticks, stones over one (1) inch in diameter, and other foreign materials from the surface.

3.6 Dispose of excess excavated materials and debris away from the site.

END OF SECTION

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SECTION 02485

SEEDING

PART 1. GENERAL

1.1 This work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, sod, planting, etc., and shall include, but not necessarily be limited to, all seed bed preparation; the supplying and placing of soil additives, seed, and mulch wherever required by the drawings or directed by the A/E; and maintenance.

1.2 Unless otherwise approved in writing by the A/E, seeding operations shall be limited to the following planting periods:

- A. Spring - March 1 through May 30
- B. Fall - August 15 through October 31

1.3 Refer to other sections for items affecting seeding. Coordinate this work with that specified by other sections for timely execution.

PART 2. PRODUCTS

2.1 GRASS SEED: Kentucky 31 Fescue (*Festuca elatior*) and/or annual rye meeting the requirements of the State Department of Agriculture and furnished in new bags or bags that are sound and not mended; no "below standard" seed will be accepted.

2.2 FERTILIZER: commercially manufactured; Grade 10-10-10; furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.

2.3 AGRICULTURAL LIMESTONE: containing a minimum of 85% calcium carbonate and magnesium carbonate combined, 85% of which passes a No. 10 mesh sieve.

2.4 MULCH: stalks of rye, oats, wheat, or other approved grain crops properly cured prior to bailing, air dried, and reasonably free of noxious weeds and weed seeds or other material detrimental to plant growth.

PART 3. EXECUTION

3.1 Perform all seeding and related work as a continuous operation. Sow seed as soon as the seed bed has been prepared, and perform subsequent work in a continuous manner.

3.2 Before beginning seeding operations in any area, complete the placing of topsoil and final grading, and have the work approved by the A/E.

3.3 Scarify, disk, harrow, rake, or otherwise work each area to be seeded until the soil has been loosened and pulverized to a depth of not less than 2 inches. Perform this work only when the soil is in a tillable and workable condition.

3.4 Apply fertilizer and agricultural limestone uniformly over the seed bed, and lightly harrow, rake, or otherwise incorporate them into the soil for a depth of approximately 1 inch at the following rates:

Fertilizer: 15 pounds per 1,000 square feet

Agricultural Limestone: 40 pounds per 1,000 square feet

3.5 Sow seed uniformly with a rotary seeder, wheelbarrow seeder, hydraulic equipment or by other satisfactory means.

3.6 The seeding rate shall be 5 pounds per 1,000 square feet for Kentucky 31 Fescue (*Festuca elatior*).

3.7 When seeding during March 1 through April 1 and October 1 through November 20, add an additional 3 pounds per 1,000 square feet of annual rye grass.

3.8 Perform no seeding during windy weather or when the ground surface is frozen, wet, or otherwise untillable.

3.9 Spread mulch material evenly over the seeded areas immediately following the seeding operation.

Mulch Rate: 2 bales (100 pound minimum) per 1,000 square feet

3.10 The mulch rate may be varied by the A/E, depending on the texture and condition of the mulch material and the characteristics of the area seeded. Cover all portions of the seeded areas with a uniform layer of mulch so that approximately 25% of the ground is visible.

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3.11 No equipment, material storage, construction traffic, etc., will be permitted on newly seeded ground.

3.12 Dispose of all surplus materials as directed by the Owner.

PART 4. INSPECTIONS

The A/E shall inspect the seeding within 60 days after planting and determine if it is acceptable.

PART 5. GUARANTEE

5.1 Secure an acceptable growth of grass in all areas designated for seeding.

5.2 An area is considered acceptable if it is represented by a minimum of 100 seedlings per square foot of the permanent species of grass representative of the seed mixture. If an acceptable growth is not obtained on the first planting, reseeding and remulching will be required.

5.3 If the planting is less than 50% successful, rework the ground, refertilize, reseed, and remulch.

END OF SECTION

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SECTION 02575

PAVEMENT REPAIR

PART 1. GENERAL

1.1 The work specified by this section shall consist of repairing or replacing all damaged pavement, whether public or private. Dirt shoulders, roads, streets, drives, and walks are to be restored to their original condition as an incidental part of the installation of utilities. Repair damaged base on either side of a trench wherever necessary. Trim the oxidation surface to neat lines outside of the trench wall, and repave the entire area as specified below and as shown on the drawings or on the standard drawings.

1.2 Both these specifications and the drawings make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT). Even though the weather limitations, construction methods, and materials specifications contained in the TDOT specifications may not be explicitly repeated in these specifications, they shall, wherever applicable to the work called for by this section, be considered as implied and therefore adhered to. However, the various subsections "Basis for Payment" contained in the TDOT specifications shall not be considered applicable.

- A. Refer to other sections for work related to that covered by this section.

PART 2. PRODUCTS

2.1 MINERAL AGGREGATE BASE: Class A, Grading D crushed stone (TDOT specifications, Section 303, subsection 903.05)

2.2 BITUMINOUS PRIME COATS: cutback asphalt, Grade RC-250, or emulsified asphalt, Grade AE-P (Section 402, Subsections 904.02 and 904.03)

2.3 CRUSHED STONE CHIPS: Size 6 or Size 7 (Subsection 903.14)

2.4 DOUBLE BITUMINOUS SURFACE: for both courses, either cutback asphalt, Grade RC-800 or RC-3000, or emulsified asphalt, Grade RS-2 (Subsections 904.02 and 904.03)

2.5 ASPHALTIC CONCRETE BINDER: Grading B or C, as directed by the A/E (Section 307)

2.6 BITUMINOUS TACK COAT: Grade AE-3 (Section 403, Subsection 904.03)

2.7 ASPHALTIC CONCRETE SURFACE: Grading E (Section 411)

2.8 QUICK DRY TRAFFIC MARKING PAINT (WHITE AND YELLOW): Subsection 910.05.

PART 3. EXECUTION

3.1 SUBGRADE

- A. Before any base material is installed, compact the subgrade of the area to be paved to 95% of optimum density as determined by ASTM D698 (Standard Proctor).
- B. The backfill material shall contain no topsoil or organic matter. For all areas where subgrade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of 2 to 3 mph over the entire surface. Make further improvements on all areas that show a deflection of 1 inch or more. When completed, the finished subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.
- C. When a base course is compacted, cut back the surface course of the existing pavement a minimum of 1 foot beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

3.2 BASE

- A. Install a mineral aggregate base of the type specified above in accordance with Section 303 of the TDOT specifications. The maximum compacted thickness of any one layer shall be 6 inches and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

3.3 SEAL COAT SURFACE

- A. Uniformly apply a bituminous prime coat of either emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.3 gallon per square yard. Immediately after application, uniformly cover the entire area with Size 7 crushed stone chips at a rate of 12 pounds per square yard.

3.4 DOUBLE BITUMINOUS SURFACE

- A. Apply the first course at a rate of 0.38 to 0.42 gallon per square yard with either emulsified asphalt, Grade RS-2, or cutback asphalt, Grade RC-800 or RC-3000, and then immediately cover with Size 6 crushed stone chips at a rate of 33 to 37 pounds per square yard. After this is rolled, apply the second course at a rate of 0.30 to 0.35 gallon per square yard, and at once uniformly cover with Size 7 chips at a rate of 20 to 25 pounds per square yard. Then roll the entire area.
- B. After the application of the cover aggregate, lightly broom or otherwise maintain the surface for a period of 4 days, or as directed by the A/E. Maintenance of the surface shall include the distribution of cover aggregate over the surface to absorb any free bitumen and cover any areas deficient in aggregate. Sweep excess material from the entire surface with rotary brooms. Sweep the surface at the time determined by the A/E.

3.5 ASPHALTIC CONCRETE BINDER

- A. Apply a bituminous prime coat of emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, at a rate of 0.38 to 0.42 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs and gutters, walls, walks, trees, etc; if such splashing does occur, remove it immediately. After the prime coat has been properly cured, apply an asphaltic concrete binder to the thickness shown on the standard drawings or the plans.
- B. Carefully place the material to avoid segregation of the mix. Broadcasting of the material will not be permitted. Remove any lumps that do not readily break down.

3.6 ASPHALTIC CONCRETE SURFACE

- A. If the asphaltic concrete surface course is to be placed directly on the mineral aggregate base, place a bituminous prime coat as described above. If, however, the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under PRODUCTS at a rate of 0.05 to 0.10 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs, gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the prime or tack coat has been properly cured, apply the asphaltic concrete to the thickness shown of the drawings or standard drawings apply the surface course as described above for the binder course.

3.7 SMOOTHNESS

- A. The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding 1/4 inch in any direction when tested with a 12 foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects.

3.8 SAMPLING AND TESTING

- A. Submit to the A/E test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain his approval of these reports before starting paving operations.
- B. Tests shall be made of the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. Remove and reinstall all such sections. Patch all test holes in connection with thickness tests.
- C. When making surface tests, furnish one man to mark all surface defects for corrections.

END OF SECTION

SECTION 02640

VALVES and HYDRANTS

PART 1. GENERAL

1.1 Refer to other sections for work related to that specified under this heading.

PART 2. PRODUCTS

2.1 VALVES

- A. Valves on water lines ten inches and smaller shall be of double disc, parallel seat, iron body bronze mounted type or resilient wedge, iron body, iron gate with bond-in-place Nitrile elastomer designed to work equally well with pressure on either side of the gate. All gate valves shall be in accordance with or exceed AWWA C500. Working pressure shall be 200 psi.
- B. Valves shall be supplied with O-ring seal stuffing boxes and shall open to the left. Valves ten inches and smaller shall be Mueller A2380-20, American Darling No. 55, Clow F-5065, or American Flow Control Series 2500, or equal, with mechanical joints.
- C. Valves on water lines 12 inches and larger shall be butterfly valves, be designed for direct burial service, and meet or exceed performance requirements for water application of applicable standards such as AWWA C504. Valves shall be fitted with operators designed to accept Metro Valve Box "John Bouchard & Sons Company, No. 8006" valves shall open to the left.
- D. Bodies shall be constructed of cast iron (ASTM A126, Class B) and shall have integrally cast mechanical joint ends in accordance with AWWA C111. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer. Valves shall be steel body of molded-in vulcanized Buna-N bonded to the valve body.
- E. Vane for the valve employing stainless steel body seat shall be of cast iron ASTM A48, Class 40, and have the rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked seat not penetrated by the valve shaft. Vane for valves employing molded-in vulcanized, bonded Buna-N body

seat shall be constructed of ASTM A436 Ni-Resist, Type I.

- F. Valve shaft shall be of one piece extending full size through the valve disc. Stub shafts will not be acceptable for valve sizes 12" and smaller.
- G. Valve operators shall be of the traveling nut type designed to withstand a minimum input torque at fully open or fully closed position of 300 foot-pounds without damage to the valve or operator. It shall be designed to resist submergence in water to a head pressure of 25 feet.
- H. Valves shall be Dresser/M&H/Clow/McWane Manufacturing Company No. 450 butterfly valve, Henry Pratt Company "Groundhog," American Darling Class 150B, or equal. The contractor shall verify the compatibility of both the submitted valves and mating pipe as to insure the inside diameter of the pipe being proposed will clear the operating disc of the valve. It shall be the responsibility of the contractor to review and submit only compatible materials. Valves which require ductile iron adaptors shall be indicated on the shop drawings and proposed by the contractor as to allow the engineer to fully review all information needed to assure valve and pipe compatibility.
- I. All valve box castings shall be made accurately to the required dimensions, and shall be sound, smooth, clean and free from blisters and other defects. Defective casting which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces of frames and covers shall be machined so that the covers rest securely in the frames with no rocking and with the cover in contact with the frames for the entire perimeter of the contact surface. All castings shall be thoroughly cleaned subsequent to machining and before rusting begins, painted with a bituminous coating so as to present a smooth finish, tough and tenacious when cold, but not tacky with no tendency to scale. Install valve boxes on each proposed valve in accordance with the details shown on the standard drawings.

2.2. FIRE HYDRANTS

- A. Fire hydrants shall comply in all respects with AWWA C502 and shall be of the compression type, with the main valve opening against the pressure and closing with the

pressure. The main valve opening shall be not less than 4-1/2 inches in diameter. The main valve facing of the hydrant shall be made of balata or similar material especially suited and proven for the service intended. The bottom stem threads of the main valve rod shall be fitted with an acorn nut or suitable means for sealing the threads away from the water. Hydrants shall be connected to the main by a 6 inch mechanical joint shoe, unless otherwise shown on the drawings, and fitted with strapping lugs. Two 2-1/2 inch hoses and one 4-1/2 inch steamer nipple shall be threaded and screwed into the nozzle section and then pinned to prevent turning. A 4-1/2-inch Stortz Adapter with 5-inch Stortz cap will be screwed onto the steamer nipple and secured with set screws. The 5-inch cap will be secured to the hydrant by cable.

- B. Operating nut shall be provided with convenient means to afford lubrication to ensure ease of operation and the prevention of wear and corrosion.
- C. Hydrant shall be the dry barrel type, and hydrant shoe shall have two positive acting noncorrodible drain valves that drain the hydrant completely by opening as soon as the main valve is closed and by closing tightly when the main valve is open. Drain valves operated by springs or gravity will not be acceptable.
- D. The packing gland located in the bonnet shall be solid bronze, and gland bolts shall be steel with bronze nuts. A double O-ring seal may be used in lieu of conventional stuffing box.
- E. The hydrant shall open by being turned to the left and be so marked on the bonnet in cast letters with an arrow.
- F. Threads on hose and steamer nipples, operating nut, and cap nuts shall conform to local Water Department standards.
- G. Bury shall be as required for the installation, with the depth being measured from grade line to bottom of trench or connecting pipe.
- H. Fire hydrant shall be red in color from manufacturer Mueller Centurion M & H or hydrant approved in the system. Hydrant bonnet shall be painted the appropriate color as per NFPA 291.

Color	CLASS	AVAILABLE FLOW @ 30PSI RESIDUAL
BLUE	AA	1500+ GPM
GREEN	A	1000-1499 GPM
ORANGE	B	500-999 GPM
RED	C	BELOW 500 GPM

Private water system hydrants shall be painted SILVER with the appropriate colored bonnet as per NFPA 291. Non-potable water hydrants will be painted lavender with a purple bonnet. Any hydrant that is not in service will be covered with a black bag, black tape, or be painted black.

PART 3. EXECUTION

3.1 SETTING VALVES AND FITTINGS

A. General

1. Set valves, fittings, plugs, and caps and joint to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.
2. Megalugs are required on all fittings (valves, tees, reducers, hydrants, elbows, vertical and horizontal bends).
3. All water mains 10-inch and above must have a minimum of four (4) galvanized rods at all fittings. All water mains 8-inch and below must have a minimum of three (3) galvanized rods at all fittings.

B. Location of Valves

1. Valves in water mains shall, where possible, be located behind the concrete curb unless otherwise shown on the drawings. If unable to install behind curb the valve shall be installed within the roadway pavement and the water valve box be encased with a 2x2 concrete apron.

C. Valve Boxes and Valve Pits

1. Provide a valve box for every valve.
2. The valve box shall not transmit shock or stress to

the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed by the A/E.

3. Valve boxes shall be Metro Nashville Valve Box "John Bouchard & Sons No. 8006".

3.2 SETTING HYDRANTS

A. Location

1. Locate hydrants as shown on the drawings or as directed by the A/E and in a manner that will provide complete accessibility and also minimize the possibility of damage from vehicles or injury to pedestrians.

B. Position

1. All hydrants shall stand plumb. Set hydrants to the established grade, with nozzles at least 18 inches above the ground, as shown on the drawings or as directed by the A/E. Hydrant steamer connection shall be positioned facing the roadway with 2-1/2-inch connections facing parallel to the roadway. At no time shall a hydrant steamer be positioned facing away from a roadway or parallel to the road.

C. Connection to Main

1. Connect each hydrant to the main with a 6 inch ductile cast iron branch, as applicable, and a gate valve of the size indicated on the plans. The cost of the ductile cast iron branch shall be included in the unit price for the hydrant, where applicable.

D. Hydrant Drainage

1. Provide drainage at the base of the hydrant by placing coarse gravel or crushed stone from the bottom of the trench to at least 6 inches above the waste opening in the hydrant to a distance of 1 foot around the elbow. Connect no drainage system to a sewer.

E. Anchorage for Hydrants

1. Rod the gate valve ahead of each hydrant to the tee, and rod the hydrant from the gate valve. Brace the bowl of each hydrant well against unexcavated earth at the end of the trench with stone slabs or concrete blocking. Where rods cannot be used, metal harness may be used. Metal harness, steel rods, or clamps shall be galvanized or otherwise rustproof treated as approved by the A/E. Self restraining fittings may be allowed in conjunction with concrete thrust blocking.

END OF SECTION

SECTION 02713

WATER LINES

PART 1. GENERAL

1.1 Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

1.2 Wherever reaction blocking is necessary, it shall be considered an integral part of the water line work, and no separate payment shall be made for it.

1.3 Due to location, size and/or complexity of proposed water lines, the use of ductile iron pipe may be required at the discretion of the Water Department Supervisor. At any time there is a dead-end proposed within a development where there is an option to connect a water line to prevent any dead-end, the city staff will have the discretion to require ductile iron pipe.

PART 2. PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile cast iron pipe shall be made of good quality ductile iron that meets the requirements for nodular iron castings of ASTM E8. It shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C150 except that all pipe with a diameter of 12 inches or less shall have a wall thickness of 0.25 inches and all pipe with a diameter of 14 inches or more shall have a thickness of 0.28 inches or greater.
- B. Ductile iron pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to the specifications of ANSI A21.51/AWWA C151. It shall be made and tested in accordance with ASTM A339 and shall be subjected to and able to withstand a hydrostatic pressure of 500 psi. The maximum depth of pits shall be half that allowed in the AWWA specifications.
- C. The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.

- D. The push-on, single gasket joints shall be either Fastite (manufactured by American Cast Iron Pipe Company), Tyton (U. S. Pipe and Foundry Company), Super Bell-Tite (Clow Corporation), or other joints of similar type and equal quality. They shall be UL approved and able to withstand 200 psi of operating pressure.
- E. The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- F. The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquidtight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- G. Enough lubricant shall be furnished with each pipe order to provide a thin coat on the spigot end of each pipe. This lubricant shall be approved for being in contact with potable water and shall be nontoxic, impart no taste or smell to the water, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe. In no case shall lubricant other than that supplied by the pipe manufacturer be used.
- H. Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110.
- I. Pipe and fittings shall be lined with enamel or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- J. Fitting laying lengths shall conform to ANSI A21.10/AWWA C110, short body.

- K. Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.
- L. The pipe manufacturer is to furnish the A/E a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with ANSI A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the serial number of each piece of pipe making up the shipment. In addition, the weight of each individual piece of pipe making up the shipment is to be listed opposite the serial number of each pipe length and attached to the certificate of inspection.

2.2 PVC PIPE

- A. All plastic pipe shall be made from Class 12454-B polyvinyl chloride plastic (PVC 1120) as defined by ASTM D1784.
- B. All Class 200, 250, or 315 pipe shall have NSF approval and be manufactured in accordance with ASTM D2241. The following tests shall be run for each machine on each size and type of pipe being produced, as specified below:
 - 1. Flattening Test: once per shift in accordance with ASTM D2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.
 - 2. Acetone Test (Extrusion Quality Test): once per shift in accordance with ASTM D2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the test.
 - 3. Quick Burst Test: once per 24 hours in accordance with ASTM D1599.

<u>SDR</u>	<u>Pressure Rating</u>	<u>Minimum Bursting Pressure, psi</u>
13.5	315	1,200
17	250	1,000
21	200	800

4. Impact Tests: for 6 inches and larger, once per shift in accordance with ASTM D2444; for 4 inches and smaller, once each two hours in accordance with ASTM D2444.
 5. Wall Thickness and Outside Dimensions Tests: once per hour in accordance with ASTM D2122.
 6. Bell Dimension Test: once per hour in accordance with ASTM D3139.
- C. If any specimen fails to meet any of the above mentioned tests, all pipe of that size and type manufactured between the test periods must be scrapped and a full set of tests rerun.
- D. Furnish a certificate from the pipe manufacturer stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimensions, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these specifications.
- E. All pipe shall be manufactured in the United States of America. All pipe for any one project shall be made by the same manufacturer.
- F. All 6-inch pipe may be furnished in the manufacturer's standard laying lengths of 20 feet, 38 feet, or 40 feet. Pipe 8 inches and larger shall be furnished in 20 foot lengths. The Contractor's methods of storing and handling the pipe shall be approved by the A/E. All pipe shall be supported within 5 feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed water line routes will not be allowed.
- G. Certain information shall be applied to each piece of pipe. At the least, this shall consist of:
1. Nominal size

2. Type of material
 3. SDR or class
 4. Manufacturer
 5. NSF Seal of Approval
- H. Pipe that fails to comply with the requirements set forth in these specifications shall be rejected.
- I. The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaimed rubber will be allowed. Gasket materials shall meet the requirements of ASTM F477. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radially compressed to the pipe and locked in place against displacement, thus forming a positive seal.
- J. The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F.
- K. Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be approved for being in contact with potable water and shall be nontoxic, impart no taste or smell to the water, have no harmful effect on the gasket or pipe material, and support or promote any bacterial growth. The lubricant containers shall be labeled with the manufacturer's name. In no case shall lubricant other than that supplied by the pipe manufacturer be used.
- L. Joints shall be manufactured in accordance with ASTM D3139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be either integral bell and ring joints with rubber compression gaskets as manufactured by the Clow

Corporation, Johns-Manville, or Vulcan Plastic Corporation; twin gasket couplings as manufactured by the Certain-Teed Products Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.

- M. Standard and special fittings shall be gray iron or ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe.
- N. Fittings shall be lines with enamine or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- O. Fitting laying lengths shall conform to ANSI A21.10/AWWA C110.
- P. Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.
- Q. All PVC pipe shall be installed within one year from the date of manufacture. Any PVC pipe that is older than one year shall not be installed and will be rejected.

PART 3. EXECUTION

3.1 INSTALLATION PROCEDURES

- A. Verify on site storage location for pipe and supplies, with contractor, is adequate to allow accessibility for inspections.
- B. Ensure all water fittings, hydrants, and other apparatus is stored off the ground to stay as clean as possible. Pipe shall not be strung out in the mud unless the ends of pipes are sealed.
- C. Construction can only begin when approved plans from TDEC have been received and shop drawings have been submitted to the inspector.
- D. Start of Construction Notice will be submitted to TDEC and to the City's inspector before laying any water lines.

- E. All water lines will be laid in accordance with City specifications and under daily inspections conducted by the City. The water line disinfection process will also be performed in accordance with the City's Standard Water Specifications and verified by the City inspector.
- F. Tracer wire (12 gauge) will be taped to the top of water lines and will be looped up into each valve box with enough slack to allow locating equipment to be attached.
- G. Tracer tape will be installed, at a minimum of one foot, above the water line to locate when digging is required.
- H. Chlorine will be used in water lines to disinfect in accordance with American Water Works Association (AWWA) guidelines. The contractor must follow AWWA Methods of Chlorination Section 4.4.2 "Placing of Calcium Hypochlorite Granules. During construction, Calcium Hypochlorite Granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-foot intervals. The quantity of granules shall be as shown in the following table.

**65% HTH granules/powder Required for 24 hour detention time
New Construction**

Pipe Diameter	Pipe Length									
	100 ft ounces	200 ft ounces	300 ft ounces	400 ft ounces	500 ft ounces	600 ft ounces	700 ft ounces	800 ft ounces	900 ft ounces	1000 ft ounces
4"	1	2	3	3	4	5	6	7	8	9
6"	2	4	6	8	10	11	13	15	17	19
8"	3	7	10	13	17	20	23	27	30	34
10"	5	11	16	21	26	32	37	42	47	53
12"	8	15	23	30	38	45	53	60	68	76
16"	13	27	40	54	67	80	94	107	121	134
18"	17	34	51	68	85	102	119	136	153	170
24"	30	60	91	121	151	181	211	242	272	302

Source: Table 1 AWWA C651-99, corrected from weight to volumetric using specific gravity = 0.8, then applying a 2.0 safety factor. All values have been rounded to the nearest ounce.

- I. The end of lines will be plugged each time it is left unattended.

Examples: Given segment is 8-inch at 659 ft Go into table at 8" and look at 700 ft (round up) - need 23 ounces for the entire segment. 659 ft/ 19.5 nominal joint lengths = 34 joints 34 joints/ 23 ounces= 1.5 joints per ounce which is 2 ounces per 3 joints OR 23ounces/ 34 joints = 0.675 ounces per joint which is 2 ounces per 3 joints

- J. While the water line is being laid, it will be kept clean of soil and debris. Continually inspect pipes and valves for contaminants entering new lines and provide decontamination processes as approved by the inspector.
- K. When the water line installation is finished, the line may be filled through a jumper, eliminating all air pockets, followed by pressure testing. Once the pressure test is completed and documented, the highly chlorinated water will be flushed from the new water line until the residual chlorine level is in range of existing systems. The set of bacteriological samples are to be pulled 48 hours after flushing the highly chlorinated water from the water line. Samples will be collected at approximately 2,500 feet intervals, with samples near the beginning point, ending point and each branch.
- L. In accordance with AWWA standards, new water lines will not be connected to the existing distribution system until item K (above) has been completed and documented. When the new water line has a negative reading on the bacteriological test, the line may be connected to the existing distribution system. If the bacteriological sample is positive, the new water line must be re-chlorinated. A chlorine reading will be taken after re-chlorinating the water line to determine how much chlorine residual is in the line and then flushing must be repeated before the second set of bacteriological samples are to be pulled. If the second set of bacteriological samples read positive then the new main must be re-chlorinated and a third set of bacteriological samples are to be pulled. Once the connection is completed and additional bacteriological samples are determined to be negative, the water line will be flushed and put into service.
- M. Inform the water plant supervisor the line is on service to add to their sampling sites. Also inform the Fire Department and GIS Department locator in order to add the hydrants and valves to the system.

3.2 INSTALLATION OF WATER LINES

- A. Lay water lines to and maintain at the lines and grades required by the drawings. All fittings, valves, and

hydrants shall be at the required locations, the spigots centered in the bells, and all valves and hydrant stems plumb.

- B. Unless otherwise indicated by the drawings, all water pipes shall have at least 30 inches of cover. No departure from this policy shall be made except with the approval of the A/E.
- C. Provide and use tools and facilities that are satisfactory to the A/E and that will allow the work to be done in a safe and convenient manner. All pipe, fittings, valves, and hydrants are to be unloaded from the trucks using suitable tools and equipment. Use a derrick, ropes, or other suitable tools or equipment to lower all pipe, fittings, valves, and hydrants into the trench one piece at a time. Lower each piece carefully so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances drop or dump water line materials into the trench.
- D. Any pipes strung out along the route of the proposed lines before the actual installation of those lines is due to take place shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. PVC pipe shall be strung out a maximum of one day ahead of pipe laying. Remove all unnecessary material from the bell and spigot end of each pipe. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell, and leave dry and oil-free.
- E. Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside, then put a heavy, tightly woven canvas bag of suitable size over each end of the pipe, and leave in place until it is time to connect that pipe to the one adjacent to it.
- F. Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- G. After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and then insert to the depth specified by the manufacturer

and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.

- H. Bell holes shall be big enough so that there is ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so that each pipe barrel will rest on a solid foundation for its entire length.
- I. Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug or by other means approved by the A/E. If the joints of any pipe in the trench cannot be completed until a later time, caulk them with packing in order to make them as watertight as possible; this shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.
- J. Cut pipe so that valves, fittings, or closure pieces can be inserted in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- K. Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the A/E.
- L. Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer, and shall be approved by the A/E.
- M. Lay no pipe in water or when it is the A/E's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, its use is considered incidental to the project, and no separate payment will be made for its use.
- N. Where a water line crosses over a sanitary sewer, use a full joint of pipe with a standard mechanical joint, and

center over the sewer. Where a water line is to be parallel to a sanitary or storm sewer, lay it at least 10 feet from the sewer. If it is not practical for the water and sewer lines to be separated as described above, then lay the water line at least 18 inches above the top of the sewer.

- O. Joint all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials. The contractor shall review all pipe being submitted and proposed for the project to ensure it is compatible with all jointing materials such as valves, fittings, adaptors, etc. Any non-compatible materials submitted by the contractor and which requires additional adaptors, replacement of valves, or additional items of work shall be at the expense of the contractor.

- P. For detection purposes, a 12 gauge solid strand copper tracing wire (shielded) will be taped to the top of the new water line. Connections between wires shall be soldered or connected with wire nut fasteners and wrapped. An approved metallic tape identified as "water" shall be installed as per the manufacturer's instructions. Tracer tape will be installed, at a minimum of one foot, above the water line to locate when digging is required.

3.3 HYDROSTATIC TESTS

A. Pressure Test

- 1. After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All services are to be laid prior to testing the main and tested as part of the test of the main.

- 2. The duration of each pressure test shall be at least one hour.

- 3. Slowly fill each valved section of pipe with water, and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the A/E. Furnish the pump, pipe,

connections, gauges, and all necessary apparatus.

4. Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.
5. Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the A/E.

B. Leakage Test

1. Conduct the leakage test after the pressure test has been satisfactorily completed. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.
2. The duration of each leakage test shall be two hours; during the test, subject the main to a pressure of 150 psi.
3. Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
4. No pipe installation will be accepted until the leakage is less than the number of gallons per two hour period listed below:

<u>Pipe Sizes</u>	<u>Gallons per 1,000 Feet of Pipe</u>
6 inches	0.9
8 inches	1.2

<u>Pipe Sizes</u>	<u>Gallons per 1,000 Feet of Pipe</u>
10 inches	1.5
12 inches	1.9
14 inches	2.2
16 inches	2.6
18 inches	2.9
20 inches	3.2
24 inches	3.8

5. Should any test of pipe laid disclosure leakage greater than specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

3.4 DISINFECTION

- A. During construction, take precautions to protect pipe interiors, fittings, and valves against contamination. When pipe laying is not in progress (e.g., at the end of the day's work), place watertight plugs in the ends of all pipe already in the trench; if water accumulates in the trench, leave the plugs in place until the trench is dry. Complete the joints of all pipe in the trench before stopping work for any reason.
- B. If dirt or other foreign material that has gotten into a pipe will not, in the opinion of the A/E, be removed by flushing, clean the interior of the pipe, and swab with a disinfecting solution of 5% hypochlorite.
- C. Make water flow from the existing distribution system or some other source approved by the A/E into the newly laid pipeline, and add chlorine to it. Feed water into the pipe, and chlorine into the water, at constant, measured rates so proportioned that the chlorine concentration in the water in the pipe is kept at a minimum of 50 mg/l available chlorine. To ensure that this concentration is maintained, measure the chlorine residual at regular intervals.
- D. Table I shows how much chlorine is needed for each 100 feet of line for pipes of various diameters. A 1% chlorine solution may be prepared either with 1 pound of calcium hypochlorite for each 8.5 gallons of water or with sodium hypochlorite.

TABLE I

CHLORINE REQUIRED TO PRODUCE A 50 MG/L CONCENTRATION
IN 100 FEET OF PIPE, BY DIAMETER

<u>Pipe Size (Inches)</u>	<u>100% Chlorine (Pounds)</u>	<u>1% Chlorine Solutions (Gallons)</u>
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88
14	0.328	3.96
16	0.428	5.12
18	0.540	6.48
20	0.680	8.00
24	0.980	11.52

- E. While the chlorine is being applied, manipulate valves so that the treatment dosage will not flow back into the line that is supplying the water. Continue the application of chlorine until the entire line being treated is filled with the chlorine solution. Then retain the chlorinated water in the line for at least 24 hours, during which time all valves and hydrants in the line being treated shall be operated so that appurtenances can also be disinfected. After 24 hours, the treated water shall have a chlorine concentration of at least 25 mg/l throughout the line.
- F. After the applicable retention period, flush the heavily chlorinated water from the line until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/l. Perform such flushing only at sites where there is adequate drainage.
- G. The velocity of the water used to flush a line shall be at least 2.5 fps. The flow rates required to produce this velocity in various sizes of pipe are shown in Table II.

TABLE II

REQUIRED OPENINGS TO FLUSH PIPELINES
(40 PSI RESIDUAL PRESSURE)

Pipe Size (Inches)	Flow Required to Produce 2.5 fps Velocity (gpm)	Orifice Size (Inches)	Hydrant Outlet Nozzles	
			Number	Size (Inches)
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2
14	1,200	3-1/42	2	2-1/2
16	1,565	3-5/8	2	2-1/2
18	1,980	4-3/16	2	2-1/2
20	2,440	---	2	2-1/2
24	3,470	---	2	2-1/2

- H. Once a line has been flushed, test to make certain that the residual chlorine in the water is within acceptable limits.
- I. It must be noted that flushing is no substitute for taking preventative measures before and during the laying of water lines. Certain contaminants especially those in caked deposits are difficult or even impossible to remove by flushing, no matter how high the velocity. Furthermore, in pipes with diameters of 16 inches or more, it can be difficult to achieve even the minimum recommended flushing velocity of 2.5 fps.

3.5 WATER LINE REPAIR PROCEDURES

We recognize that chlorine is an effective disinfectant for only some of the contaminants that may enter a line during a leak. Chlorine is ineffective for chemicals and cryptosporidium and many other possible contaminants.

Therefore the primary concern during repairs will be to maintain the integrity of the line. This will be accomplished by

1. Valve off the line downstream from leak.
2. Reduce the flow upstream from the leak but allow enough flow to maintain a positive pressure at the leak site.
3. Cover shall be removed from the line at the leak and a hole approximately 18" lower than the line shall be dug. Excess water shall be pumped or dipped from the hole until all cover is removed from the pipe at the leak.
4. If the leak can be repaired with a full circle clamp, repair will be made the line will be flush and service restored. No further action will be taken.
5. If the line will have to be cut and section replaced, the following actions will be taken.
6. Upstream valve will be closed and excess water will continue to be pumped from the leak site and all cover will be removed from pipe at least 18" in both directions from the cut sites on pipe.
7. The customer's service will be cut off to protect from contaminants.
8. A 1% hypochlorite solution will be prepared by adding 2 oz. of 65% HTH to 1 gallon of water.
9. The surrounding area will be checked for signs of broken sewer or septic lines and animal waste. If present, special care must be taken and some of the 1% hypochlorite solution should be scattered around the work site.
10. Work can now proceed with the cutting of the pipe. Once the defective section is removed, both ends of the remaining

pipe should be checked and any debris from pipe cuttings or other sources should be removed.

11. The new section of pipe and both ends of the remaining pipe should be swabbed with the 1% hypochlorite solution and repairs completed.

12. Upstream valve will be opened and the nearest hydrant downstream of line leak will be flushed vigorously at a velocity of at least 2 ft. per second. Highly chlorinated water should be de-chlorinated. To determine how long to flush a line divided the estimated distance (feet) between the upstream valve and the nearest flushing site by two. Example (if the flushing point is 3000 ft. from the leak site the line should be flushed a minimum of 1500 sec. or 25 minutes.) Flushing shall continue until chlorine residual readings are equal at the flushing site and at a site upstream from the repaired line. In addition, flushing shall continue until turbid water is no longer visible at the flushing site. These steps will be taken on the downstream valve as the upstream valve.

13. After the line is flushed at least one bacteria sample shall be obtained immediately prior to service being restored. This sample shall be coded as type "D." If the sample is negative no further action is required other than to properly and fully document the repaired event and procedures. If the sample is positive, then the original positive site will be resampled and 3 repeat samples will be obtained in the downstream area of the repair and from customer taps within 24 hours of notification of the positive sample. The original site will be coded as "R" and each of the three downstream samples, and will be coded as "R", repeat distribution samples, and will be counted as compliance samples

14. If all 4 samples are negative, no further action will be taken. If the sample from the original site is positive and the other 3 are negative, the system may ask the state to invalidate the sample as site specific due to a contaminated tap and no further action will be required. If any of the downstream samples are positive, normal repeat sample monitoring procedures become effective. If any repeat sample is fecal coliform positive or E-coli positive or if the repeat sample following an initial positive fecal coliform or E-coli sample is total coliform positive, the system will issue a Tier-1 Boil Water Notice.

15. If it is suspected that the line may have had contaminants enter the line, slug disinfection shall be employed to disinfect the line. The line shall be slug disinfected from closed valve to closed valve. Slug disinfection consists of putting HTH in a line, completely filling the line with water and slowly flowing the slug of water through the line. The slug should contain about 100ppm free chlorine and flow rates adjusted to keep the chlorine in contact with the line for about three hours. Chlorine will be added to the line in addition to all of the above procedures. Chlorine doses needed per 1000 feet of pipe: 2" pipe 1oz. of 65% HTH, 4" pipe 4oz. of HTH, 6" pipe 8oz. of HTH, 8" pipe 16oz. of HTH will produce about 25 ppm free chlorine. If the suspected contaminant is not affected by chlorine, alternative measures must be employed to remove the contamination.

16. Service line of one-inch diameter or less will not have any samples taken or additional disinfectant added. The leak will be clamped off to prevent any contaminant from entering the main line. The service line will be flushed and chlorine residual will be taken. Line larger than one-inch in diameter will be treated as a water main.

17. For any repair procedure, detailed records of the repair must be prepared documenting the procedure utilized, disinfection information, contact time, dose calculations, bacteriological sample time and location. Bacteriological sample results shall be attached to corresponding repair records.

3.6 BACTERIOLOGICAL TESTS

A. After a water line has undergone final flushing but before it is placed into service, collect a sample for bacteriological testing from the end of that line. In the case of extremely long lines, take additional samples if the engineer or inspector so directs.

B. Collect these samples in sterile bottles treated with sodium thiosulfate. Do not use a hose or fire hydrant to collect samples. One suggested sampling method is to install a standard corporation cock in the line with a PEX tube gooseneck assembly; after the samples have been taken, the gooseneck assembly can be removed and retained for later use.

C. Take the samples collected to an approved laboratory to be

tested for bacteriological quality in order to determine if they contain any coliform organisms. If the initial disinfection fails to produce satisfactory samples, repeat disinfection until satisfactory samples are obtained.

D. When the samples tested are found to be satisfactory, the water line may be placed in service.

3.7 DISINFECTION PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING LINES

A. The procedures outlined above apply primarily to cases in which the lines are wholly or partially dewatered.

B. However, leaks or breaks that are repaired with clamping devices while the lines remain full of water under pressure present little danger of contamination and require no disinfection.

C. When an existing line is opened, whether by accident or design, the excavated area could be wet and contaminated because of the presence of sewers nearby. The danger of contamination from such pollution can be lessened if liberal quantities of hypochlorite are applied to the open trenches. It is better to use tablets for disinfection in such cases because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation site.

D. Where practical, treat the lines by the slug method in accordance with ANSI / AWWA C651.

E. The following disinfection procedure is considered the minimum that may be used when existing lines are repaired:

1. Swab the interior of all pipes and fittings (particularly couplings and tapping sleeves) that are to be used in repairing an existing line with a solution of 5% hypochlorite before installing them.

2. The most practical means of removing contamination introduced into a line during repairs is to give the line a thorough flushing. If the locations of valves and hydrants make it possible, flushing in both directions is recommended. Start flushing as soon as repairs are completed, and continue until all discolored water is eliminated.

3.8 CLEANUP

- A. After completing each section of water line, remove all debris and all construction materials from the work site. Then grade and smooth over the surface of both sides of the line. Leave the entire area clean and in a condition satisfactory to the A/E.

END OF SECTION

0100-000
02713-20

SECTION 02718

SERVICE ASSEMBLIES

PART 1. GENERAL

1. Refer to other sections for work related to that specified under this heading.

PART 2. PRODUCTS

2.1 The service assembly shall include a corporation cock, PEX service pipe gooseneck, meter yoke, meter, meter box, and tapping saddle as required.

2.2 CORPORATION COCK: The corporation cock shall be of solid bronze suitable for a compression flange on the service pipe and for tapping into the water main at a vertical angle. This cock shall be similar to Mueller H-15000, or equal. The threads on the corporation cock shall be Mueller.

2.3 SERVICE PIPE: Service pipe shall be 3/4 inch PEX meeting ASTM F876 and SDR9 PEX tubing size. A currently approved alternate is polyethylene service line meeting SDR9 sizing, CSA B137.5, ASTM F876 & F877, NSF Standard 14 & 16, chlorine resistance in accordance with ASTM F876 when tested in accordance with ASTM F2023 and UV resistance according to ASTM F2657. Polyethylene service line adaptors/tube fittings shall be stainless steel type suitable for application with compression couplings. Should at any time the City of Spring Hill Water Department determine polyethylene not to be an adequate alternative as a service line material then PEX shall be solely utilized. Goosenecks shall be a minimum of 3 feet long.

2.4 METER YOKES: Meter yokes 5/8 inch x 3/4 inch with compression fittings shall be Mueller H-1401-2 with H-14227 and H-14222 3/4 inch tailpieces, or Ford VBH72-7W-4133Q with appropriate tailpieces, or equal, with integral angle stop and provisions for locking. Meter yokes for 2" shall be 2" Ford VBH77-12B, or 2" Mueller B-2422-2. Note 2" yoke must have a bypass line. Each assembly shall include a meter check valve.

0100-000

02718-1

2.5 WATER METERS: All meters shall be frostproof, sealed register, displacement type with bronze cast and made by Badger Meters, Inc. Meters shall be straight reading in gallons. Meters 1-1/2 inches and larger shall have flanged connections and shall be Badger M25.

2.6 METER BOXES: Meter boxes for 5/8 inch x 3/4 inch assemblies shall be precast concrete, Brooks Products No. 36, 16 inches deep with No. 36-H cover. The box shall be installed with one course of brick as a base.

2.7 TAPPING SADDLES: Tapping saddles shall be used for tapping all PVC pipe and shall be all brass, or approved equal, and shall be threaded to accept the corporation cock specified above. No taps larger than 1 inch shall be made in any size pipe without approval by the A/E.

PART 3. EXECUTION

3.1 Make no taps on dry lines without approval from the A/E.

3.2 The service line shall have a minimum of 18 inches cover. After the line is installed and yoke set, turn water on service pipe between yoke and main, blowing any accumulated trash out of the pipe.

3.3 In general, install the meter box as near the property lines as possible in the street right-of-way. Set plumb approximately 1 inch above the existing or proposed grade and so that surface drainage will not enter it. Fill from the existing or proposed grade to the top of the meter box at a slope of 1 inch in 12 inches. When the cut or fill slopes on streets extend beyond the street right-of-way, install the meter box at the top or toe of slope, as applicable, or as directed by the A/E.

3.4 The service main shall not be taut from stop to cock.

3.5 Set the yoke plumb and level.

3.6 All service lines crossing new residential streets shall be installed within a minimum two (2) inch diameter Schedule 40 PVC casing pipe. All service lines crossing existing paved roads shall be bored and jacked and installed within a minimum two (2) inch diameter Schedule 40 PVC casing pipe. A minimum size 12 gauge

copper wire shall be installed along the pipe for detection. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached.

END OF SECTION

0100-000
02718-3

SECTION 02725

BORING AND CASING FOR WATER LINES

PART 1. GENERAL

1.1 The work to be performed hereunder shall consist of the installation of casing pipe and carrier pipe for all pressure pipes (water lines and force mains) as shown on the drawings or as called for in these specifications. For the open cut casing pipes, it shall include the excavation of the trench, placing proper bedding material, furnishing and installing the casing pipe, furnishing and installing the carrier pipe, backfilling, and disposing of the excess excavated materials. For the boring and jacking of casing pipes, it shall include the excavation of a boring pit, auger boring between the point as specified on the drawings, furnishing and installing of the carrier pipe, and disposing of the excavated materials in the manner herein provided.

PART 2. PRODUCTS

2.1 CASING PIPE

- A. The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association "Specifications" for Pipelines for Carrying Flammable and Nonflammable Substances." The steel casing pipe shall have a minimum yield strength of 35,000 PSI and shall have the minimum wall thickness shown in the following table:

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE
FOR E72 LOADING

<u>Carrier Pipe Diameter</u>	<u>Casing Pipe Diameter</u>	<u>Nominal Thickness</u>
6 inches	16 inches	0.312 inches
8 inches	16 inches	0.312 inches
10 inches	20 inches	0.312 inches
12 inches	22 inches	0.312 inches
14 inches	24 inches	0.344 inches
16 inches	26 inches	0.375 inches
18 inches	28 inches	0.406 inches

- B. When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inches greater than the thickness shown.

2.2 CARRIER PIPE: The carrier pipe shall be PVC, SDR 21, unless otherwise noted on the drawings.

PART 3. EXECUTION

3.1 BORING

- A. The boring shall be accomplished by means of auguring to the size, line and grade shown on the drawings.

3.2 INSTALLATION OF CASING PIPE

- A. For open cut of casing pipes, install the steel casing pipe into the open cut as the trench excavation proceeds. Weld sections of casing pipe together to provide watertight joints, and replace the protective coatings in areas where it is damaged by welding.
- B. For boring casing pipes, jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide watertight joints.
- C. Do not remove unacceptable casing without prior approval from the A/E. If the removal of casing pipe is permitted, make proper provisions to prevent caving in of the earth surrounding the casing.

3.3 INSTALLATION OF CARRIER PIPE

- A. The carrier pipe shall be furnished by the Contractor. Upon acceptance of the casing, install the carrier pipe in the casing by jacking it through the casing. In order to achieve proper line and grade on the carrier pipe, install pipe spacers to the carrier pipe to offset any minor variations in the alignment of the casing and to secure the pipe within the casing.

3.4 LAYOUT OF WORK

- A. The Owner will provide the necessary control points required by the Contractor for this construction. The Contractor will provide the detailed layout required to keep the excavation and pipe installation on grade.

4. GUARANTEE OF WORK

4.1 Guarantee a usable completed casing between the points specified and to the line and grade specified. The allowable tolerance at the downstream end point of the casing shall be such that the invert of the carrier pipe may be positioned within a vertical area limited on the top by an elevation no higher than the elevation shown on the drawings and on the bottom by an elevation no lower than the existing inlet pipe invert.

4.2 The allowable tolerance at the upstream end point of the casing shall be such that the invert of the carrier pipe may be positioned at the elevation shown on the drawings.

END OF SECTION

0100-000
02725-3

SECTION 03303

CONCRETE FOR UTILITY LINES

PART 1. GENERAL

1.1 This item shall include furnishing and installing concrete blocking, cradles, anchors, caps, pipe protection, and/or encasement at the locations shown on the drawings and/or directed by Spring Hill's representative.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1 Concrete work shall conform to ACI 301-72 (as revised), as modified by the supplemental requirements below:

A. Strength

1. The strength of concrete shall be 3,000 psi unless otherwise shown on the drawings.

B. Durability

1. All concrete exposed to weather shall be air entrained.

C. Slump

1. Concrete shall be proportional and produced to have a slump of 3 inches with a 1 inch tolerance.

D. Admixtures

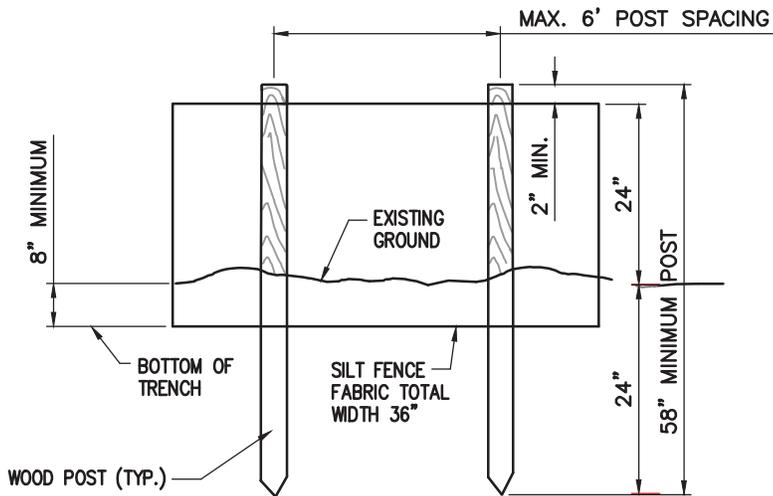
1. Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture (retarding, normal, or accelerating, depending on placing temperature), may be used if approved by the Spring Hill's representative.

E. Reinforcing Steel

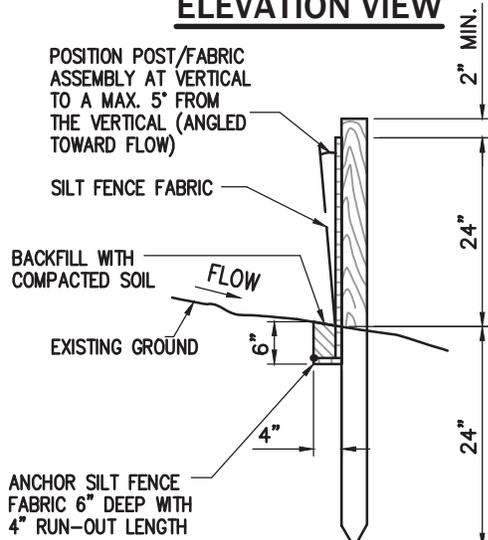
1. Yield strength of reinforcing steel shall be 60,000 psi.

END OF SECTION

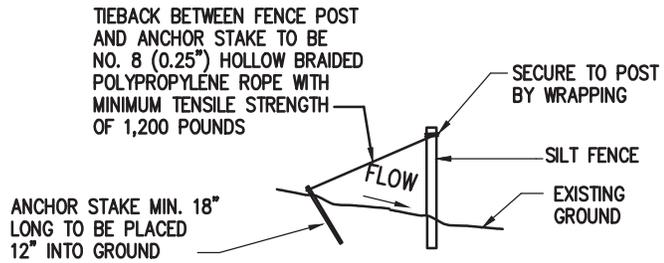
STANDARD DRAWINGS WATER



ELEVATION VIEW



SECTIONAL VIEW

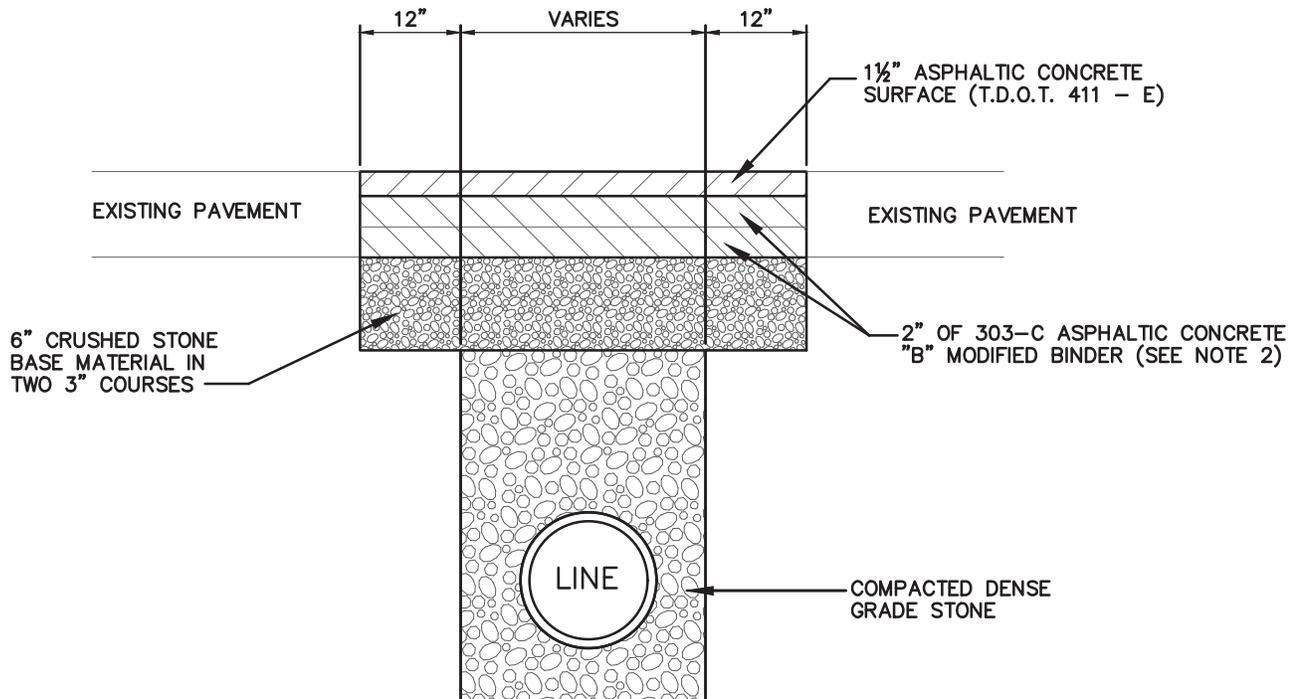


SILT FENCE TIEBACK FOR STEEL POSTS OR WOOD POSTS

NOTES:

1. POST TO BE HARDWOOD (OAK OR HICKORY) MIN. 2.25" X 2.25" (NOM.) (1.75" X 1.75" ACTUAL) (3.06 SQ. IN.).
2. STEEL POST TO BE MIN. 1.25 LB./FT. STD. "T" OR "U" SECTION - LENGTH 58".
3. USE A MINIMUM OF 18 POSTS PER 100 FEET OF FENCE.
4. WHEN REQUIRED BY THE ENGINEER OR NOTED IN THE PLANS, COST TO BE INCLUDED IN THE ITEMS FOR SILT FENCE.

TEMPORARY SILT FENCE DETAIL

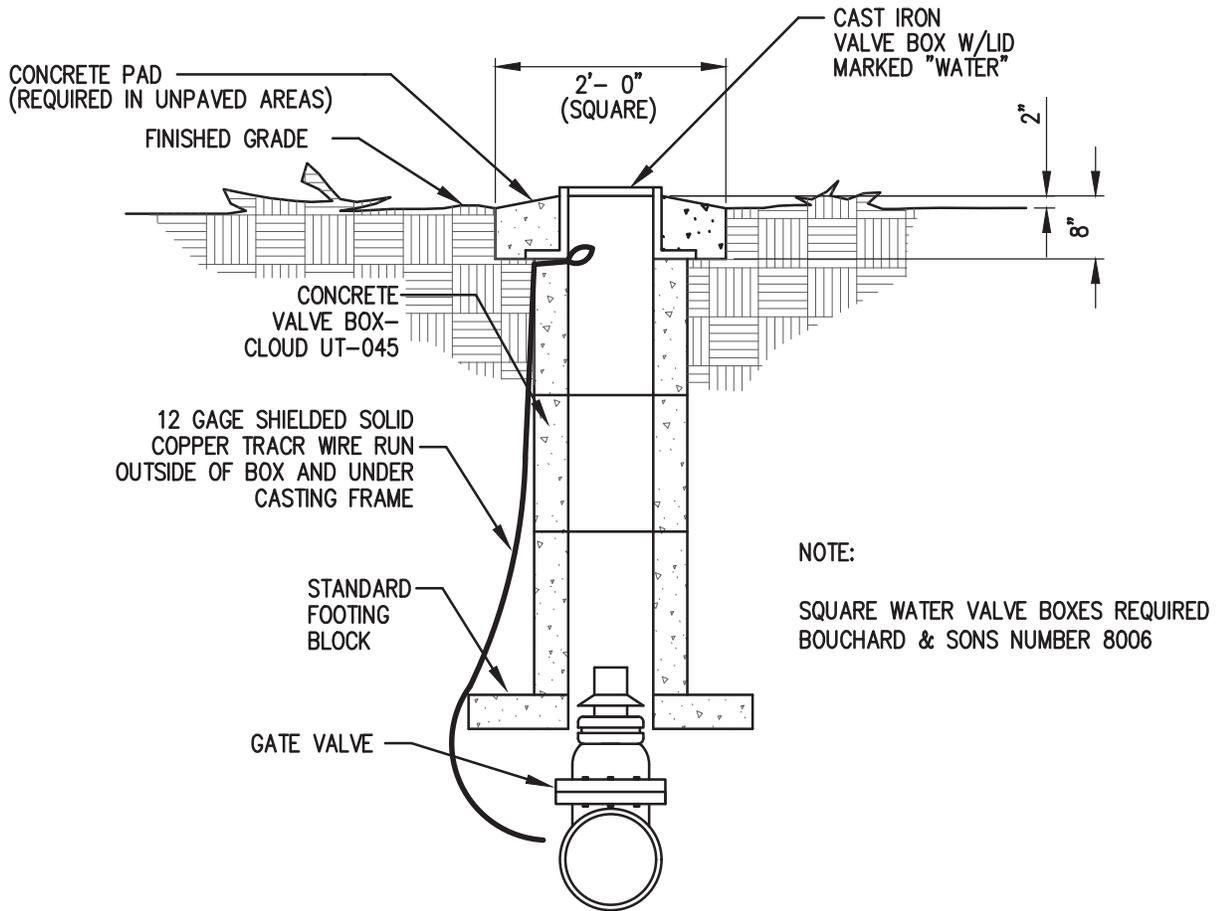


NOTE:

1. EDGE OF EXISTING PAVEMENT TO BE TRIMMED A MINIMUM OF 12" BEYOND EACH SIDE OF TRENCH WIDTH TO OBTAIN NEAT LINES. COLD MIX TO BE PLACED AS A TEMPORARY SURFACE WITHIN 48 HOURS OF MAKING ROAD CROSSING.
2. A MINIMUM OF TWO INCHES OF ASPHALTIC CONCRETE BINDER ("B" MODIFIED) SHALL BE REQUIRED FOR ALL PAVEMENT REPAIRS. AN ADDITIONAL TWO INCHES SHALL BE PLACED WHEN DIRECTED BY THE CITY OF SPRING HILL.

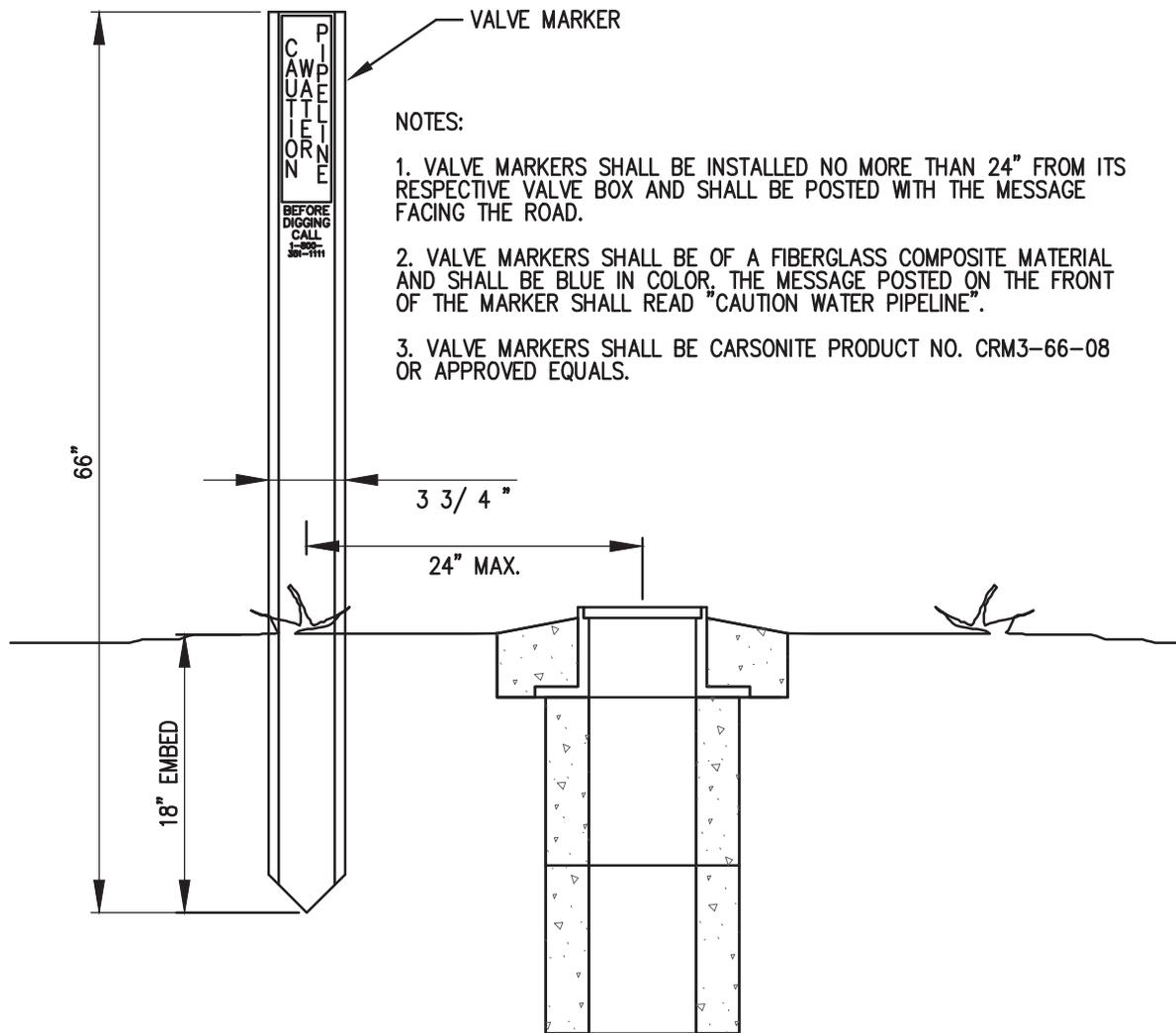
**PAVEMENT REPLACEMENT DETAIL
(BITUMINOUS BASE WITH SURFACE)**

N.T.S.



CONCRETE VALVE BOX SETTING DETAIL

N.T.S.



NOTES:

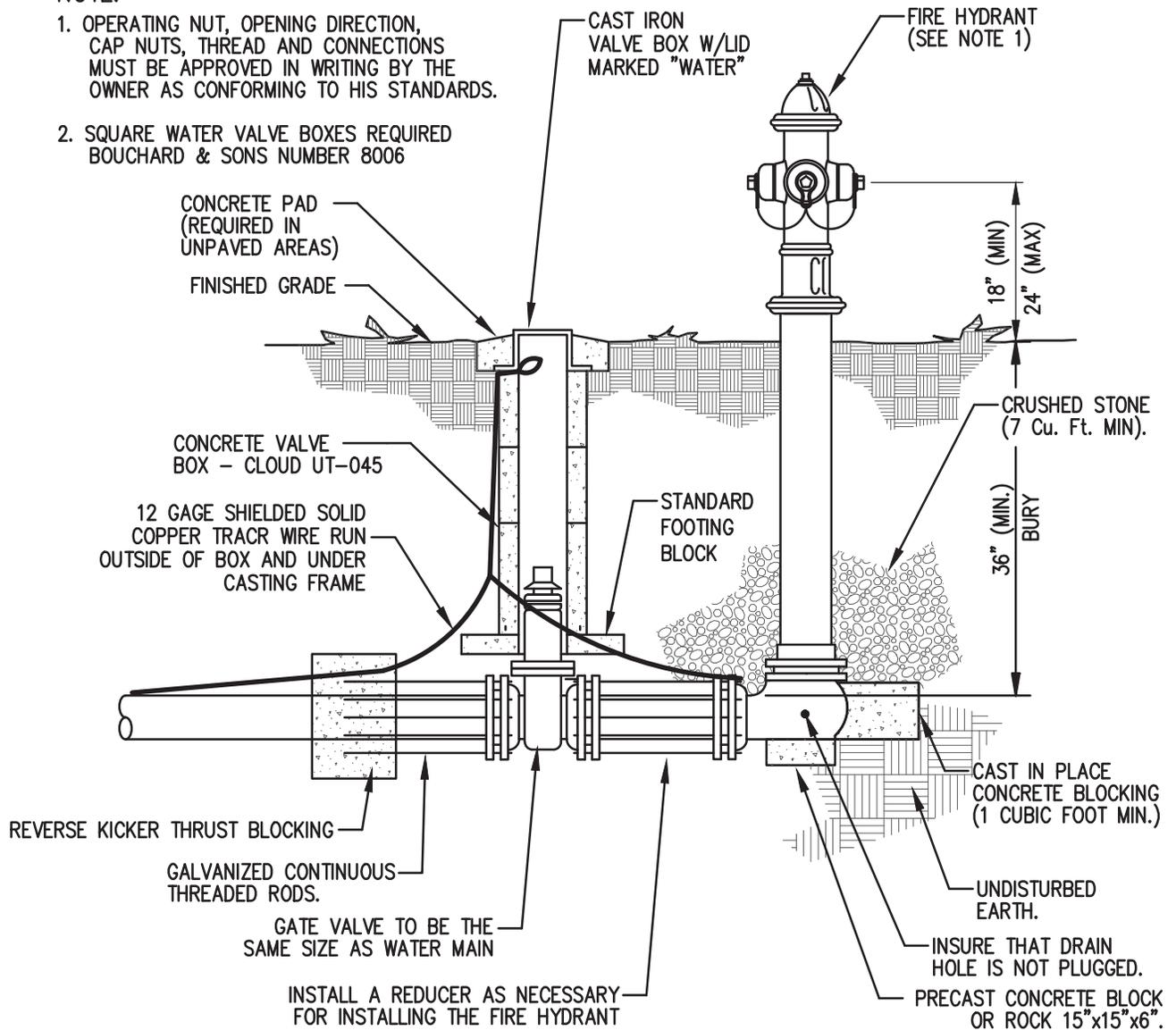
1. VALVE MARKERS SHALL BE INSTALLED NO MORE THAN 24" FROM ITS RESPECTIVE VALVE BOX AND SHALL BE POSTED WITH THE MESSAGE FACING THE ROAD.
2. VALVE MARKERS SHALL BE OF A FIBERGLASS COMPOSITE MATERIAL AND SHALL BE BLUE IN COLOR. THE MESSAGE POSTED ON THE FRONT OF THE MARKER SHALL READ "CAUTION WATER PIPELINE".
3. VALVE MARKERS SHALL BE CARSONITE PRODUCT NO. CRM3-66-08 OR APPROVED EQUALS.

WATER VALVE MARKER DETAIL

N.T.S.

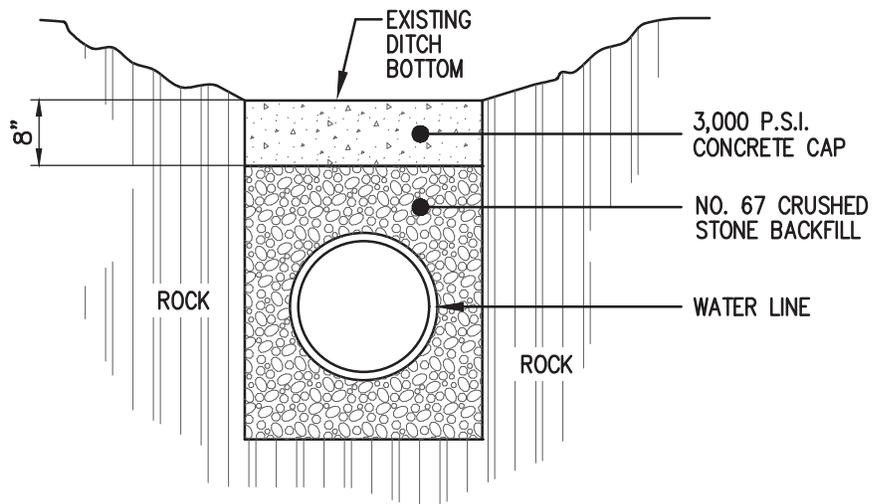
NOTE:

1. OPERATING NUT, OPENING DIRECTION, CAP NUTS, THREAD AND CONNECTIONS MUST BE APPROVED IN WRITING BY THE OWNER AS CONFORMING TO HIS STANDARDS.
2. SQUARE WATER VALVE BOXES REQUIRED BOUCHARD & SONS NUMBER 8006

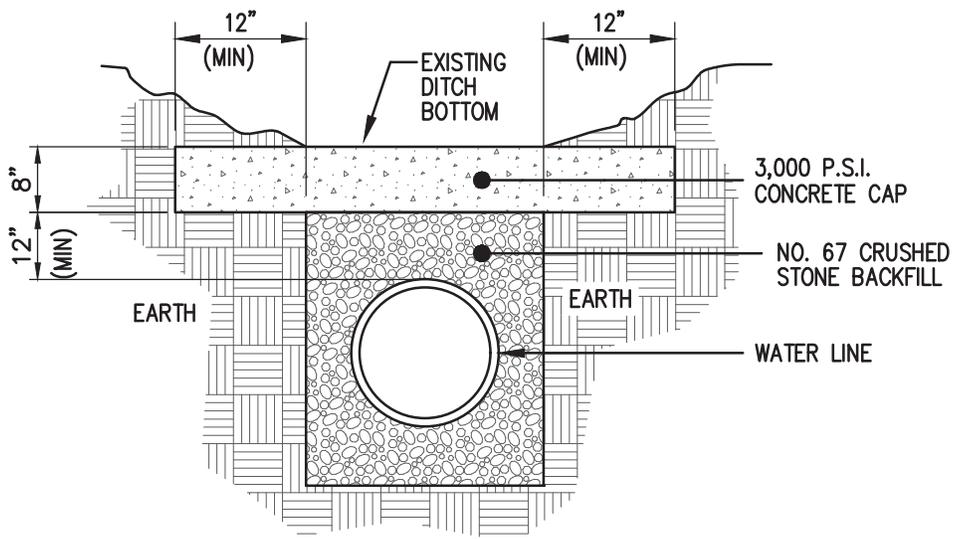


FIRE HYDRANT END-OF-LINE DETAIL

N.T.S.



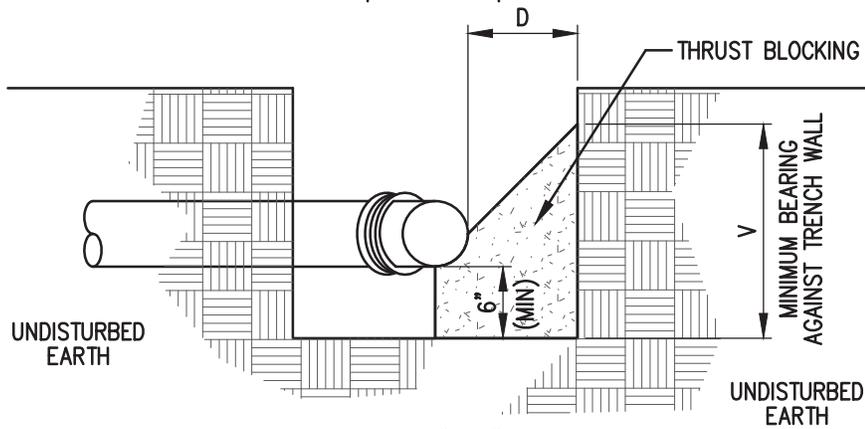
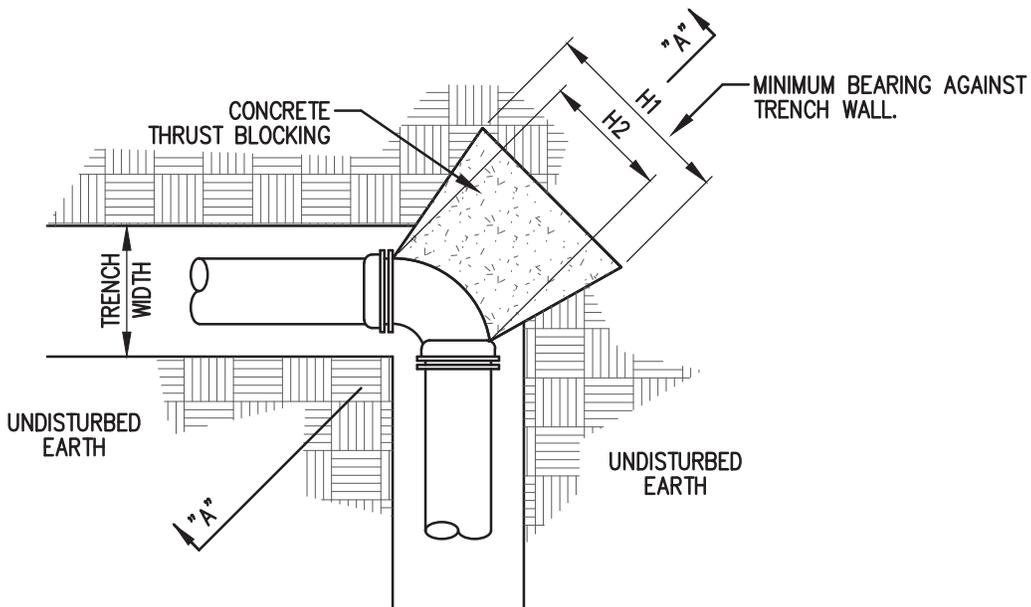
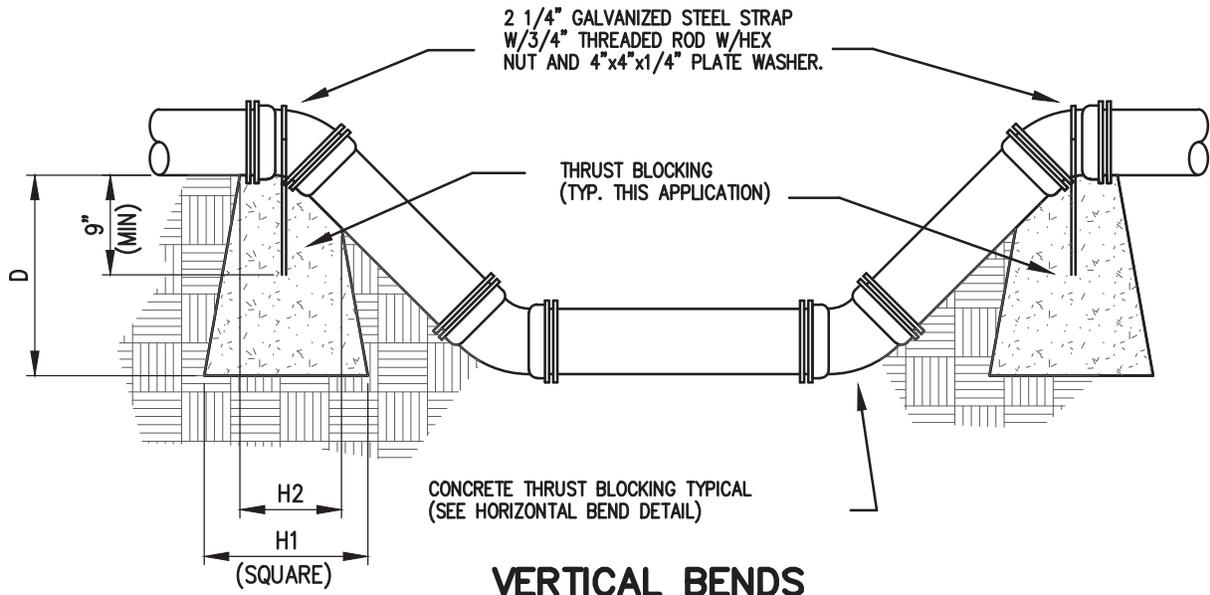
ROCK EXCAVATION



EARTH EXCAVATION

CONCRETE CAP DETAIL

N.T.S.



SECTION "A-A"
HORIZONTAL BENDS

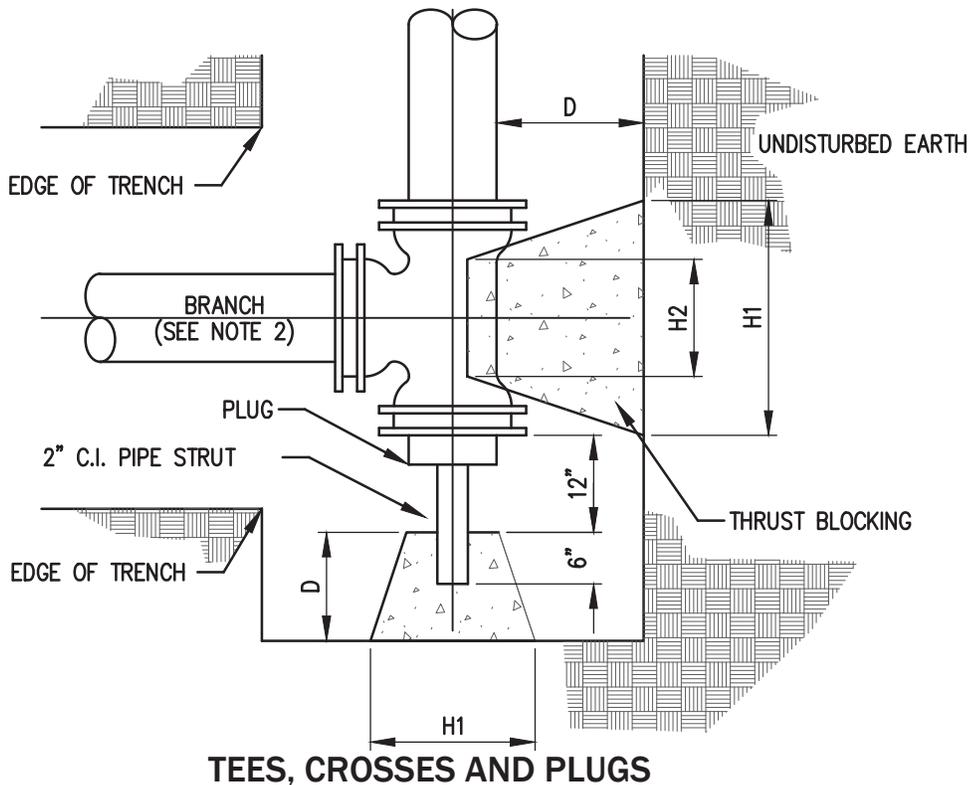
CONCRETE THRUST BLOCKING (1 OF 2)

N.T.S.

TEES, CROSSES, AND PLUGS					90° BENDS					45° BENDS					22-1/2° BENDS					11-1/4° BENDS					PIPE SIZE
H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	H1	H2	V	D	Cu.Ft.	
18"	10"	12"	18"	1.90	18"	10"	12"	18"	1.90	18"	6"	12"	18"	1.50	18"	6"	12"	18"	1.50	18"	6"	12"	18"	1.50	2" - 2 1/4"
24"	12"	12"	18"	2.25	24"	12"	12"	18"	2.25	18"	8"	12"	18"	1.60	18"	8"	12"	18"	1.60	18"	8"	12"	18"	1.60	3" - 4"
24"	16"	18"	18"	3.50	30"	16"	18"	18"	4.05	24"	10"	16"	18"	3.20	24"	10"	16"	18"	3.20	24"	10"	16"	18"	3.20	6"
36"	18"	18"	24"	5.05	39"	18"	24"	18"	7.30	30"	12"	18"	18"	3.95	24"	12"	18"	18"	3.45	24"	12"	16"	18"	3.40	8"
48"	24"	18"	24"	7.15	54"	32"	24"	18"	10.25	36"	18"	21"	18"	4.60	24"	18"	21"	18"	4.60	24"	18"	21"	18"	4.60	10"
54"	30"	24"	24"	13.40	54"	32"	36"	24"	18.15	42"	18"	24"	24"	9.60	24"	18"	24"	24"	6.60	24"	18"	21"	24"	6.10	12"
60"	32"	30"	24"	17.90	60"	40"	42"	24"	25.00	44"	24"	30"	24"	13.20	30"	24"	24"	24"	9.20	27"	21"	24"	24"	7.90	14"
66"	34"	36"	24"	22.50	69"	48"	48"	24"	29.00	48"	30"	36"	24"	17.00	36"	30"	27"	24"	11.80	27"	24"	27"	24"	9.10	16"
66"	36"	40"	24"	27.50	69"	48"	48"	24"	33.00	48"	30"	36"	24"	17.00	36"	30"	29"	24"	13.00	27"	30"	29"	24"	11.00	18"
	38"		24"			48"		24"			40"		24"			36"		24"			30"	40"		28"	20"
	42"		24"			60"		24"			48"		24"			42"		24"			42"			32"	24"
	58"		24"			96"		24"			72"		24"			72"		24"			48"			36"	36"

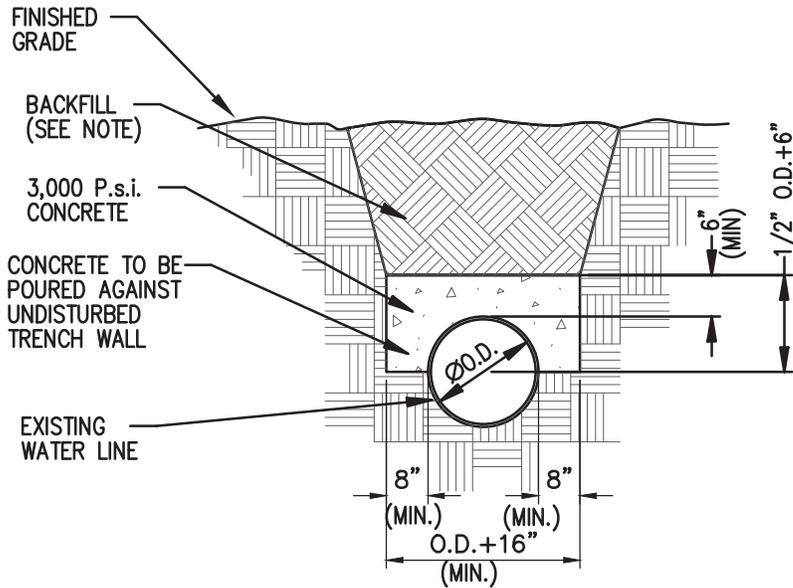
NOTES:

1. THRUST BLOCKING WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR CLASS "B" CONCRETE FOR THE VOLUME SHOWN IN THE ABOVE TABLE FOR EACH FITTING SO BLOCKED ONLY IF A SEPARATE ITEM APPEARS IN THE SCHEDULE OF A PROPOSAL FOR A UNIT PRICE CONTRACT. OTHERWISE, THERE WILL BE NO SEPARATE PAYMENT FOR CONCRETE THRUST BLOCKING.
2. DIMENSIONS ARE CONTROLLED BY DIAMETER OF BRANCH MAIN.

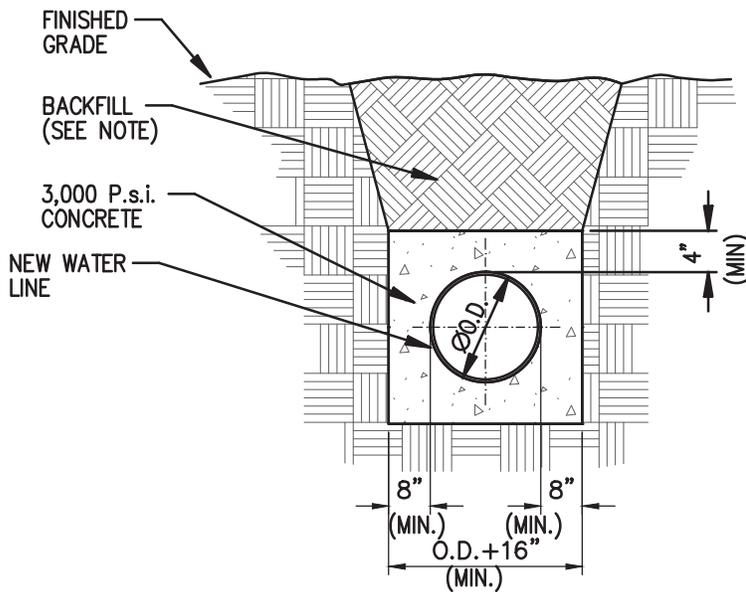


CONCRETE THRUST BLOCKING (2 OF 2)

N.T.S.



**TYPICAL CONCRETE PROTECTION
FOR EXISTING WATER LINES**

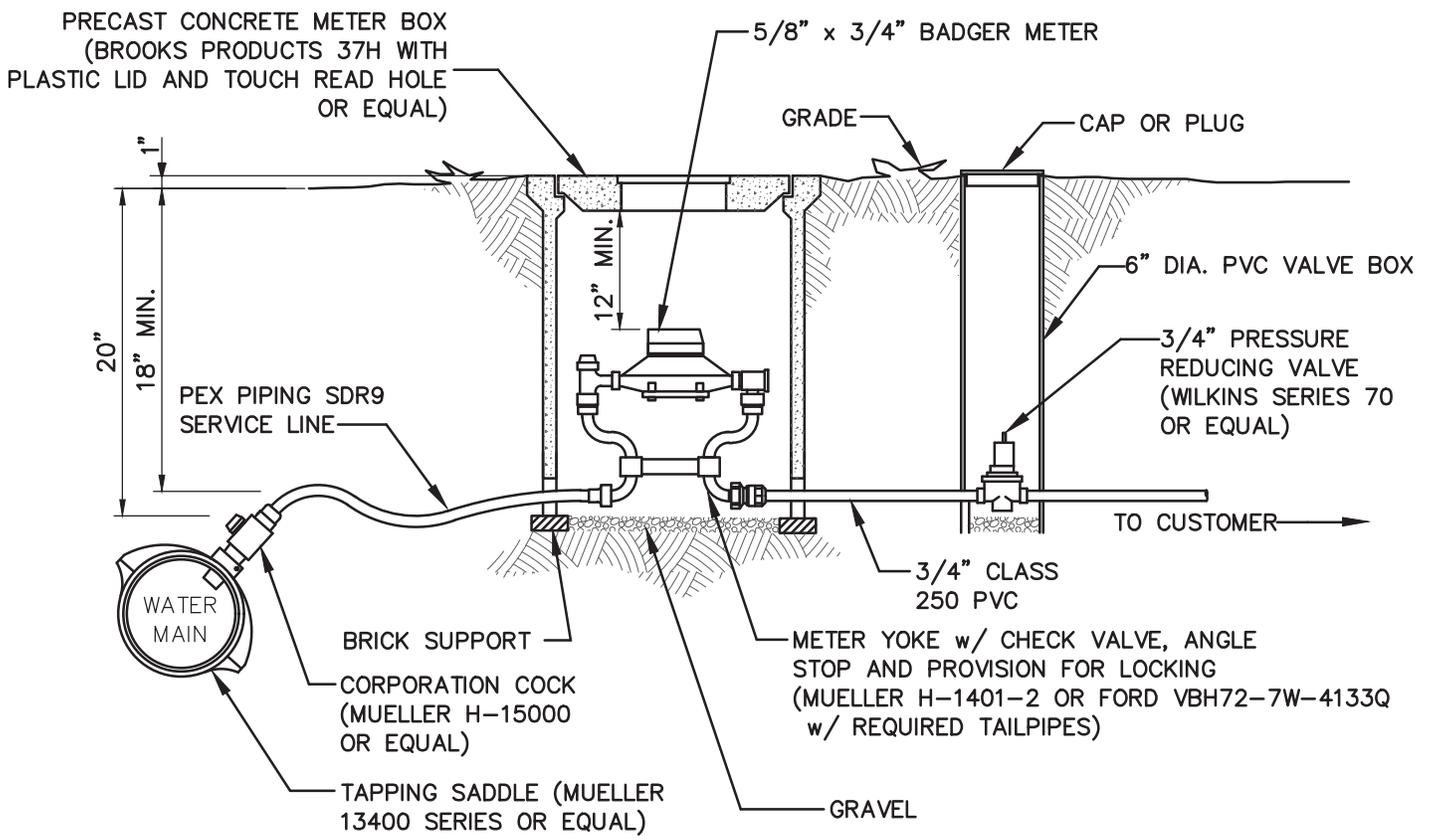


**TYPICAL CONCRETE PROTECTION
FOR NEW WATER LINES**

NOTE:
CONCRETE TO BE POURED 16 HRS.
BEFORE BACKFILL IS PLACED AND
IN SUCH A MANNER SO AS TO
PREVENT FLOATING.

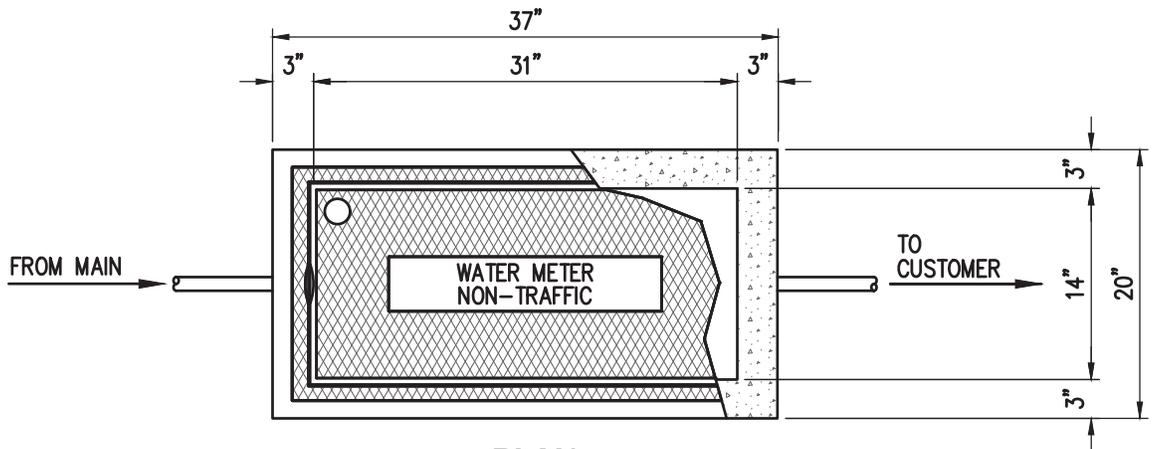
CONCRETE PROTECTION FOR WATER LINES

N.T.S.



**3/4" SERVICE ASSEMBLY
 w/ PRESSURE REDUCING VALVE**

N.T.S.



PLAN

CAST IRON FRAME AND COVER
(JOHN BOUCHARD & SONS NO. 8121
OR APPROVED EQUAL)
WITH TOUCH READ HOLE FOR AMR/AMI READERS
SEE NOTE 1

1" WATER METER
(BADGER MODEL 55)

FINISHED GRADE

PRECAST CONCRETE METER BOX
W/O BASE (CLOUD UT-035 OR
APPROVED EQUAL)

PEX PIPING SDR-9



1" CORPORATION COCK
(MUELLER H-15000 SERIES
OR APPROVED EQUAL)

1" BRONZE TAPPING SADDLE
(MUELLER 13400 SERIES OR
APPROVED EQUAL)

METER YOKE W/ 12" RISER HEIGHT TO INCLUDE
CHECK VALVE, ANGLE STOP AND PROVISION FOR
LOCKING W/ PACK JOINT INLET CONNECTION AND
DUAL PURPOSE UNION SWIVEL (1" FORD
VBHH74-12W-4144) SEE NOTE 3

1" SCH 40 PVC
(SEE NOTE 2)

TO CUSTOMER

4" GRAVEL

12" RISER

28 1/2"

SECTION

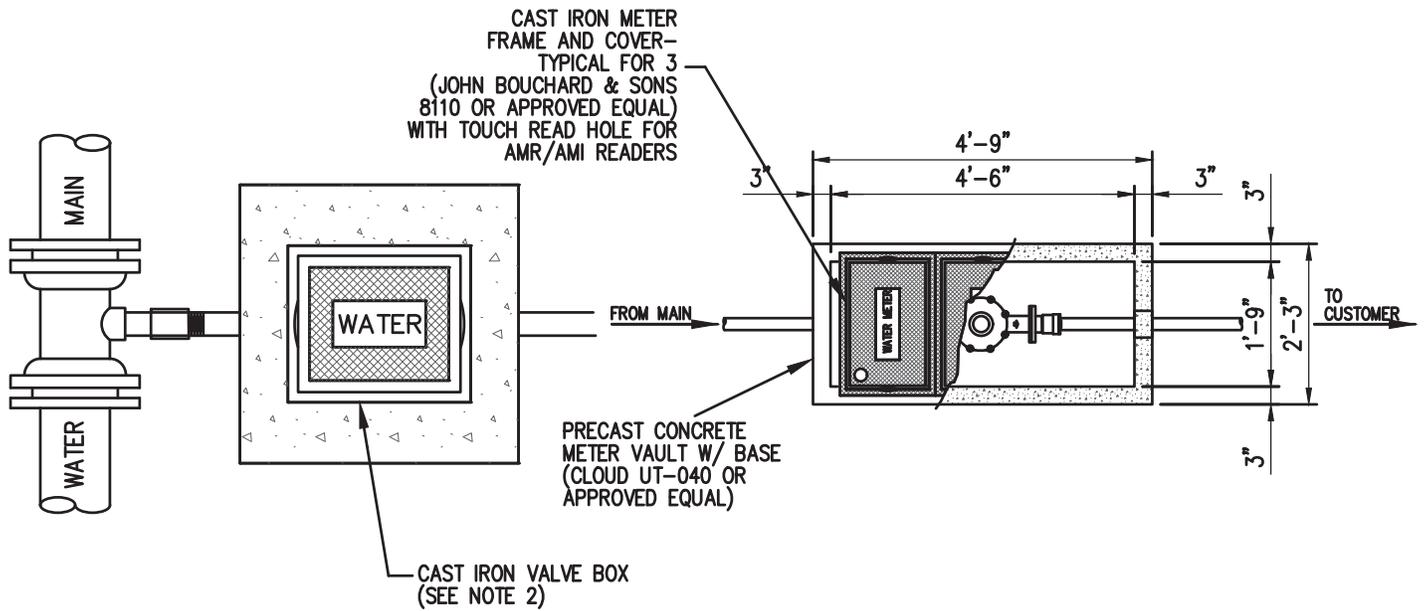
NOTES:

1. THE CAST IRON FRAME AND COVER SHOWN SHALL BE INSTALLED IN NON-TRAFFIC AREAS. JOHN BOUCHARD & SONS MODEL 8122 OR AN APPROVED EQUAL SHALL BE SUBSTITUTED IN DRIVEWAYS OR OTHER AREAS WHERE OCCASIONAL VEHICULAR TRAFFIC IS ANTICIPATED.
2. ONE INCH SCHEDULE 40 PVC SERVICE LINE IS SHOWN. POLYETHYLENE (PE) MAY BE SUBSTITUTED WITH CITY APPROVAL.
3. THE CONTRACTOR SHALL PROVIDE AND INSTALL A 1/2" OR 3/4" X 12-INCH LONG PVC OR GALVANIZED STEEL BRACING BAR.
4. A PRESSURE REDUCING VALVE, NOT SHOWN, SHALL BE REQUIRED TO BE INSTALLED ON THE SERVICE LINE. IF THE PRESSURE REDUCING VALVE IS INSTALLED OUTDOORS, A METER BOX SHALL BE REQUIRED.

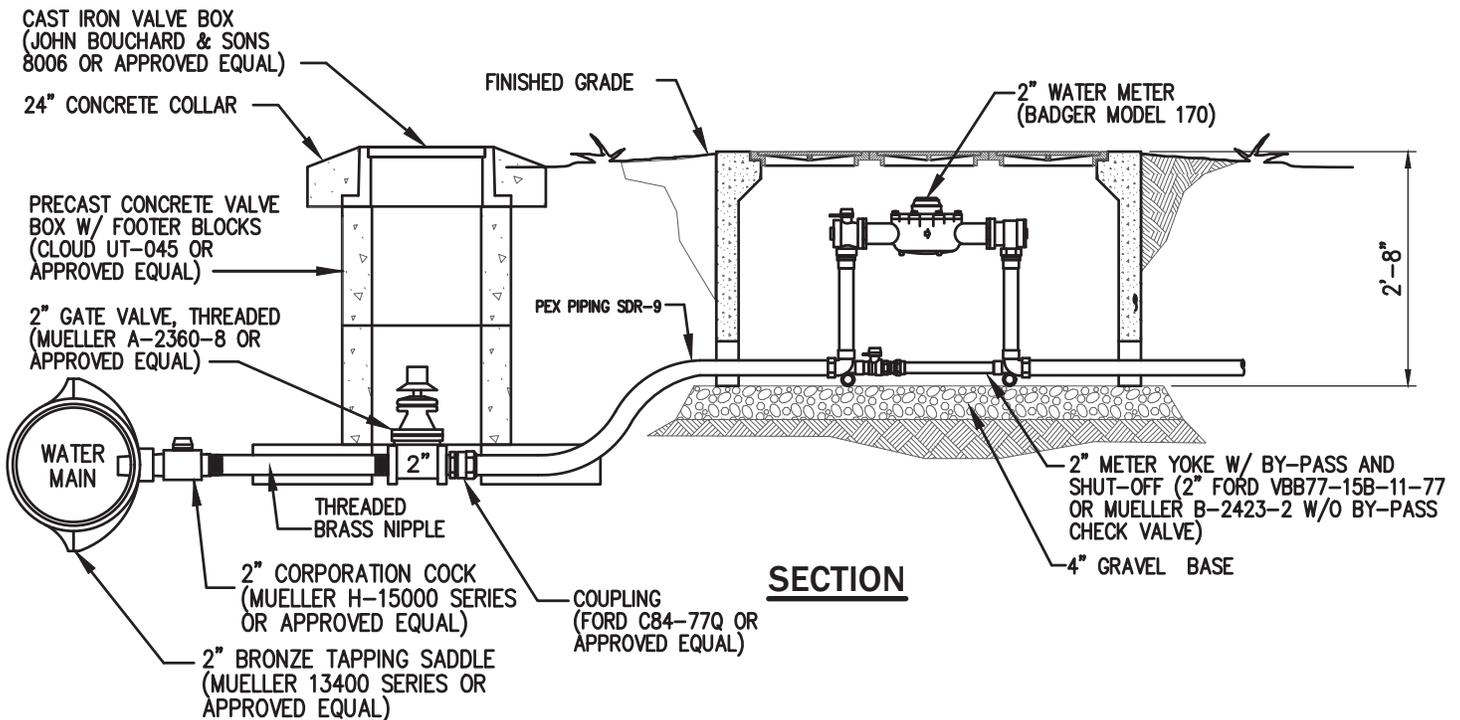
1" WATER METER SERVICE ASSEMBLY DETAIL

N.T.S.

W -7.5B



PLAN



SECTION

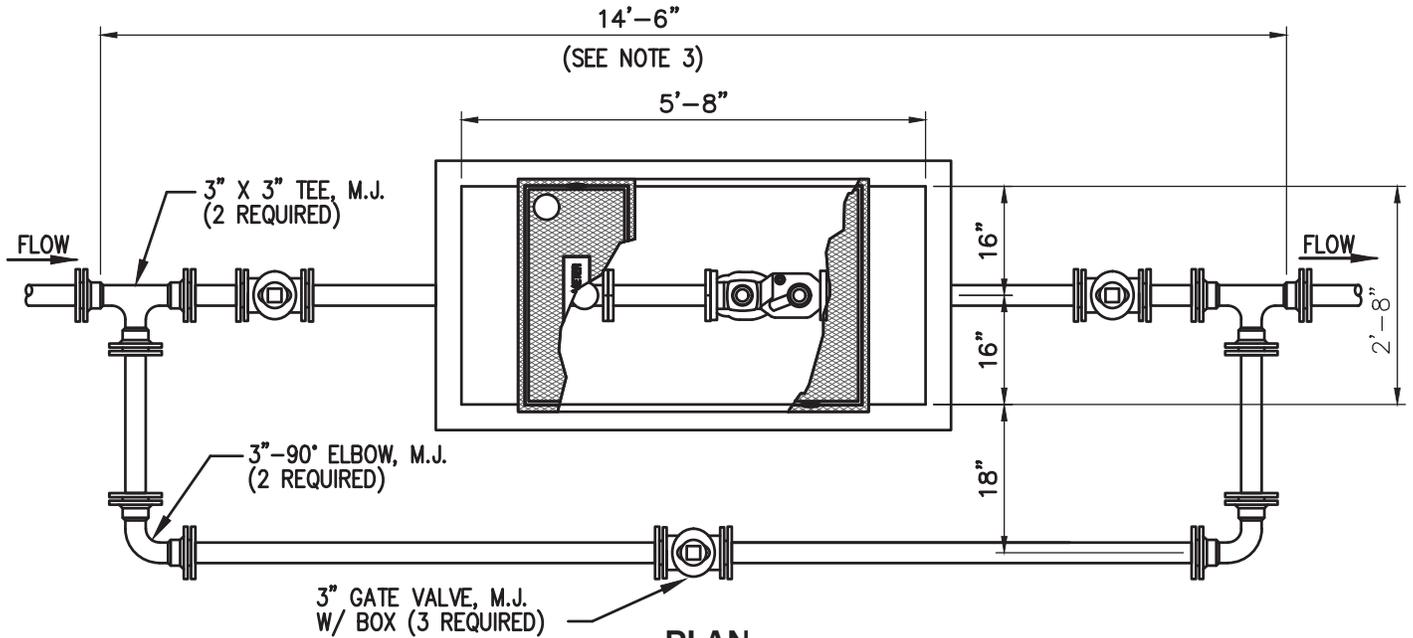
NOTE:

A PRESSURE REDUCING VALVE, NOT SHOWN, SHALL BE REQUIRED TO BE INSTALLED ON THE SERVICE LINE. IF THE PRESSURE REDUCING VALVE IS INSTALLED OUTDOORS, A METER BOX SHALL BE REQUIRED.

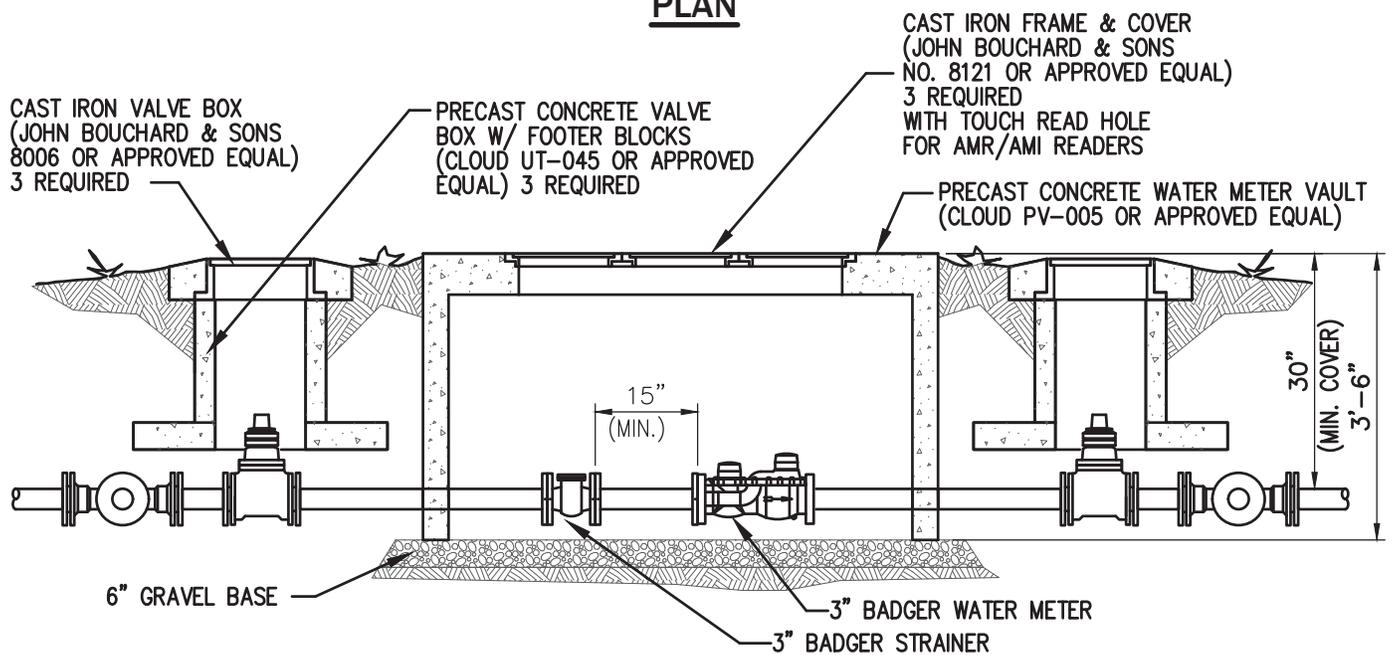
2" WATER METER SERVICE ASSEMBLY AND VAULT DETAIL

N.T.S.

W-7.5C



PLAN



SECTION

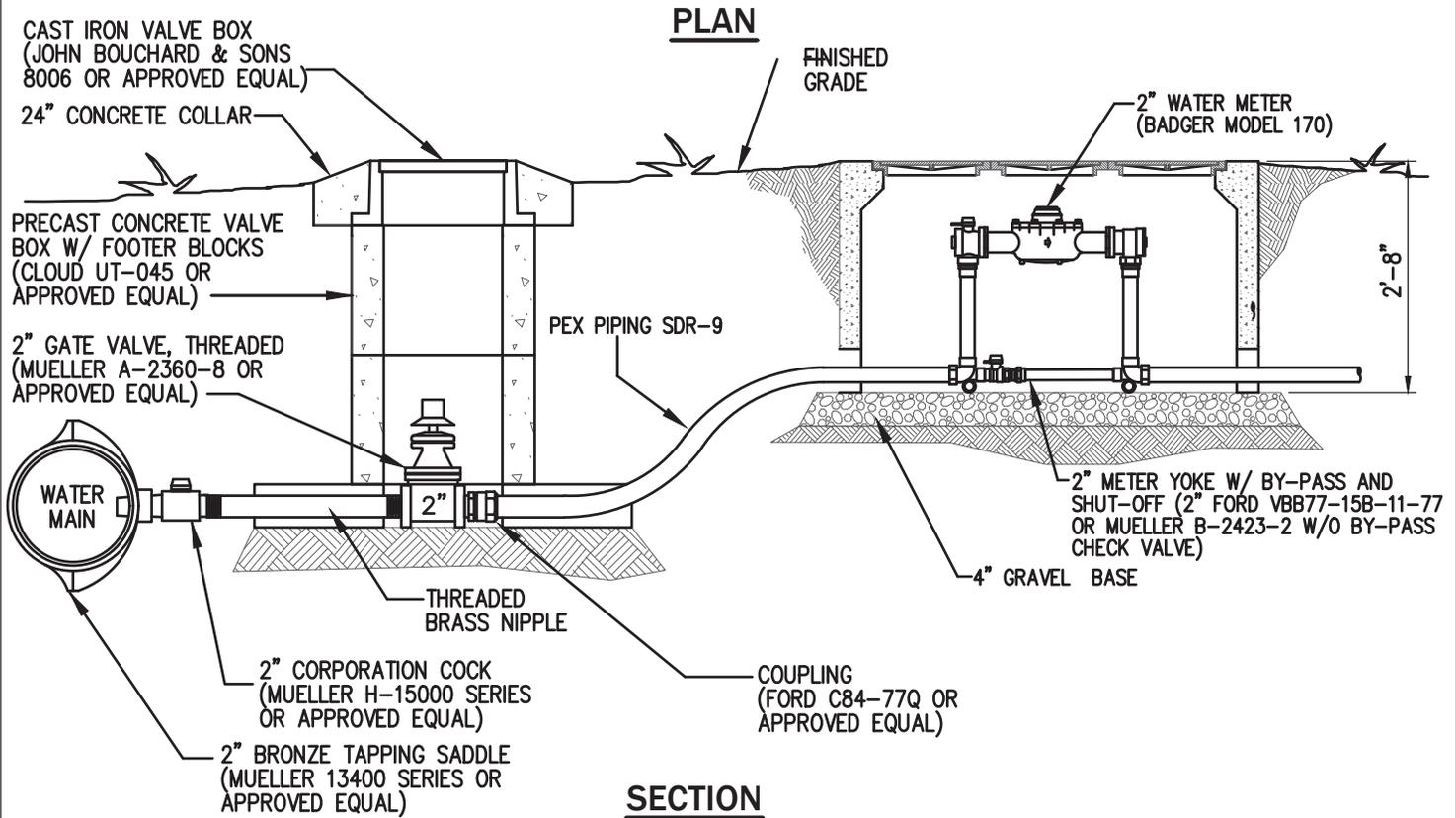
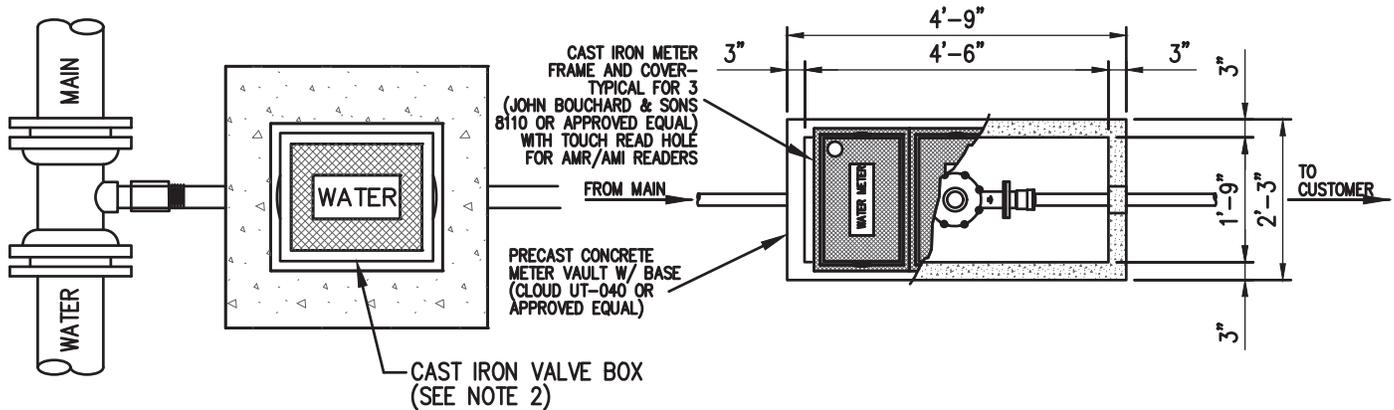
NOTES:

1. A 6" X 6" CONCRETE COLLAR SHALL ENCOMPASS EACH CAST IRON VALVE BOX AND SO FORMED AS TO SHED WATER AWAY FROM THE VALVE BOX.
2. THE VALVE BOX SHALL BE SET WITH THE LONGEST SIDE RUNNING PARALLEL WITH THE ENTERING AND EXITING WATER LINE.
3. ALL PIPE WITHIN THE LIMITS OF THE SERVICE ASSEMBLY SHALL BE AT LEAST CLASS 350 DUCTILE IRON. ALL FITTINGS SHALL BE DUCTILE IRON AND SHALL BE INSTALLED WITH RESTRAINING GLANDS AND CONCRETE THRUST BLOCKING.

3" WATER METER SERVICE ASSEMBLY AND VAULT DETAIL

N.T.S.

W-7.5D



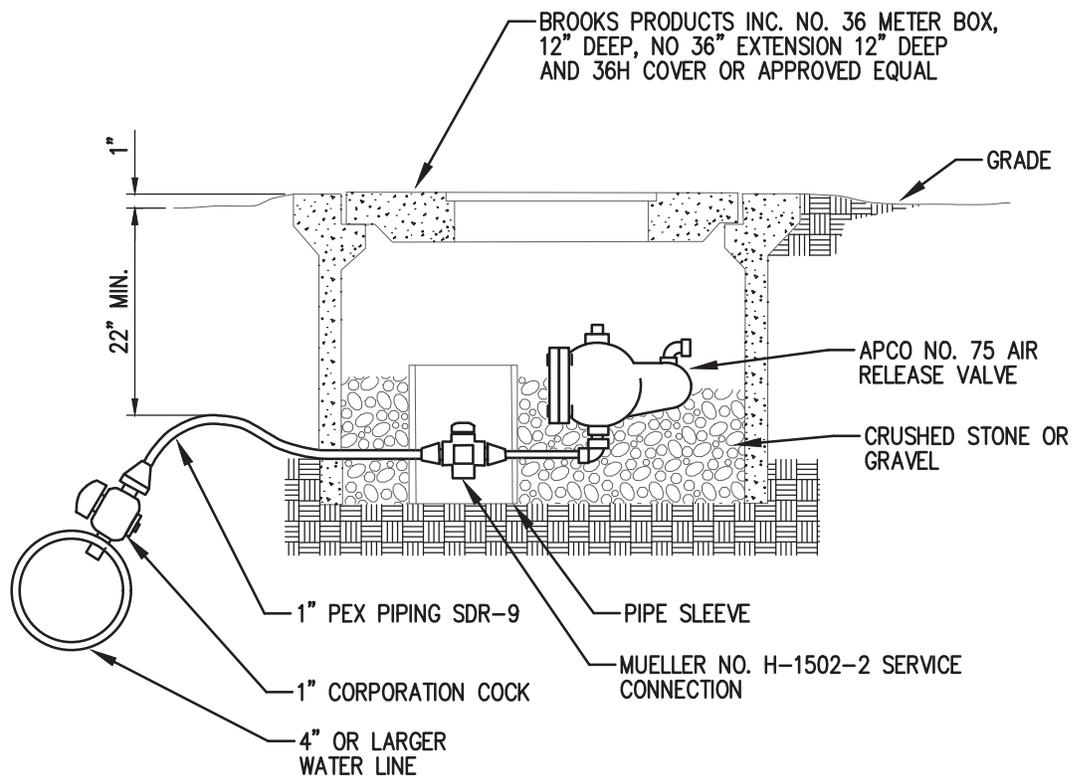
NOTE:

1. A PRESSURE REDUCING VALVE, NOT SHOWN, SHALL BE REQUIRED TO BE INSTALLED ON THE SERVICE LINE. IF THE PRESSURE REDUCING VALVE IS INSTALLED OUTDOORS, A METER BOX SHALL BE REQUIRED.
2. INSTALL THE VALVE BOX SUCH THAT THE LONGEST DIMENSION IS PARALLEL WITH THE WATER LINE IT CONTROLS.

2" FIRE LINE AND WATER METER DETAIL FOR TOWNHOMES AND APARTMENTS

N.T.S.

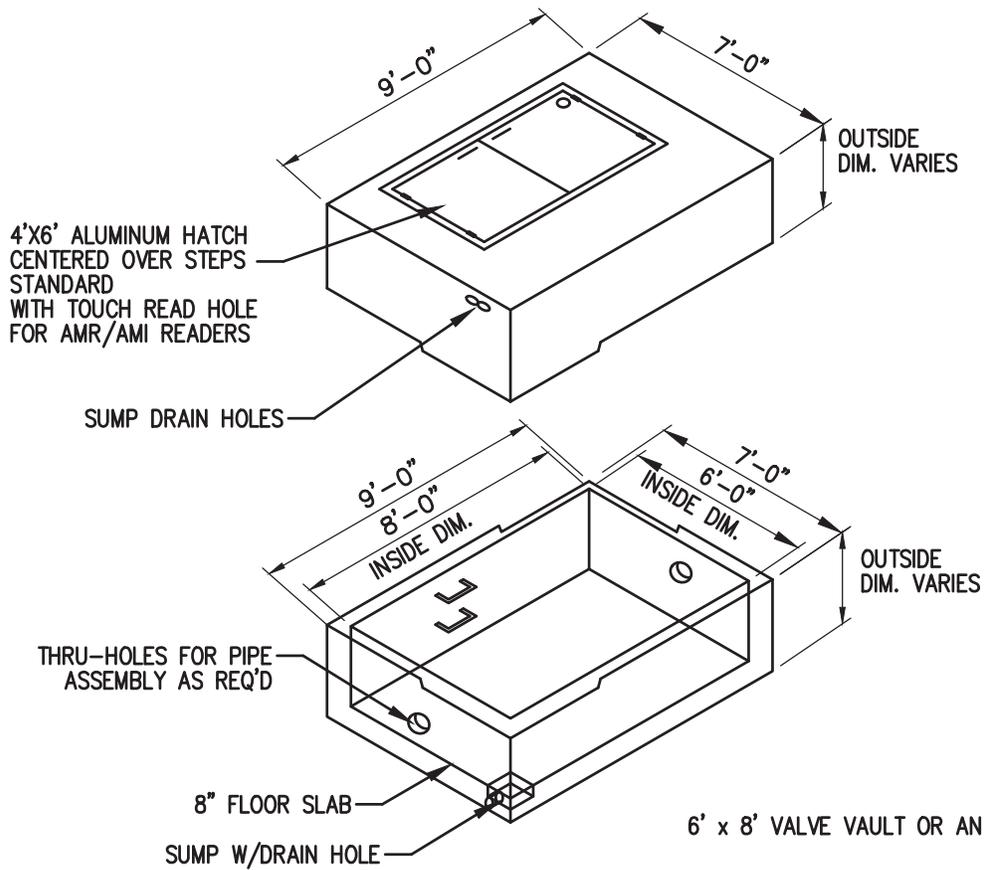
W-7.5E



NOTE:
AUTOMATIC AIR RELEASE SHOWN. FOR MANUAL OPERATION, OMIT APCO VALVE AND
SUBSTITUTE A 12" NIPPLE W/THREADED END

AUTOMATIC AIR RELEASE ASSEMBLY

N.T.S.

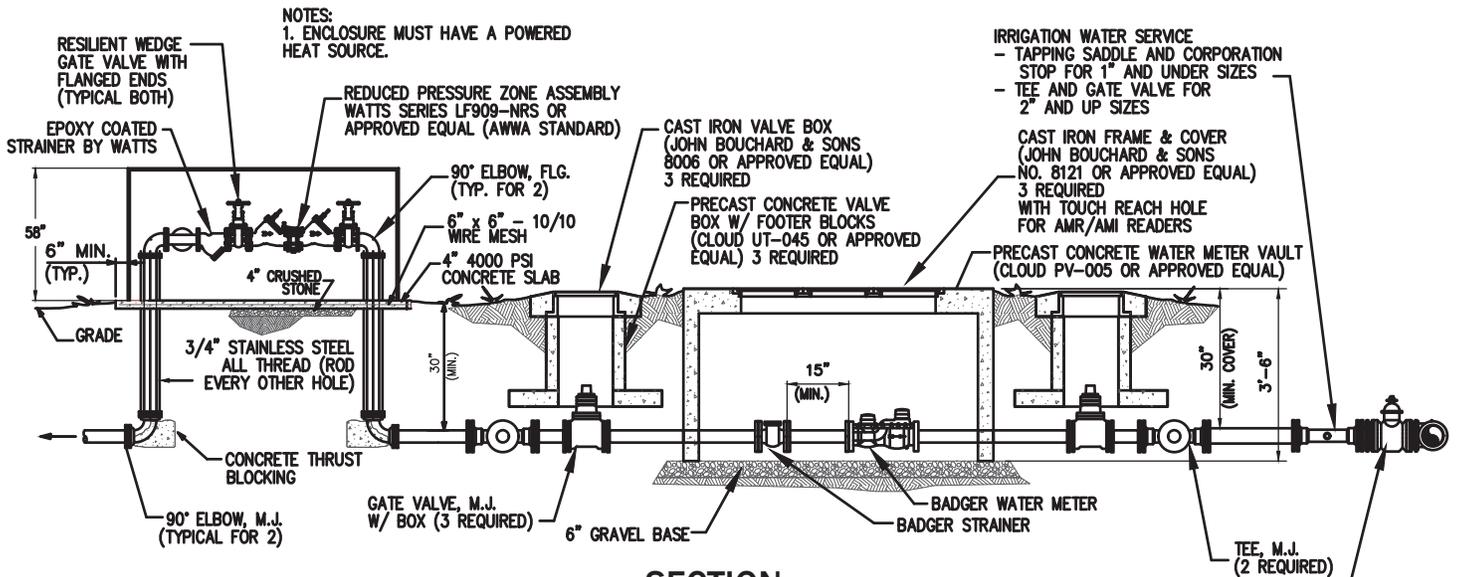
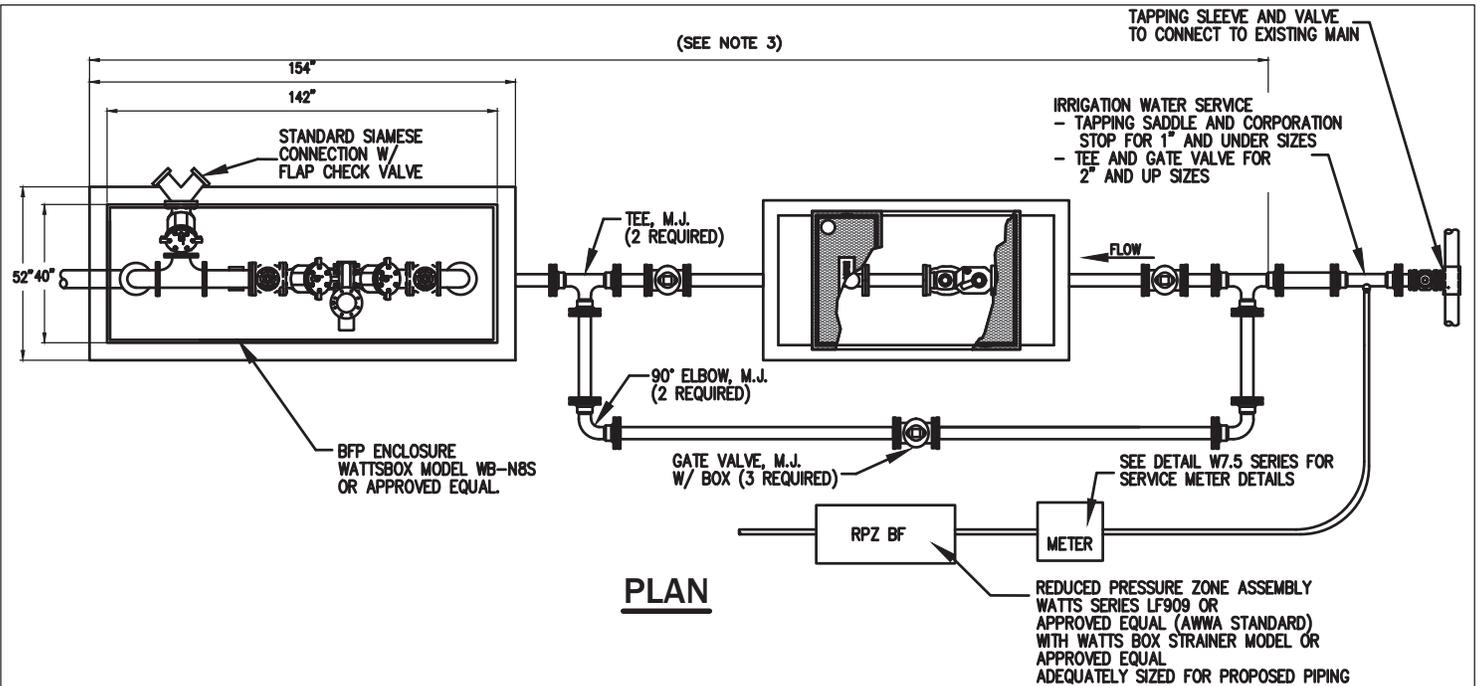


6' x 8' VALVE VAULT OR AN APPROVED EQUAL

- VALVE VAULTS INCLUDE:
- 4' x 6' ALUMINUM HATCH
 - SEALANT MATERIAL
 - ASSEMBLY OF WATER CONTROL PACKAGE

FIRE LINE BACKFLOW PREVENTER VAULT

N.T.S.

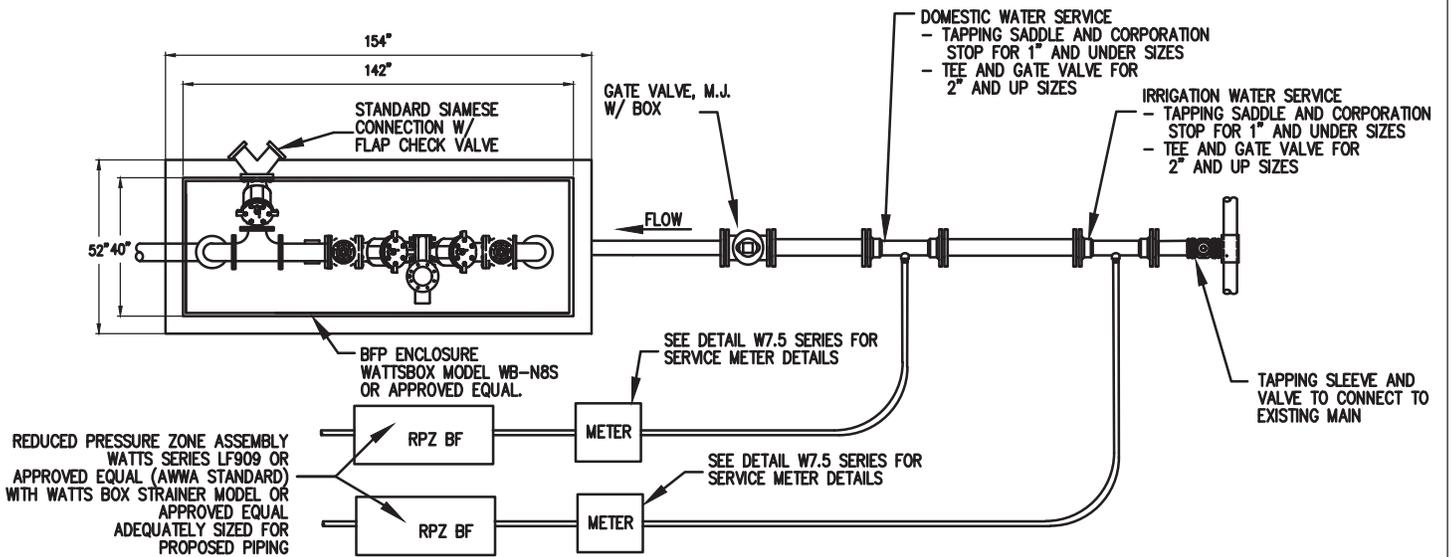


- NOTES:
1. A CONCRETE COLLAR SHALL ENCOMPASS EACH CAST IRON VALVE BOX AND SO FORMED AS TO SHED WATER AWAY FROM THE VALVE BOX.
 2. THE VALVE BOX SHALL BE SET WITH THE LONGEST SIDE RUNNING PARALLEL WITH THE ENTERING AND EXITING WATER LINE.
 3. ALL PIPE WITHIN THE LIMITS OF THE SERVICE ASSEMBLY SHALL BE AT LEAST CLASS 350 DUCTILE IRON. ALL FITTINGS SHALL BE DUCTILE IRON AND SHALL BE INSTALLED WITH RESTRAINING GLANDS AND CONCRETE THRUST BLOCKING.
 4. FOR A COMBINED FIRE AND DOMESTIC LINE, BACKFLOW PREVENTER MUST BE REDUCED PRESSURE ZONE ASSEMBLY WATTS SERIES LF909-NRS OR APPROVED EQUAL (AWWA STANDARD)
 5. FOR A DEDICATED FIRE LINE ONLY, BACKFLOW PREVENTER MUST BE A DOUBLE CHECK DETECTOR ASSEMBLY WATTS SERIES LF757 OR APPROVED EQUAL (AWWA STANDARD)

**4", 6", OR 8" MASTER METER ASSEMBLY DETAIL
WITH BY-PASS AND IRRIGATION SERVICE**

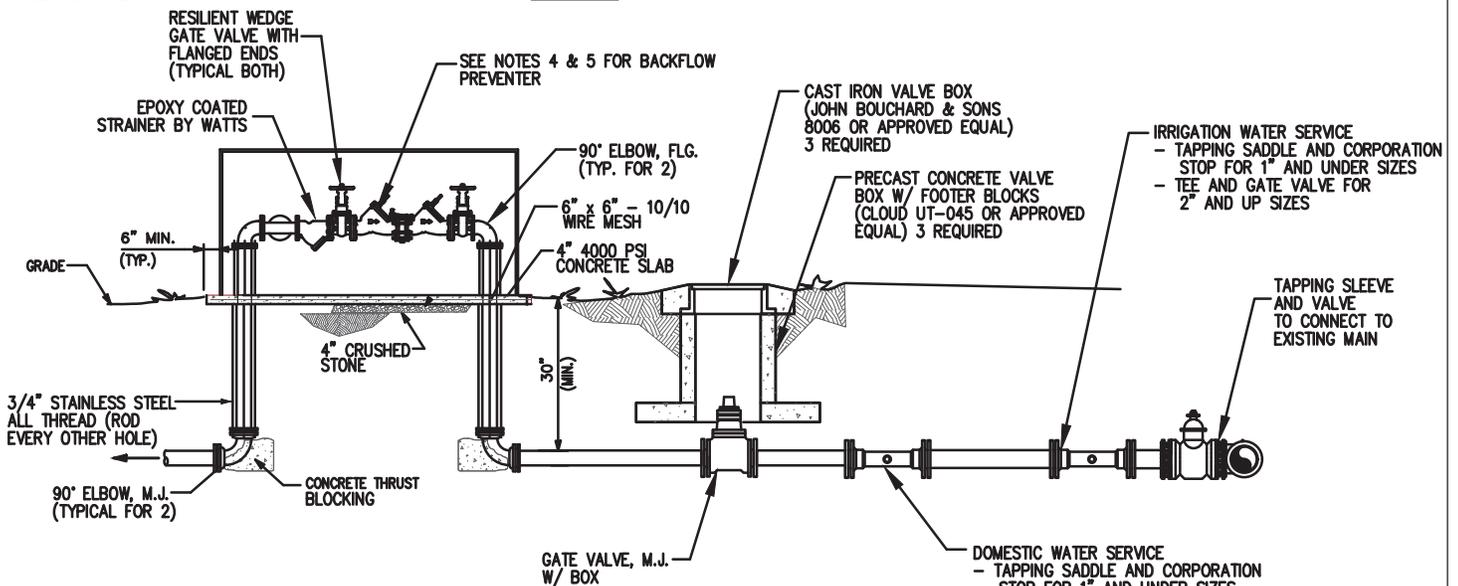
N.T.S.

W-9A



NOTES:
1. ENCLOSURE MUST HAVE A POWERED HEAT SOURCE.

PLAN



NOTES:

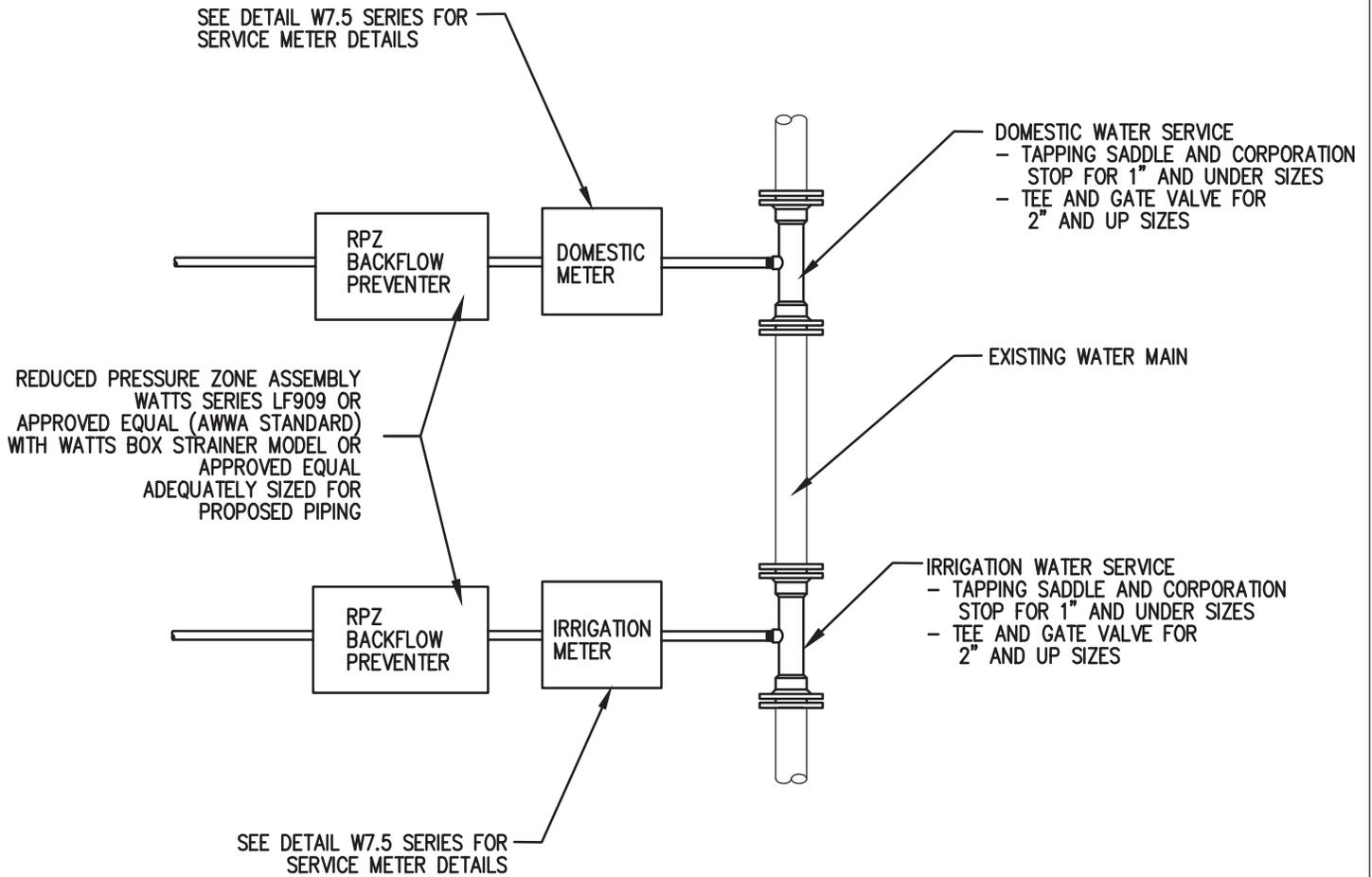
SECTION

1. A CONCRETE COLLAR SHALL ENCOMPASS EACH CAST IRON VALVE BOX AND SO FORMED AS TO SHED WATER AWAY FROM THE VALVE BOX.
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4. FOR A COMBINED FIRE AND DOMESTIC LINE, BACKFLOW PREVENTER MUST BE REDUCED PRESSURE ZONE ASSEMBLY WATTS SERIES LF909-NRS OR APPROVED EQUAL (AWWA STANDARD)
5. FOR A DEDICATED FIRE LINE ONLY, BACKFLOW PREVENTER MUST BE A DOUBLE CHECK DETECTOR ASSEMBLY WATTS SERIES LF757 OR APPROVED EQUAL (AWWA STANDARD)

TOWNHOME/COMMERCIAL SERVICE WITH BACKFLOW AND DOMESTIC AND IRRIGATION SERVICE

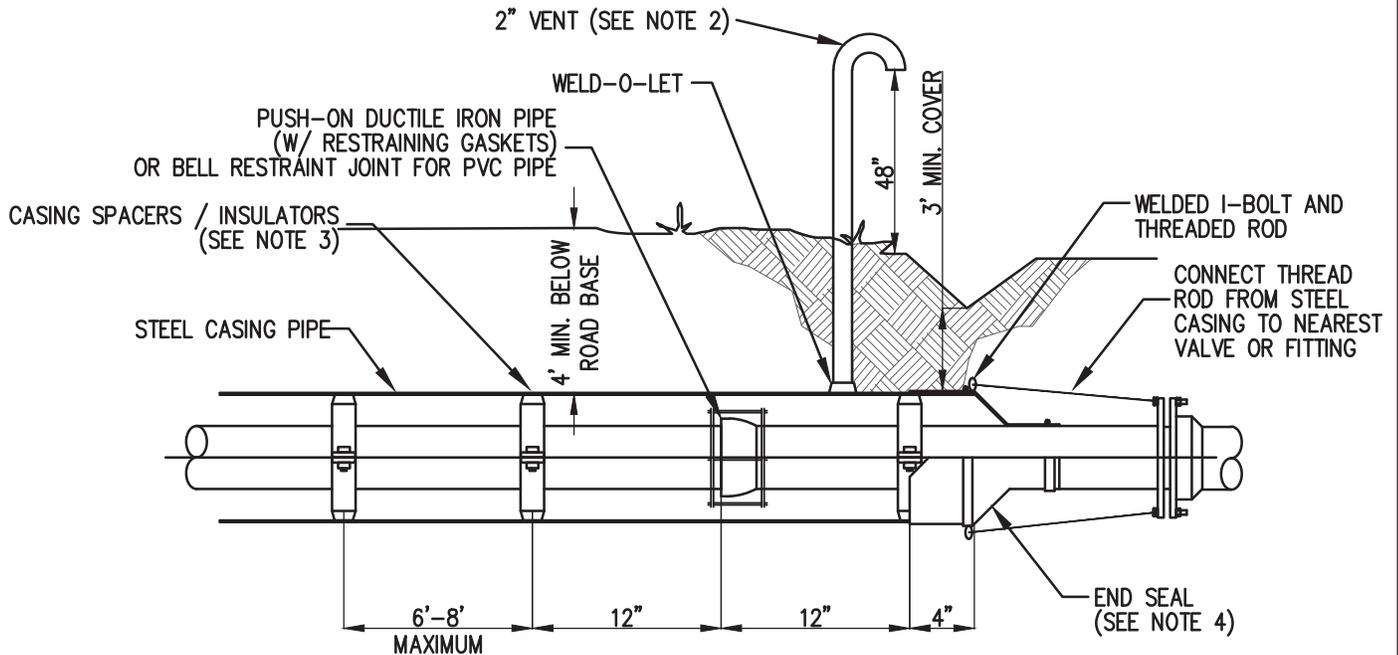
N.T.S.

W-9B



**COMMERCIAL SERVICE FOR
 DOMESTIC AND IRRIGATION SERVICE ONLY**

N.T.S.



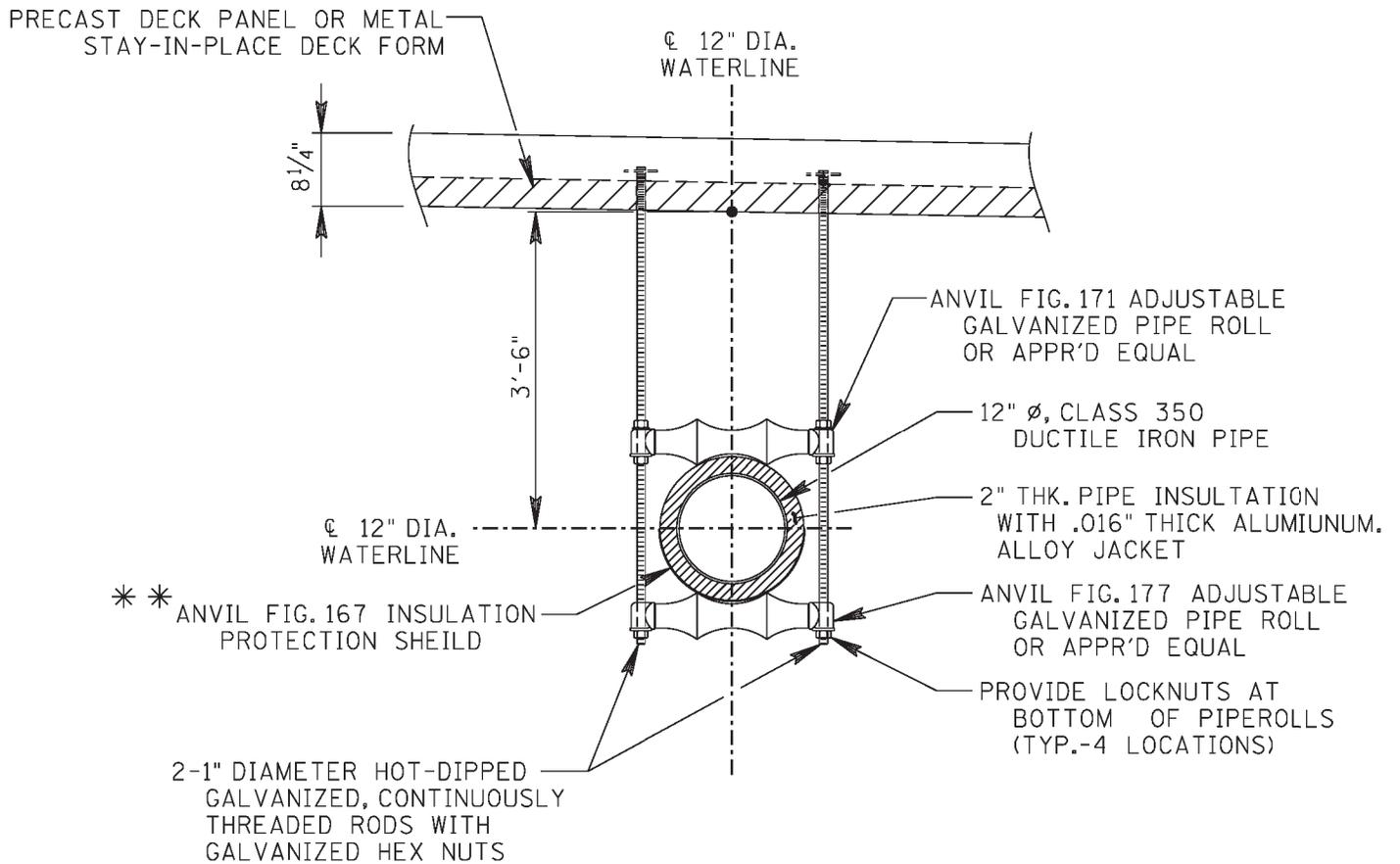
SECTION VIEW

NOTES:

1. ALL STEEL CASING PIPE SHALL BE ASTM A139, GRADE B.
2. ALL CASING PIPES WITH A LENGTH LESS THAN OR EQUAL TO 150' SHALL INCLUDE ONE VENT. THE VENT SHALL BE INSTALLED ON THE HIGH END OF THE CASING INSTALLATION. ALL CASING PIPES WITH A LENGTH GREATER 150' SHALL INCLUDE TWO VENTS. ALL VENTS SHALL BE 2" DIA. SCHEDULE 40 STEEL WITH A STAINLESS STEEL SCREENED TURNDOWN. THE TURN DOWN SHALL BE NO LOWER THAN 4' FROM THE GROUND LINE BELOW IT. THE VENT SHALL BE PRIMED AND PAINTED SAFETY YELLOW. INSTALL VENT(S) WITHIN 4 FEET OF CASING END AND CLEAR OF END SEALS.
3. STAINLESS STEEL SPACERS / INSULATORS SHALL BE INSTALLED WITH DUCTILE IRON CARRIER PIPE. POLYETHYLENE SPACER / INSULATOR SHALL BE INSTALL WITH PVC CARRIERS PIPE. SPACER / INSULATORS SHALL BE ADVANCE PRODUCTS & SYSTEMS, INC.
4. PULL-ON END SEALS SHALL BE INSTALLED AT EACH END OF EACH STEEL CASING PIPE. END SEALS SHALL BE ADVANCE PRODUCTS & SYSTEMS MODEL AC OR APPROVED EQUAL.

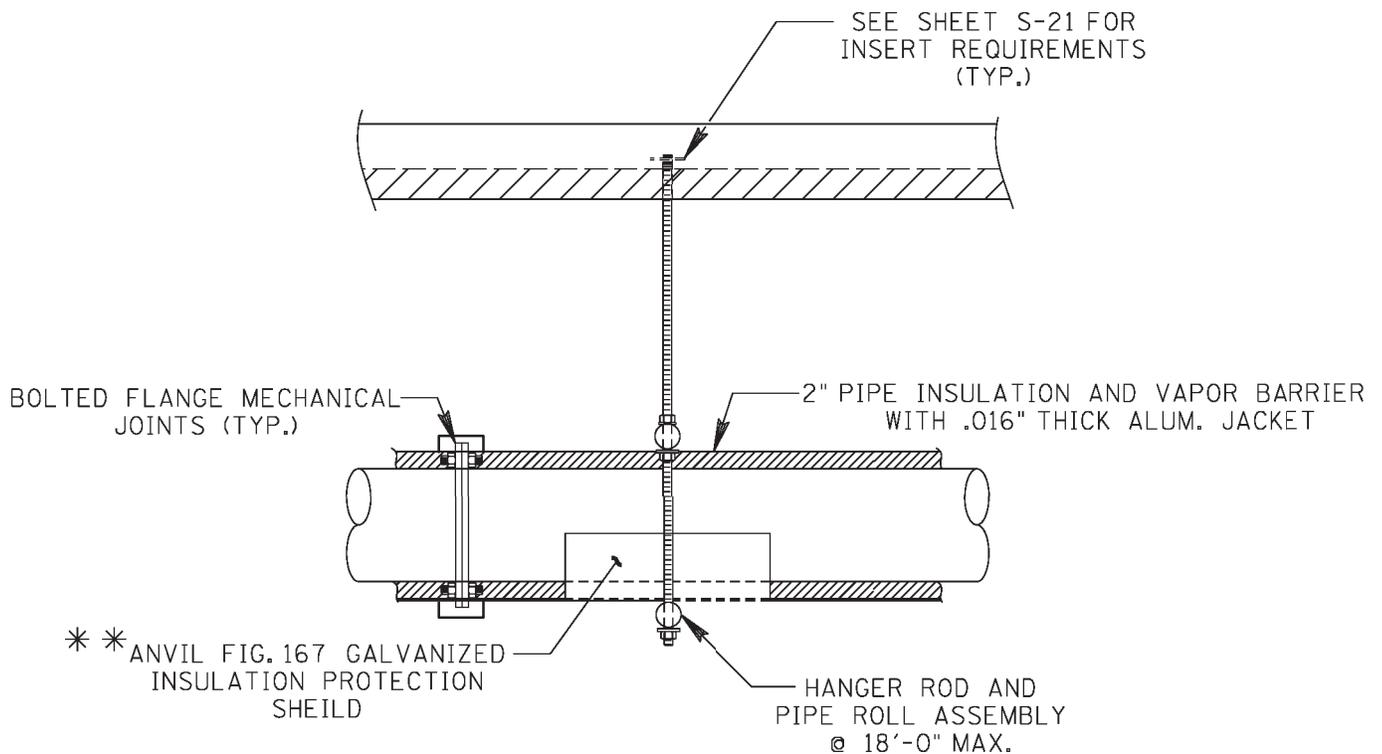
CASING PIPE DETAIL

N.T.S.



TYPICAL HANGER ASSEMBLY DETAIL
(SHOWN AT PRECAST DECK PANEL ALTERNATE)

NOTE:
THE DETAILS PROVIDED REPRESENTS A TYPICAL BRIDGE HANGER ASSEMBLY SYSTEM DETAIL ONLY.
EACH PROJECT SHALL BE DESIGNED FOR THE SPECIFIC INSTALLATION CONDITIONS AND
STAMPED BY A STATE OF TN LICENSED STRUCTURAL ENGINEER.



NOTE: MAXIMUM HANGER PIPE SUPPORT ASSEMBLY SPACING = 18'-0"

ELEVATION @ HANGER ASSEMBLY
(SHOWN AT PRECAST DECK PANEL ALTERNATE)

** *: COAT INSIDE FACES OF GALVANIZED INSULATION PROTECTION SHIELDS WITH SHERWIN WILLIAMS DURAPLATE 235 MULTIPURPOSE COATING OR APPROVED EQUAL AND ALLOW TO CURE PRIOR TO INSTALLATION OF WATERLINE. PREPARE GALVANIZED SURFACE OF SHIELD BY SOLVENT CLEANING TO SSPC-SP1 WITH VM&P NAPHTHA SOLUTION PRIOR TO COATING APPLICATION.

NOTE:
THE DETAILS PROVIDED REPRESENTS A TYPICAL BRIDGE HANGER ASSEMBLY SYSTEM DETAIL ONLY. EACH PROJECT SHALL BE DESIGNED FOR THE SPECIFIC INSTALLATION CONDITIONS AND STAMPED BY A STATE OF TN LICENSED STRUCTURAL ENGINEER.

BRIDGE HANGER ASSEMBLY DETAIL

(SHEET 2 OF 3)

W-11.0

WATERLINE HANGAR NOTES:

NOTE: INSULATION FOR 12" Ø WATERLINE SHALL BE 2" IN THICKNESS AND SHALL CONSIST OF POLYPHEN 2500 INSULATION INSTALLED OVER ALL EXTERIOR SURFACES OF WATERLINE EXCEPT IN THE BEARING AREAS AT PIPE INSULATION SHIELDS. AT BEARING AREAS OF PIPE INSULATION SHIELDS, THE 2" INSULATION SHALL BE POLYPHEN 5000 MATERIAL. A ZEROPERM VAPOR BARRIER SHALL BE APPLIED TO THE ENTIRE EXTERIOR SURFACE OF THE PIPE INSULATION. INSULATION AND VAPOR BARRIER MATERIALS SHALL BE BY POLYGUARD PRODUCTS OF ENNIS, TX, OR APPROVED EQUAL AND SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

NOTE: AN ALUMINUM ALLOY PROTECTION JACKET IS REQUIRED ON ALL EXTERIOR SURFACES OF THE VAPOR BARRIER MATERIAL. THE JACKET SHALL BE .016" MINIMUM THICKNESS, TYPE 3003 OR 3105, ALUMINIUM ALLOY, IN COMPLIANCE WITH ASTM C1729, TYPE 1, GRADE A, CLASS A. INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

NOTE: PIPE ROLL SIZE TO BE IN ACCORDANCE W/MANUFACTURER'S RECOMMENDATIONS. SIZE TO INCLUDE THICKNESS OF INSULATION, VAPOR BARRIER AND INSULATION PROTECTION SHIELD.

NOTE: BOLTED FLANGE MECHANICAL JOINTS FOR DUCTILE IRON PIPE SHALL BE MEGALUG SERIES 1100 BY EBBA IRON INC., WHICH INCLUDES GRIPPING WEDGES, GLAND, AND GLAND BODY AND ALL RELATED MATERIALS; OR, APPROVED EQUAL. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

NOTE: INSTALLATIONS UTILIZING MECHANICAL JOINT DUCTILE IRON PIPE SHALL ALSO INCLUDE INSTALLATION OF AN EXPANSION JOINT AT EACH END ABUTMENT AND SHALL BE SERIES 200 EX-TEND PIPE EXPANSION JOINT AS MANUFACTURED BY EBBA IRON, INC., OR APPROVED EQUAL. SUPPORTS SHALL BE INSTALLED WITHIN 2'-0" MAX. OF EACH END OF THE EXPANSION JOINT.

NOTE: AMERICAN TR FLECX DUCTILE IRON PIPE OR ENGINEER APPROVED EQUAL MAY BE UTILIZED FOR BRIDGE CROSSINGS. THE STRUCTURAL ENGINEER SHALL INCLUDE LATERAL BRACING AS REQUIRED PER DESIGN STANDARDS. THE USE OF TR FLEX PIPE MAY NOT REQUIRE THE INSTALLATION OF AN EXPANSION JOINT AT EACH END ABUTMENT. STRUCTURAL ENGINEER TO DETERMINE REQUIRED EXPANSION IN STRUCTURAL DESIGN.

NOTE:
THE DETAILS PROVIDED REPRESENTS A TYPICAL BRIDGE HANGAR ASSEMBLY SYSTEM DETAIL ONLY. EACH PROJECT SHALL BE DESIGNED FOR THE SPECIFIC INSTALLATION CONDITIONS AND STAMPED BY A STATE OF TN LICENSED STRUCTURAL ENGINEER.

BRIDGE HANGAR ASSEMBLY DETAIL

(SHEET 3 OF 3)

W-11.0