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# **TOWN OF SMYRNA**

## **(RUTHERFORD COUNTY, TENNESSEE)**

### **WATER SYSTEM STANDARD SPECIFICATIONS FOR NEW CONSTRUCTION**

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APPROVED BY: TDEC – Division of Water Supply

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**TOWN OF SMYRNA, TENNESSEE**  
**WATER SYSTEM STANDARD SPECIFICATIONS**  
**FOR NEW CONSTRUCTION**

**INDEX TO PROJECT MANUAL**

These specifications give the minimum requirements for installation of water system additions in the Town of Smyrna, Tennessee. Any special construction problems or conditions not covered under these specifications shall be submitted in writing to the Town for review.

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

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# **S P E C I F I C A T I O N S**



**TOWN OF SMYRNA, TENNESSEE**  
**GENERAL GUIDELINES**  
**COVERING THE WATER SYSTEM STANDARD SPECIFICATIONS,**  
**CONSTRUCTION, AND APPURTENANCES**

**A. WATER SYSTEM STANDARD SPECIFICATIONS REQUIREMENTS**

The purpose of the requirements and guidelines is to provide guidance to the Developers, engineers, and contractors in order to achieve an acceptable installation for furnishing of water system components to subdivisions and other developments. Summarized below are requirements and conditions that apply to the granting of water service by the Town of Smyrna.

1.1 Prior to the design of any water line extension, component, or expansion, the design engineer should first confer with the Town's Planning Department with regard to growth potential and density that may be expected in the general area of the extension being planned. A conference with the Director of Utilities should follow to discuss system standards and requirements, as well as any issues related to the water system components being proposed.

1.1.1. Construction of water system components and water lines (including individual service connections) may not begin until approval by the Town of Smyrna and the Tennessee Department of Environment and Conservation, Department of Water Supply has been received.

1.2 No connection to an existing water line shall be made until all new lines have been completely tested and the tie-in has approved by the Director of Utilities.

1.3 The Town of Smyrna will not accept utility lines that were not approved in accordance these specifications.

1.4 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.

1.5 Water service may be denied to structures currently connected to the Town's Sewer System which is deemed to be outside of the Town's Water Service District.

1.6 All water lines and services (to property line or right-of-way only) constructed utilizing these specifications become the property of the Town of Smyrna upon acceptance by the Director of Utilities. Utility lines and services (to property line or right-of-way only) will not be accepted by the Town unless and until they are in strict conformance with these specifications.

1.7 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.

1.8 Five (5) sets of drawings including vicinity map shall be submitted for approval. Submittals shall be presented based on the Town's Planning and Utility Departments submittal schedules. Developers and their engineers are asked to submit drawings as far in advance as possible in order to conserve time at planning and utility 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) set of TDEC approved drawings and one (1) copy of the State approval letter shall be provided to the Director of Utilities prior to beginning construction. Prior to acceptance of the water system components by the Town, two sets of paper "Record Drawings" along with digital drawings (compatible with the Town of Smyrna's Utilities Department software) showing all work, changes, elevations, fittings, line locations, service locations, and other data required for complete "Record Drawings" shall be submitted to the Director of Utilities after each project or phase of a project is completed. The "Record Drawings" shall be reviewed by the Utilities Department and may require additional information prior to acceptance of the water system components.

1.9 Detail drawings 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 approved by the Director of Utilities before beginning any construction.

1.10 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 throughout the design, approval, and construction process.

1.11 Sizes and locations of all water lines, components, appurtenances, and construction methods shall be in accordance with these Standard Specifications and plans approved by the Town. If plans are approved by the Town and they are later found not to be in compliance with these standard specifications or other requirements (as deemed necessary by the Director of Utilities) then they shall be revised to such standards required and shall be constructed accordingly prior to acceptance by the Town.

1.12 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. Open road cuts will not be allowed unless approval has been granted by both the Director of Utilities and the Department of Public Works.

1.13 If construction has not started within one (1) year from the date of approval then that approval will no longer be valid. Utility plans shall be resubmitted to renew approval. Renewal will not be automatically guaranteed, but will be based on current review and existing conditions.

1.14 The Contractor's name, project name, project location, and estimated working time for each project shall be submitted to the Director of Utilities prior with the plans submitted for review and approval.

1.15 Laboratory test reports shall be provided on all water line piping to assure that it meets the requirements of the Town's specifications.

1.16 Shop drawings for utility materials shall be submitted to the Director of Utilities for review after being thoroughly checked by the Contractor and stamped with his approval.

1.17 The Town reserves the right to require relocation of water lines on the construction plans to facilitate maintenance.

1.18 All utility construction shall be in accordance with specifications of the Town of Smyrna.

1.19 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.

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

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

1.22 Any special requirements shall be transmitted as a part of the approval.

1.23 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 proposed water system improvements complete construction plans in addition to all sets required by the Planning Department.

2.2 Complete project specifications in accordance with these Standard Specifications.

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

### 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. Wider easements may be required after further review by the Director of Utilities. Easements required across private property or in roads are to be acquired by the Developer in the name of the Town.

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

3.2.1 Easement Document on a form, approved by the Town, 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, Corp of Engineers, Tennessee Valley Authority, and State Highway crossings must be prepared by the Developer's Engineer as described above prior to commencement of construction.

### 4. Pre-Construction Conference

4.1 Before beginning any construction, the Developer shall contact the Town and schedule a preconstruction conference and shall pay all tap fees and impact fees as required prior to commencement of any construction. The Developer, Engineer, and the Town's Utility Representative shall attend the meeting to discuss procedures for construction, inspection, connections to existing facilities, acceptance procedure by the Town, and any other special issues that are warranted for discussion. At this meeting, the Contractor will be informed of the Town'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 Town.
- 4.2.5 When submitting plans and shop drawings to the Town's Director of Utilities they will retain one (1) copy and the Town 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 Town's Standard Specifications.
- 4.2.6 Developer is to have at conference:
- Approved plans.
  - Copy of Contractor's contract (both off-site and on-site).
  - Tap fees and impact fees. All fees are subject to final approval by the Town of Smyrna Director of Utilities.

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 from the Town's Utilities Department and/or the Town's project engineer.

**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 Town. Summarized below are the requirements and conditions that apply to the granting of water service by the Town.
2. No valve or cutoff shall be operated except by a Town 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 Town.
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 Town before beginning any construction.
6. "Cut-ins" or taps to live mains shall be made only in the presence of a Town Representative.
7. Meters and meter assemblies (5/8" x 3/4") shall be provided by the Town to the Developers for each lot after the 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.
8. 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 Town 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 the Town of Smyrna roads, Rutherford County roads, and all State Highways. The amount of this bond shall be determined by the Town after it receives all requirements for repairs from the appropriate Town Of Smyrna Public Works Department, County Highway Department, or the Tennessee Department of Transportation.
9. Water mains are generally located within street right-of-ways of new developments however, when special conditions require them, separate dedicated easements; must be provided with a minimum width of twenty (20) feet.
10. Centerlines of roads shall be staked before beginning construction. The road section and water line location in 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.
11. Hydraulic calculations and data should be submitted for the proposed system.

12. Where the static water pressure exceeds 80 psi, the developer shall provide a pressure-reducing valve on the service line. This pressure-reducing valve shall be installed in accordance with the detail in the Standard Drawings section of this document.
13. 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: sewers are to 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, it is to be 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 water tightness.
14. 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 Town's Utilities Director.

- (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 gpm or domestic flow plus 500 gpm fire flow whichever is larger.
- (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.

## 15. Fire Protection

- (a) Fire hydrants should not be connected to distribution pipes which are not capable of providing a minimum flow of 750 gallons per minute at a residual pressure of 30 psi.
- (b) Fire hydrants shall be located at points to be within a maximum distance of 500-feet to any proposed structure.
- (c) The minimum pipe size to which a fire hydrant may be connected shall be six (6) inches.
- (d) The minimum standards for privately-owned sprinkler service lines shall be the following:
  - i. Constructed of Class 51 ductile iron pipe.
  - ii. Backflow prevention device shall be installed.
  - iii. Reviewed and approved by the Town's Fire Department Official and by the State's Fire Marshall.

## 16. Marking of Hydrants

### 16.1 Classifications of Hydrants

- (a) Hydrants should be classified in accordance with their rated capacities at 20 psi residual pressure as follows:
  - i. Class AA – Rated capacity of 1500 gpm or greater
  - ii. Class A – Rated capacity of 1000-1499 gpm
  - iii. Class B – Rated capacity of 500-999 gpm
  - iv. Class C – Rated capacity of less than 500 gpm
  - v. Class D – Out of Service

## 16.2 Public Hydrants

- (a) All barrels are to be chrome yellow except in cases where another color has already been adopted.
- (b) The tops and nozzle caps should be painted with the following capacity-indicating color scheme to provide simplicity and consistency with colors used in signal work for safety, danger, and intermediate condition:
  - (1) Class AA – Light blue
  - (2) Class A - Green
  - (3) Class B - Orange
  - (4) Class C - Red
  - (5) Class D - Black
- (c) For rapid identification at night, it is recommended that the capacity colors be of a reflective-type paint.
- (d) Hydrants rated at less than 20 psi should have the rated pressure stenciled in black on the hydrant top.
- (e) In addition to the painted top and nozzle caps, it can be advantageous to stencil the rated capacity of high volume hydrants on the top.
- (f) The classification and marking of hydrants provided for in this section anticipate determination based on individual flow test.
- (g) Where a group of hydrants can be used at the time of a fire, some special marking designating group-flow capacity may be desirable.

## 16.3 Permanently Inoperative Hydrants

Fire hydrants that are permanently inoperative or unusable should be removed.

## 16.4 Temporarily Inoperative Hydrants

Fire hydrants that are temporarily inoperative or unusable should be wrapped or otherwise provided a temporary indication of their condition.

16.5 Flush Hydrants

Location markers for flush hydrants should carry the same background color as stated above or class identification, with such other data stenciled thereon as deemed necessary.

16.6 Private Hydrants

Marking on private hydrants within private enclosures is to be at the owner's discretion. When private hydrants are located on public streets, they should be painted red, or some other color, to distinguish them from public hydrants.

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 for blow off purposes (where fire protection is provided by the distribution system). Small diameter blow-off hydrants are not allowed.
- (c) Dead end water lines shall extend to the property line, with a line size gate valve, cap, thrust blocking, and reverse restraint rodding.

18. Gate Valves

- (a) Unless otherwise specified by the Director of Utilities, gate valves shall be placed at all intersections of distribution pipes. Three (3) valves shall be placed at each tee; one (1) installed in the run and the other two (2) installed at the branch ends. Four (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. Valves shall not be located in the pavement areas but shall be installed behind the extruded concrete curbing of the roadway.
- (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.

19. Means of Detecting PVC pipe

When PVC pipe is installed, for detection purposes, a 12 gage solid (braded and strand is not allowed) copper tracing wire (shielded) shall be duct taped to the water line pipe at both ends and at the middle of each segment. Connections between wires shall be soldered or connected with water tight wire nut fasteners and wrapped. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection

equipment may be attached. An approved metallic tape identified as "water" and shall be installed as per the manufacturer's instructions. Bury the metallic tape 12 inches below subgrade.

20. Separation of Water Mains and Other Utilities

(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 other utilities.
4. Compensating variations in the horizontal and vertical separations.
5. Space for repair and alterations of the water main with relation to the other utilities.
6. Off-setting of pipes around manholes and other structures.
7. Water mains and other utilities 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 other utilities. 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 other utilities provided that:
  - i. The bottom of the water main is at least 18 inches above the top of other utilities.
  - ii. Where this vertical separation cannot be obtained, the other utilities shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

(c) Crossing:

1. Normal conditions-Water mains crossing other utilities will be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the other utilities, 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 Town of Smyrna; the Tennessee Department of Environment and Conservation, Division of Water Supply and Division of Water Pollution Control; Tennessee Valley Authority, 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. Structurally self supporting or with structural casing which both are 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 currently adopted code as may be revised and adopted from time to time by the Town of Smyrna.

END OF SECTION

## SECTION 01030

### FIRE PROTECTION

#### GENERAL REQUIREMENTS

1. Detailed drawings of the site plans and construction plans (showing all exterior and interior components of the fire sprinkler system) are to be submitted to the Town of Smyrna Tennessee Building Department for approval prior to any construction taking place. These plans shall be included within the construction plans submittal to be approved by the Town of Smyrna Planning Commission. The detail drawings of the 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 0789-2-3 (Review of Construction Plans and Specifications). Also an electronic copy of said fire sprinkler plans shall be submitted, to the Town of Smyrna Tennessee Building Department, the electronic plans shall be in one of the following formats; AutoCAD, Microstation, AutoSketch, Visio, or Generic CADD.
2. All piping for fire sprinkler systems will conform to the most current edition 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 Town of Smyrna Water Department Standard Specifications.
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 Town of Smyrna, Tennessee. When PVC pipe is installed, for detection purposes, a 12 gage solid (braded and strand is not allowed) copper tracing wire (shielded) shall be duct taped to the water line pipe at both ends and at the middle of each segment. Connections between wires shall be soldered or connected with water tight wire nut fasteners and wrapped. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached. An approved metallic tape identified as "water" shall be installed as per the manufacturer's instructions. Bury the metallic tape 12 inches below subgrade.
5. Only a reduced pressure principle backflow prevention device is permitted on the fire line (manufacturer and model number as approved by the Town of Smyrna Water Department). No double detector check valves shall be allowed.

6. 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.
7. A fire hydrant shall be available within-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 barrel shall be chrome yellow with the tops and nozzle caps painted the appropriate flow capacity colors.
8. Fire hydrants shall be located as to provide a minimum of three feet clearance around the hydrant in all directions, as to provide access for firefighter use.
9. 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.
10. F.D.C.'s shall be installed for each building on the address side, and locking Knox-Caps shall be installed.
11. Water gong (alarm indicator) shall be installed on the exterior address side of the building.
12. All water line taps shall be performed by a Licensed Contractor of the State of Tennessee. These taps shall be supervised and inspected by Town of Smyrna Water Department.
13. 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. A two hour hydrostatic test shall be performed in accordance with the procedures of section 02713 paragraph 3.2 "Hydrostatic Tests".
14. Disinfection of the fire lines shall be conducted in accordance with procedures outlined in section 02713 paragraph 3.3 "Disinfection".
  - (a) A jumper with backflow preventer shall be installed to fill the line to be tested.
  - (b) Heavily chlorinated water must be dechlorinated if the line cannot be properly flushed. The following dechlorinating agents and parameters may be utilized:

<u>Dechlorinating Agent</u>	<u>Part/part chlorine (required)</u>	<u>Alkalinity Consumed (as CaCO<sub>3</sub>)</u>
Sulfur dioxide (SO <sub>2</sub> )	0.900	2.800
Sodium bisulfite (NaHSO <sub>3</sub> )	1.460	1.380
Sodium sulfite (Na <sub>2</sub> SO <sub>3</sub> )	1.770	1.380
Sodium thiosulfate, (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> )	0.700	-----
Activated carbon (C)	0.085	2.100

END OF SECTION

## 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 Town of Smyrna Director of Utilities. The Developer shall pay for all laboratory inspection services as a part of the required work. Submit all material test reports to the Director of Utilities 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, and private markers; do not remove or disturb any such markers without prior approval from the Director of Utilities. 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 federal, state and local regulations.

## 8. DEPARTMENT OF TRANSPORTATION PERMITS

8.1 The Developer will secure any permits and provide bond as required by the Tennessee Department of Transportation for the installation of permanent facilities on State Highway rights-of-way. 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 Town of Smyrna and the Director of Utilities.

8.2 The Developer will secure any permits as required by the local Public Works and the County Highway Department for the installation of sewer lines within the rights-of-way of local and county roads. The Developer shall be responsible for complying with the requirements of the local Public Works Department and County Highway Department, and all such work shall be coordinated with and be subject to their approval.

## 9. INSTALLATION, TESTING, AND GUARANTEE

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

## 10. DRAWINGS OF RECORD

10.1 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 that has occurred with the project. 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 and approval by the Director of Utilities in each case. These record drawings shall be converted to digital format by the developer's engineer and shall be submitted to the Town of Smyrna in a format compatible with the Town's Utilities Department software.

## 11. DETECTION WIRE

11.1 For detection and location purposes of force mains, a 12 gage 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. Also, metallic tape marked "sewer" shall be provided 12" below grade directly above the force main.

## 12. UTILITIES

12.1 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. A Tennessee-One-Call shall be performed by the developer's contractor prior to commencement of any work in the area of existing utilities.

## 13. INSURANCE

13.1 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.

14. National Pollution Discharge Elimination System (NPDES) General Permit for Municipal Separate Storm Sewer System (MS4)  
Phase II Program

14.1 All work shall be in accordance with the Town of Smyrna's National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II Program. Prior to any excavation activities commencing, the developer, developer's engineer, and/or contractor shall apply for and receive an approved permit from the Town of Smyrna for such excavation activities. The application for permit will be reviewed by the Program Director and an approved permit shall be obtained prior to excavation activities. All erosion and sediment runoff control measures shall be installed in accordance with the approved permit and shall be maintained throughout the project cycle and until adequate and approved vegetative cover has been established.

END OF SECTION

## 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 jobsite 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, N.W. Washington, DC 20001
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48331
AGC	Associated General Contractors of America 333 John Caryle St, Suite 200 Alexandria, VA 22314

AI Asphalt Institute  
2696 Research Park Dr  
Lexington, KY 40511

AISC American Institute of Steel Construction  
One East Wacker Drive, Suite 3100  
Chicago, IL 60601-2001

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

ANSI American National Standards Institute  
25 West 43rd Street, 4 floor  
New York, NY 10036

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

ASME American Society of Mechanical Engineers  
Three Park Avenue  
New York, NY 10016-5990

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  
P.O. Box 388  
Selma, AL 36702-0388

AWS American Welding Society  
550 N.W. LeJeune Road  
Miami, FL 33126

CLFMI Chain Link Fence Manufacturers Institute  
10015 Old Columbia Rd, 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 Consulting Engineers Council  
1050 15th Street, N.W.  
Washington, DC 20005

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

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

FS Federal Specification  
General Services Administration  
Specifications and Consumer Information  
Distribution Section (WFSIS)  
Washington Navy Yard, Bldg. 197  
Washington, DC 20407

GA Gypsum Association  
810 First St., NE, #510,  
Washington DC, 20002

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

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

	221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000 Chicago, Illinois 60603
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, Maryland 20877
NEMA	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1847 Rosslyn, Virginia 22209
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, DC 20036
NSWMA	National Solid Waste Management Association 4301 Connecticut Avenue, NW, Suite 300 Washington, DC 20008-2304
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 W. Jackson Blvd. Chicago, IL 60606-6938
PS	Product Standard U. S. Department of Commerce Washington, DC 20203
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  
3127 Mr. Joe White Avenue  
Myrtle Beach, SC 29577-6760
- SMACNA Sheet Metal and Air Conditioning Contractors  
National Association  
4201 Lafayette Center Drive  
Chantilly, Virginia 20151-1209
- SSPC 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
- TCA Tile Council of America, Inc.  
100 Clemson Research Blvd.  
Anderson, SC 29625
- UL Underwriters Laboratories, Inc.  
333 Pfingsten Road  
Northbrook, IL 60062-2096

## PART 2. PRODUCTS

2.1 Not Used.

## PART 3. EXECUTION

3.1 Not Used.

END OF SECTION

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. Inspection and testing required by governing authorities.
- B. Section 01300 - Submittals: Submittal of Manufacturers' Instructions.
- C. Section 03303 - Concrete for Utility Lines: 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.

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 Standard Specifications, request clarification from Director of Utilities before beginning work.

## 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 the Director of Utilities.

## 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; start-up of equipment; test, adjust, and balance of equipment, as applicable; and, to make appropriate recommendations.
- B. Representative shall submit written report to Director of Utilities 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 the Director of Utilities in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards, and with Standard Specification and 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 Director of Utilities 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.

END OF SECTION

## 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.

All work shall be in accordance with the Town of Smyrna's National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II Program. Prior to any excavation activities commencing, the developer, developer's engineer, and/or contractor shall apply for and receive an approved permit from the Town of Smyrna for such excavation activities. The application for permit will be reviewed by the Program Director and an approved permit shall be obtained prior to excavation activities. All erosion and sediment runoff control measures shall be installed in accordance with the approved permit and shall be maintained throughout the project cycle and until adequate and approved vegetative cover has been established.

#### 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 Town of Smyrna. 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 Town of Smyrna.

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. EXECUTION

##### 1.1 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.

##### 1.2 EXTERIOR STORAGE

- A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Provide protection against ultraviolet (UV) light for polyvinylchloride (PVC) piping and products subject to damage by UV light. 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.

##### 1.3 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 Director of Utilities, 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

2.1 Products only approved within the standard specifications and/or as approved by the Director of Utilities.

#### PART 3. EXECUTIONS

##### 3.1 PREPARATION OF THE SITE

- A. Before starting construction, remove from the work site all vegetative 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 project engineer specifically indicates are to be removed. Dispose of this refuse material in a manner acceptable to the Town of Smyrna.
- 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 Town of Smyrna Director of Utilities. 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 vegetative 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 Town of Smyrna. Fill all holes or cavities created during this work that extend below the sub grade 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 Town of Smyrna. 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, sub grade, 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 excavated area with enough excavated material and/or timber, steel, or rubber blast matting to prevent danger and damage 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. The contractor shall be licensed for such operations and shall 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 24 inches in diameter, not

less than 8 inches below the bottom for 24 inch to 36 inch diameter pipes, and not less than 12 inches below the bottom for pipes larger than 36 inches in diameter, 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. Where pipe lines are constructed on concrete cradles, rock shall be excavated to the bottom of the cradle.

### 3.4 DISPOSAL OF MATERIALS

- A. Whenever practicable and approved by the Town of Smyrna, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the Town shall be used for these purposes. Any materials not so approved by the Town or used shall be considered waste materials and disposed of by the Contractor at no additional cost.
- B. Waste materials may be deposited in spoil areas at locations approved by the Town of Smyrna. 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 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 required by the Director of Utilities, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the design engineer 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 design engineer and the Director of Utilities, 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 Town of Smyrna to require that stronger pipe and/or a higher class of bedding be used at no cost.

- 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 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 Town of Smyrna.
- 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 Director of Utilities 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 non-vertical 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. The contractor shall 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 design engineer for the project. However, such approval does not relieve the Contractor of the sole responsibility for the safety of all employees, damage to any property, 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 settle-

ment beneath such structures or pavement. Underpin adjacent structures wherever necessary, with the approval of the project engineer.

- E. Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the design engineer, 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 pre-fabricated 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 Town of Smyrna. 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, 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 Town of Smyrna. All federal, 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 Town of Smyrna.

- 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 Town of Smyrna. 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 sub grade 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. In areas approved by the Town of Smyrna, 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 the approval of the Director of Utilities, 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. Compaction test shall be required for the 6-inch lifts to meet 98% standard proctor density. 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 Town of Smyrna, 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 Town 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, vegetative 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 and as required by the Town of Smyrna, cold mix or leveling course binder minimum of 4-inches thick shall be installed and maintained until permanent pavement is installed.
- G. Conduct backfilling around 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 Town of Smyrna.
- J. Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the Town of Smyrna 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 98% maximum density in accordance with ASTM D698. In all other locations, compact to 90%.

### 3.10 MAINTENANCE

- A. Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the Town of Smyrna.
- 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 Town of Smyrna. Continue such maintenance until final acceptance of the project or until the Town of Smyrna 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 Town of Smyrna. 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 and/or as existed prior to commencement of construction.

1.2 Refer to other sections for work related to that specified under this heading. Coordinate all 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 project engineer and the Town of Smyrna 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 at an approved location.

END OF SECTION

## 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 Town of Smyrna; and maintenance.

1.2 Unless otherwise approved by the Town of Smyrna, 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 baling, 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.

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

The mulch rate may be varied by the Town of Smyrna, 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.

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

3.12 Dispose of all surplus materials.

#### PART 4. INSPECTIONS

The Town of Smyrna 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

## 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 excavation 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 (Section 307), as directed by the Town of Smyrna.

2.6 BITUMINOUS TACK COAT: cutback asphalt, Grade RC-250, or emulsified asphalt, Grade SS-1 (Section 403, Subsections 904.02 and 904.03).

2.7 ASPHALTIC CONCRETE SURFACE: Grading "D" or "E" (Section 411)  
as approved by the Town of Smyrna.

2.8 PAVEMENT MARKINGS (WHITE AND YELLOW): Thermoplastic, Paint, Paint with  
Glass, Reflectors, Etc. Section 716.

### PART 3. EXECUTION

#### 3.1 SUBGRADE

- A. Before any base material is installed, compact the subgrade of the area to be paved to 98% 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. 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 BITUMINOUS PRIME 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.

### 3.4 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 0.30 gallons per square yard. Take care to prevent the bituminous material from 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 layer to the thickness shown on the standard drawings or as specified by the Town of Smyrna.
- 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.

### 3.5 BITUMINOUS TACK COAT SURFACE

- A. Uniformly apply a bituminous tack coat of either emulsified asphalt, Grade SS-1, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.1 gallon per square yard.

### 3.6 ASPHALTIC CONCRETE SURFACE

- A. When the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under at a rate of 0.10 gallon per square yard. Take care to prevent the bituminous material from splashing on exposed faces of curbs, gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the tack coat has been properly cured, apply the asphaltic concrete surface layer to the thickness shown of the drawings or as specified by the Town of Smyrna. 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 in a manner approved by the Town of Smyrna.

### 3.8 SAMPLING AND TESTING

- A. Submit to the Town of Smyrna test reports made by an independent testing

laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain 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 Manufacturing Company No. 450 butterfly valve, Henry Pratt Company "Groundhog," American Darling Class 150B, or equal.
- 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 5-1/4 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.
- 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. Hydrants shall be Mueller "Centurion" or approved equal.

### 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.

##### 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 valve box shall 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 Town of Smyrna.

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

### 3.2 SETTING HYDRANTS

#### A. Location

1. Locate hydrants as shown on the drawings or as directed by the Town 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 Town of Smyrna.

#### 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.

#### 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 concrete thrust blocking as indicated on the standard drawings. Where rods cannot be used, metal harness may be used. Metal harness, steel rods, or clamps shall be galvanized or otherwise rustproof treated as and shall be used only when approved by the Town of Smyrna. Self restraining fittings will be allowed only in conjunction with concrete thrust blocking.

END OF SECTION

0102-03  
02640-4

## 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 At locations of bends, fittings, hydrants, as directed by the Town of Smyrna, and 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 Pipe sizes 4" – 10" diameter shall be PVC in conformance with AWWA C900 standards and specifications.

1.4 Pipe sizes 12" and greater shall be ductile iron meeting the design thickness as specified by ANSI A21.50/AWWA C150 and meet the minimum pressure class of 300 psi. The ductile iron pipe shall be centrifugally cast in metal or sand-lined molds and conforming to ANSI A21.51/AWWA C151 AWWA specifications. Pipe joints shall meet ANSI A21.11/AWWA C111. Ductile iron pipe shall contain cement lining in accordance with ANSI A21.4/AWWA C104.

#### 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.
- 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 a minimum pressure of 300 psi of operating pressure and shall meet ANSI 21.11/AWWA C111.
- 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 liquid tight 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 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, compact and special fittings shall be ductile iron. All standard size fittings shall conform to the specifications of ANSI A21.10/AWWA C110. All compact fittings shall conform to ANSI A21.53/AWWA C153 specifications.
- I. Pipe and fittings shall be lined with enameline 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 (standard) or ANSI 21.53/AWWA C153 (compact) specifications.
- 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 Town of Smyrna 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. All PVC pipe shall meet the specifications of AWWA C900 (DR-14) with a minimum pressure class of 200 psi.
- B. All pipe shall have NSF approval and be manufactured in accordance with ASTM D2241. The following tests shall be conducted 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>DR</u>	<u>Pressure Rating</u>	<u>Minimum Bursting Pressure, psi</u>
14	200	985
  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 pipes shall be manufactured in the United States of America. All pipes 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 Town of Smyrna and as noted in Section 01620 Storage and Protection. All pipes 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 by the Town of Smyrna for installation. Any pipe found not to meet these specifications after installation shall be removed and approved pipe installed at the expense of the contractor.
- 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, compact and special fittings shall be ductile iron. All standard size fittings shall conform to the specifications of ANSI A21.10/AWWA C110. All compact fittings shall conform to ANSI A21.53/AWWA C153 specifications. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe.
- N. Fittings shall be lined with enameline 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 (standard) or ANSI A21.53/AWWA C153 (compact) specifications.

- 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.

## PART 3. EXECUTION

### 3.1 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 Town of Smyrna.
- C. Provide and use tools and facilities that are satisfactory to the Town of Smyrna 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 (for that days of installation work only) before the actual installation is due to take place shall not be lowered into the trench until they have been swabbed and thoroughly cleaned 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 installation. 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 Town of Smyrna. 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 Town of Smyrna.
- 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 Town of Smyrna.
- M. Lay no pipe in water or when it is the Town of Smyrna's representative'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. A minimum 18-inch vertical separation from the bottom of the water line to the top of the sewer line shall be maintained. Where a water line is to be parallel to a sanitary or storm sewer, lay it at least 10 feet from the sewer line edge to edge. If it is not practical for the water and sewer lines to be separated as described above, then lay the water line with a ductile iron joint centered over the sewer line and as described in Section 01010 General Guidelines Covering Installation of Water Lines and Appurtenances.
- O. Joint all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials.
- P. When PVC pipe is installed, for detection purposes, a 12 gage solid (braded and strand is not allowed) copper tracing wire (shielded) shall be duct taped to the water line pipe at both ends and at the middle of each segment. Connections between wires shall be soldered or connected with water tight wire nut fasteners and wrapped. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached. An approved metallic tape identified as "water" and shall be installed as per the manufacturer's instructions. Bury the metallic tape 12 inches below subgrade

## 3.2 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 two hours.
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 Town of Smyrna. 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 Town of Smyrna.

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 (per methods and fittings as approved by the Town of Smyrna) until the leakage is within the specified allowance.

### 3.3 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 Town of Smyrna, 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 48 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. Further-more, 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.

### 3.4 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 Town of Smyrna 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 copper 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 (at the contractors expense) 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.

### 3.5 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.

### 3.6 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 Town of Smyrna.

END OF SECTION

## 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, copper 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 Type K copper meeting ASTM B88. 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 Ford Retro 2CVBHHR with a Ford C38-23-2-5 3/4 inch tailpiece. Meter yokes for 1 inch meters shall be Badger VBHH44-10WR and the tailpiece shall be Ford C38-44-2-625. Meter yokes for 1-1/2" shall be Ford VBHH46-14R and 2" shall be Ford VBHH47-14R. Note, 1 1/2" and 2" meter yokes must not have a bypass line. Each assembly shall include a meter check valve. Each meter yoke shall have an integral angle stop and provisions for locking

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 inch in size shall be Badger M70. Meters 1-1/2 inch in size shall be Badger M120 B81. Meters 2 inches in size shall be Badger M170 B81. Larger meters 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. Larger meter boxes may be required for different applications and larger meters and will require approval from the Town of Smyrna Water Department prior to ordering or installing the meter boxes.

2.6 CURB STOPS: Curb stops shall be as manufactured by Ford. The 3/4 inch shall be Model B43-232WR-Q, 1 inch shall be Model B43-344WR-Q and the 1 ½ inch & 2 inch shall be Model BF43-777WR-Q.

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 Town of Smyrna.

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 near the street right-of-way. Set plumb approximately 1 inch above the existing or proposed grade and as to insure surface drainage will not enter the box. 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 Town of Smyrna.

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.

END OF SECTION

## 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 water lines as shown on the drawings or as called for in these specifications. For the open cut casing pipes (only as approved by the Town of Smyrna), it shall include the excavation of the trench, placing proper bedding material, furnishing and installing the casing pipe, furnishing and installing the carrier pipe, furnishing and installing casing spacers, (specifically designed and manufactured for the application, no hand fabricated or homemade spacers will be allowed), furnishing and installing casing end caps (specifically designed and manufactured for this type application), backfilling, and disposing of the excess excavated materials at an approved location secured by the contractor. 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, furnishing and installing casing spacers, (specifically designed and manufactured for the application, no hand fabricated or homemade spacers will be allowed), furnishing and installing casing end caps (specifically designed and manufactured for this type application) and disposing of the excavated materials at an approved location secured by the contractor.

#### PART 2. PRODUCTS

A. The minimum casing pipe size and wall thickness shall be as shown in the following table for the water or wastewater carrier pipe size indicated. For sizes not included therein, or for special design considerations, approval shall be obtained from the Director of Utilities.

##### 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". Casings shall be pipe conforming to the requirements of ASTM Designation A-139 Ductile Iron Pipe Class 250. 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>
4 inches	12 inches	5/16 inches
6 inches	18 inches	5/16 inches
8 inches	20 inches	5/16 inches
10 inches	24 inches	3/8 inches
12 inches	24 inches	3/8 inches
14 inches	26 inches	3/8 inches
16 inches	30 inches	1/2 inches
18 inches	30 inches	1/2 inches
20 inches	36 inches	1/2 inches
24 inches	42 inches	1/2 inches
30 inches	48 inches	1/2 inches
36 inches	54 inches	5/8 inches
42 inches	60 inches	5/8 inches
48 inches	66 inches	5/8 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 1/16 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. Casing pipes crossing under roadways/railroads shall be located at suitable approved alignments in order to eliminate possible conflicts with existing or future utilities and structures. A minimum 36-inch depth of cover between the top of the casing pipe and the surface of the roadway shall be maintained. Casing length shall extend a minimum of eight feet beyond the edge of pavement or curbing. 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 Director of Utilities. 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 at each bell of the pipe and in the middle of the pipe segment to offset any deviations in the casing grade and as to allow true design grade and to secure the carrier pipe within the casing pipe.

### 3.4 LAYOUT OF WORK

- A. The Developer's or Owner's Engineer 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

## SECTION 03303

### CONCRETE FOR UTILITY LINES

#### PART 1. GENERAL

1.1 This item shall include furnishing and installing concrete manholes, blocking, cradles, anchors, caps, pipe protection, and/or encasement at the locations shown on the drawings and/or directed by the Town of Smyrna'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. Manholes shall have a 28-day compressive strength of minimum 5,000 psi.

##### 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 Town of Smyrna's representative.

##### E. Reinforcing Steel

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

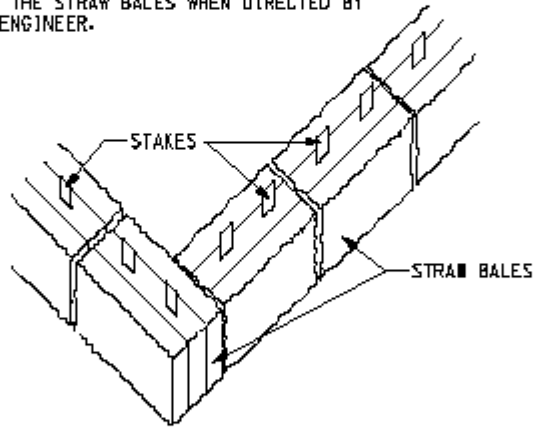
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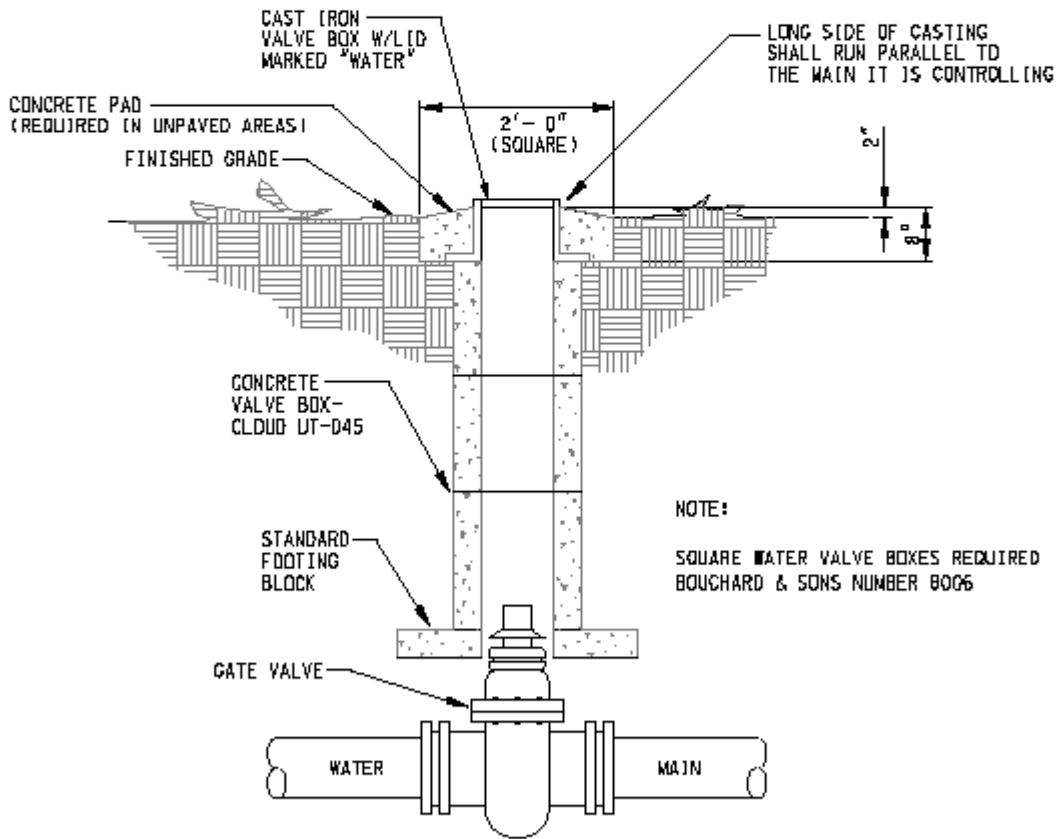
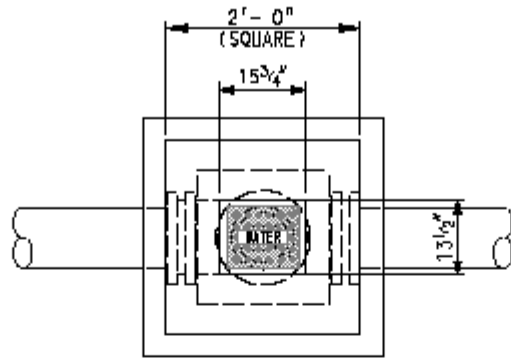


NOTE:  
STRAW BALES TO BE STAKED IN PLACE BY THE  
GRADING CONTRACTOR FOR THE PURPOSE OF  
PREVENTING SOIL, SILT OR DEBRIS FROM WASH  
ONTO ADJACENT PROPERTY. AS THEIR EFFECTIVENESS  
FOR THIS PURPOSE, DETERIORATES SIGNIFICANTLY,  
THE GRADING CONTRACTOR SHALL REPLACE WHERE  
NECESSARY, THE GRADING CONTRACTOR SHALL REMOVE  
AND DISPOSE OF THE STRAW BALES WHEN DIRECTED BY  
THE ARCHITECT/ENGINEER.



**TEMPORARY STRAW BALES DETAIL**

N.T.S.

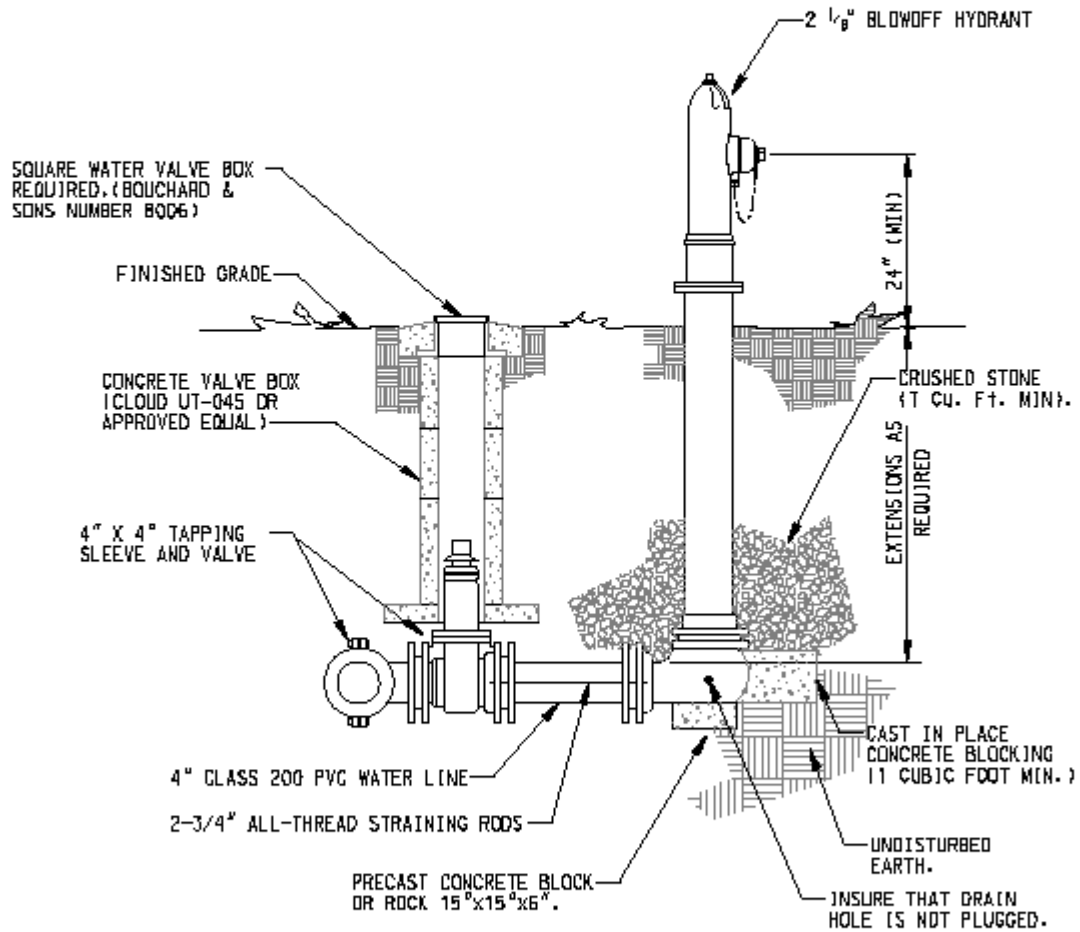


**CONCRETE VALVE BOX SETTING DETAIL**

N.T.S.

**NOTE:**

OPERATING NUT, OPENING DIRECTION,  
CAP NUTS, THREAD AND CONNECTIONS  
MUST BE APPROVED IN WRITING BY THE  
OWNER AS CONFORMING TO HIS STANDARDS.

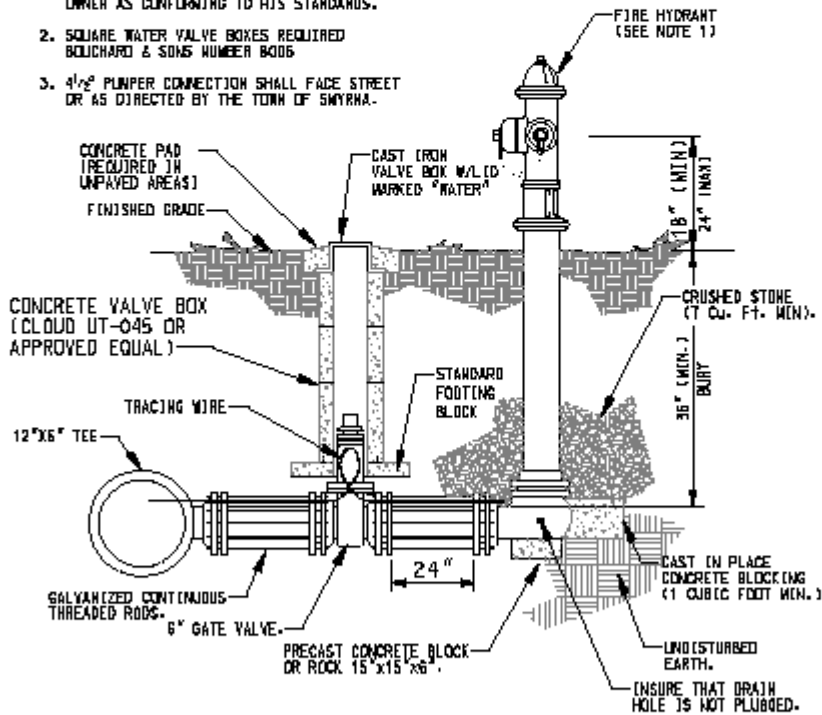


**BLOWOFF HYDRANT WITH VALVE DETAIL**

N.T.S.

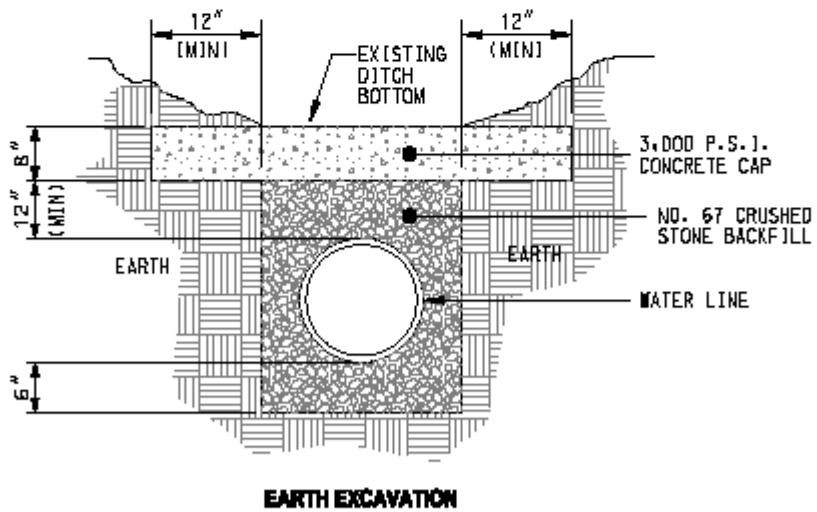
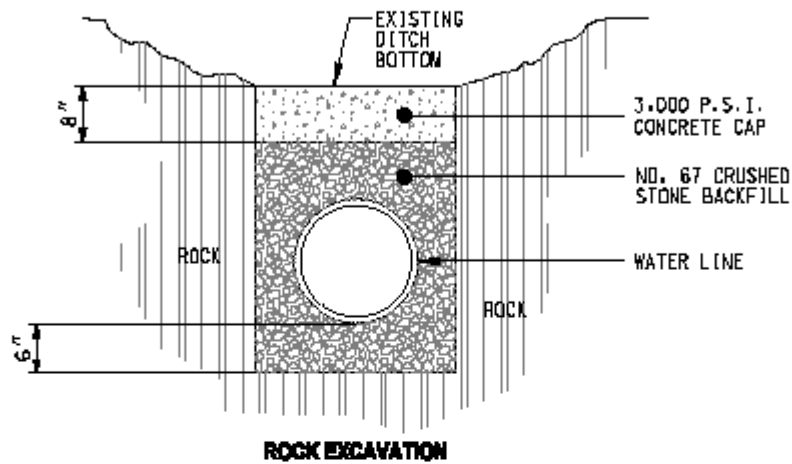
**NOTE:**

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
3. 4 1/2" PUMPER CONNECTION SHALL FACE STREET OR AS DIRECTED BY THE TOWN OF SMYRNA.



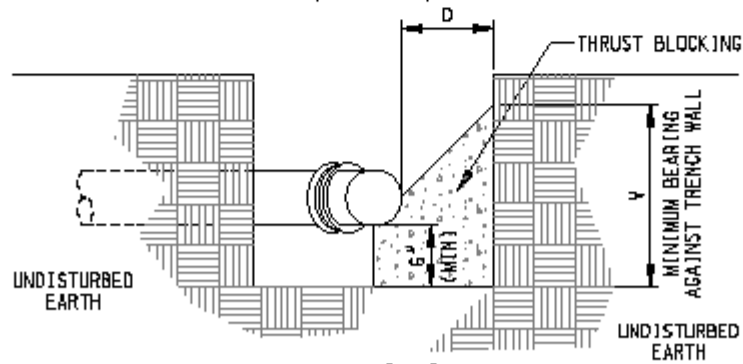
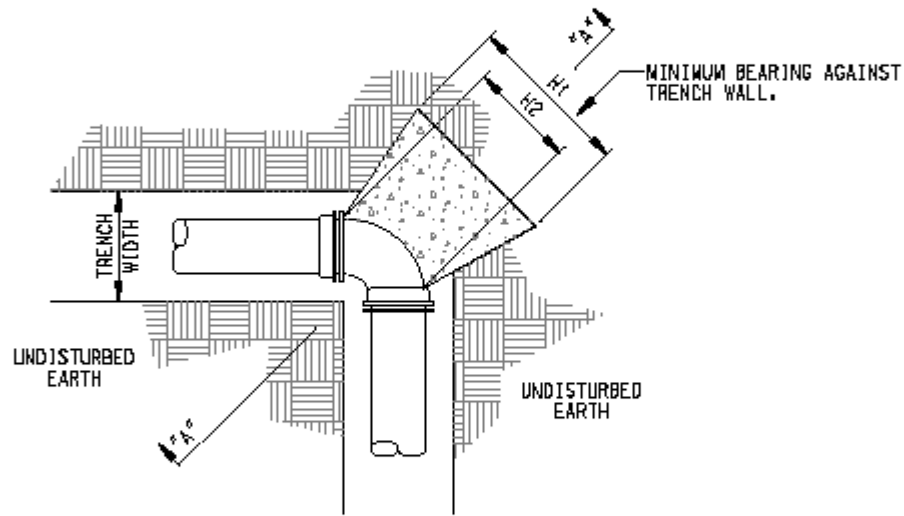
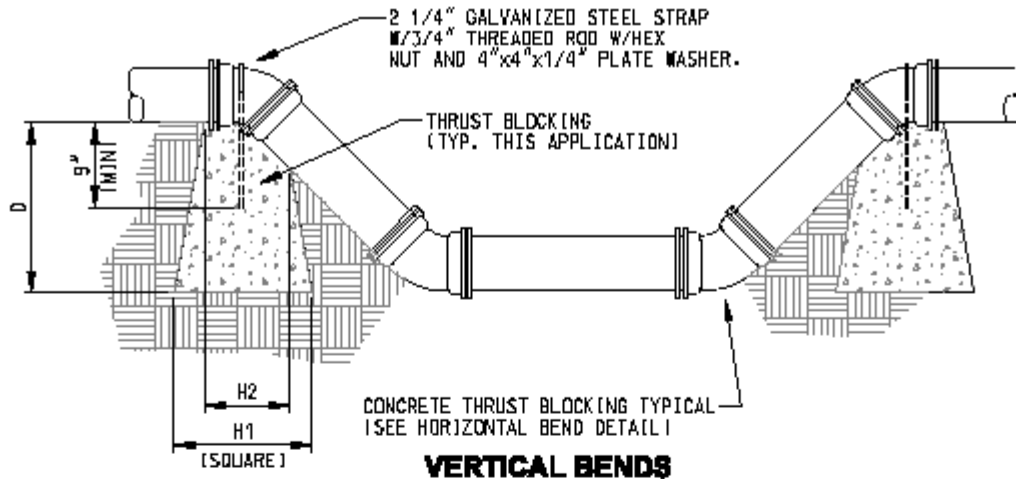
**FIRE HYDRANT WITH VALVE DETAIL**

N.T.S.



**CONCRETE CAP DETAIL**

N.T.S.



SECTION "A-A"  
**HORIZONTAL BENDS**

**CONCRETE THRUST BLOCKING (1 OF 2)**

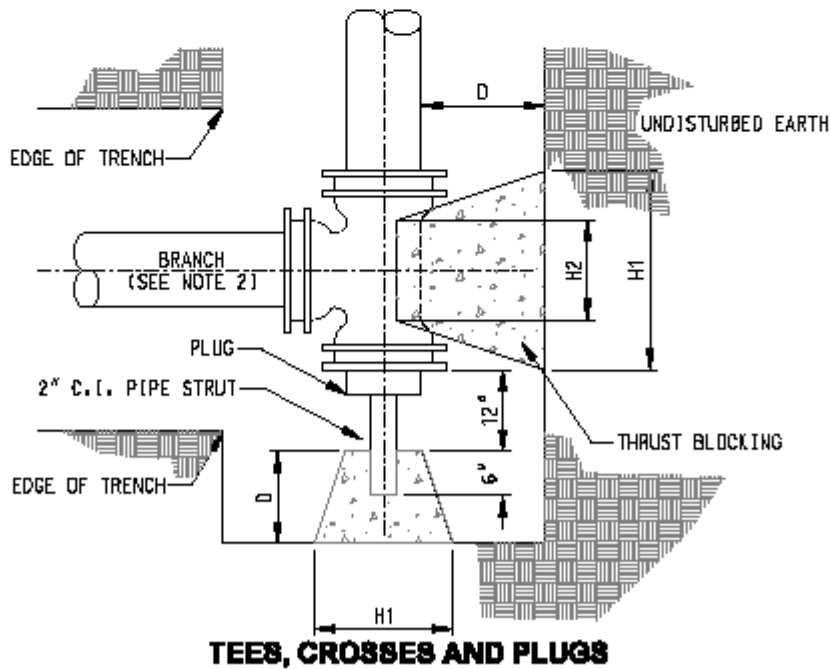
N.T.&

**W-4**

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.		H1	H2	V	D	Cu.Ft.
18"	10"	12"	14"	1.80	18"	10"	12"	18"	1.90	18"	6"	12"	18"	1.50	18"	6"	12"	14"	1.50	18"	6"	12"	18"	1.50	18"	6"	12"	18"	1.50	2" - 2 1/2"
24"	12"	12"	14"	2.25	24"	12"	12"	18"	2.25	18"	8"	12"	18"	1.60	18"	8"	12"	14"	1.60	18"	8"	12"	18"	1.60	18"	8"	12"	18"	1.60	3" - 4"
24"	16"	18"	14"	5.50	30"	16"	18"	18"	4.05	24"	10"	16"	18"	3.20	24"	10"	16"	14"	5.20	24"	10"	16"	18"	3.20	24"	10"	16"	18"	3.20	6"
36"	18"	18"	24"	5.05	30"	18"	24"	18"	7.30	30"	12"	18"	18"	5.95	24"	12"	18"	14"	3.45	24"	12"	18"	18"	3.45	24"	12"	18"	18"	3.45	8"
48"	24"	18"	24"	7.15	54"	32"	24"	18"	10.20	36"	16"	21"	18"	4.60	24"	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"	38"	36"	24"	16.15	42"	18"	24"	24"	9.60	24"	18"	24"	24"	6.60	24"	18"	24"	24"	6.60	24"	18"	24"	24"	6.60	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"	9.20	27"	21"	24"	24"	9.20	14"
66"	34"	36"	24"	22.50	66"	48"	48"	24"	29.00	48"	30"	36"	24"	17.00	36"	30"	27"	24"	11.80	27"	24"	27"	24"	11.80	27"	24"	27"	24"	11.80	16"
66"	36"	40"	24"	21.50	66"	48"	48"	24"	33.00	48"	30"	36"	24"	17.00	36"	30"	29"	24"	13.00	27"	30"	29"	24"	13.00	27"	30"	29"	24"	13.00	18"
	38"		24"			48"		24"			40"		24"			38"		24"		30"	40"		28"			40"		28"		20"
	42"		24"			60"		24"			48"		24"			42"		24"			42"		32"			42"		32"		24"
	58"		24"			96"		24"			72"		24"			72"		24"			48"		36"			48"		36"		36"

**NOTES:**

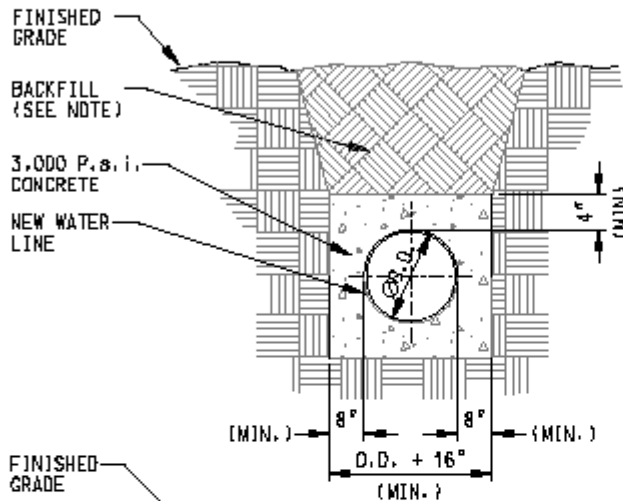
1. THRUST BLOCKING WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR 3000 PSI CONCRETE FOR THE VOLUME SHOWN IN THE ABOVE TABLE FOR EACH FITTING SO BLOCKED ONLY IF A SEPARATE ITEM APPEARS IN THE SCHEDULE OF A PROPOSAL FOR A UNIT PRICE CONTRACT. OTHERWISE, THERE WILL BE NO SEPARATE PAYMENT FOR CONCRETE THRUST BLOCKING.
2. DIMENSIONS ARE CONTROLLED BY DIAMETER OF BRANCH MAIN.
3. THRUST BLOCKING SHALL BE PLANT MIX CONCRETE. SAC CRETE OR BAGGED CONCRETE MIX SHALL NOT BE ALLOWED.



**TEES, CROSSES AND PLUGS**

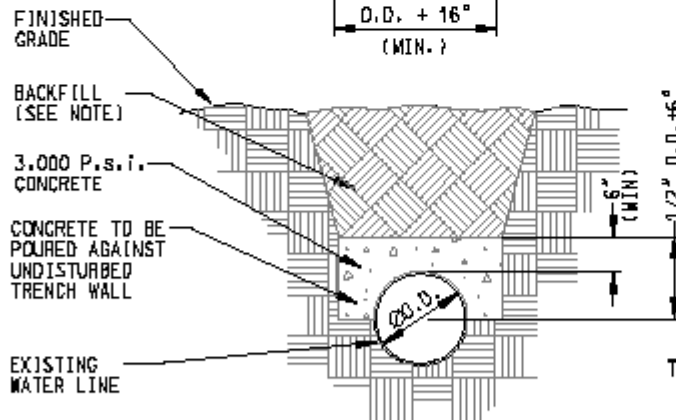
**CONCRETE THRUST BLOCKING (2 OF 2)**

N.T.S.



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

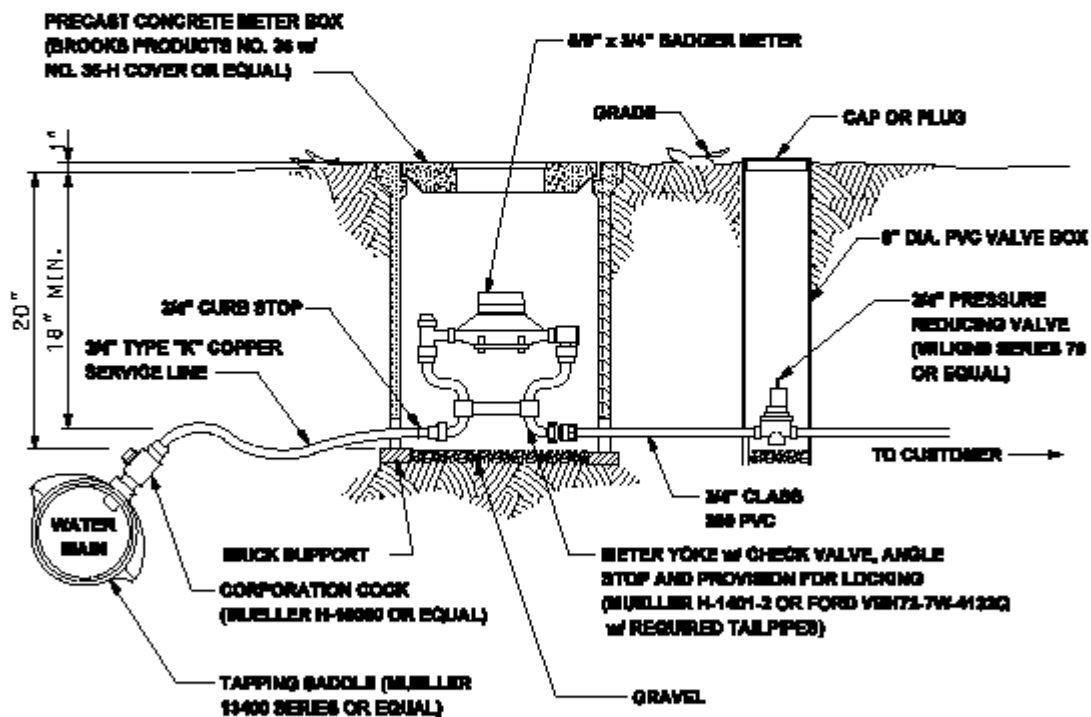
TYPICAL CONCRETE PROTECTION  
 FOR NEW WATER LINES



TYPICAL CONCRETE PROTECTION  
 FOR EXISTING WATER LINES

**CONCRETE PROTECTION FOR WATER LINES**

N.T.S.

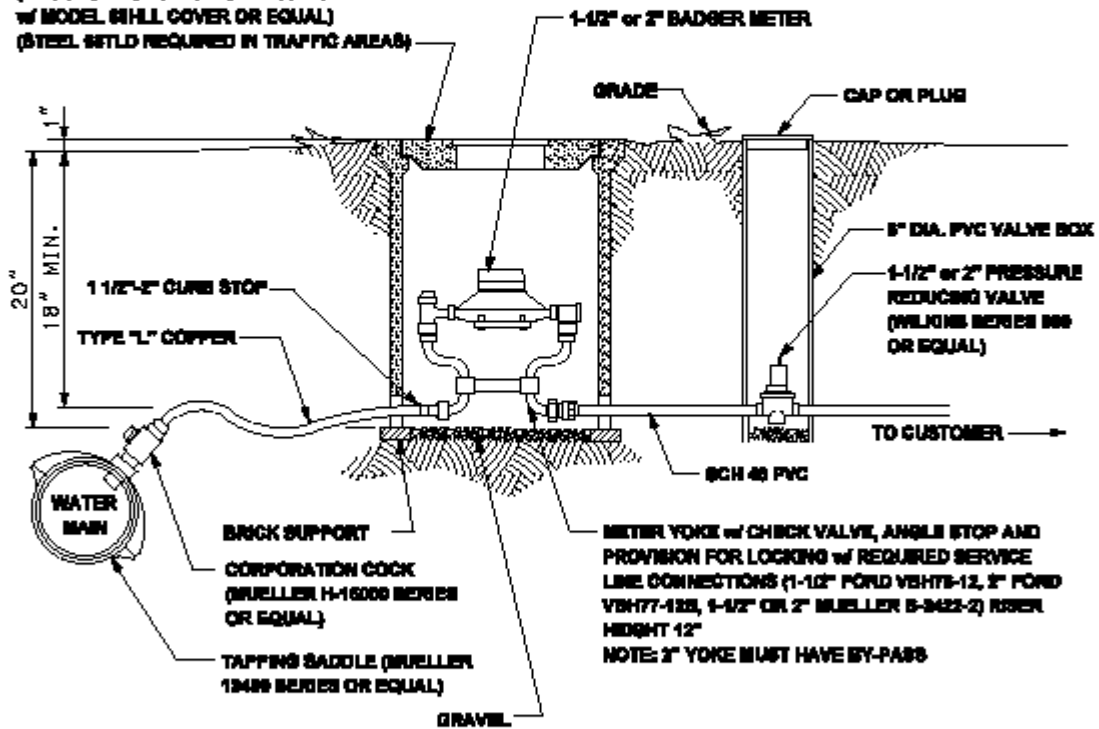


**3/4" SERVICE ASSEMBLY  
 w/ PRESSURE REDUCING VALVE**

N.T.S.

W 7.5A

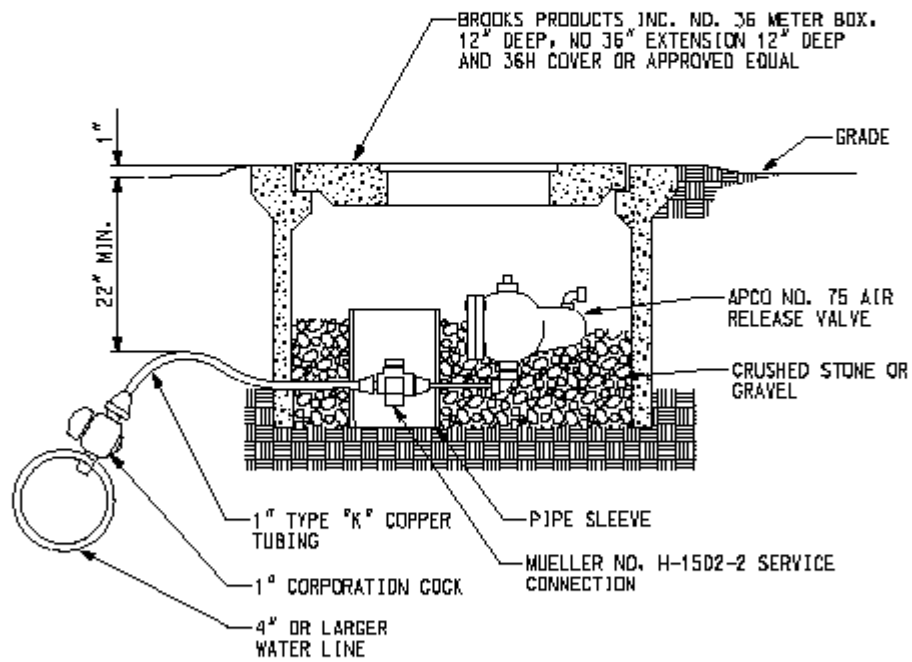
**PRECAST CONCRETE METER BOX  
(BROOKS PRODUCTS MODEL 8811F  
w/ MODEL 8811L COVER OR EQUAL)  
(STEEL SETLD REQUIRED IN TRAFFIC AREAS)**



**1-1/2" OR 2" SERVICE ASSEMBLY  
w/ PRESSURE REDUCING VALVE**

N.T.S.

W 7.8.1A

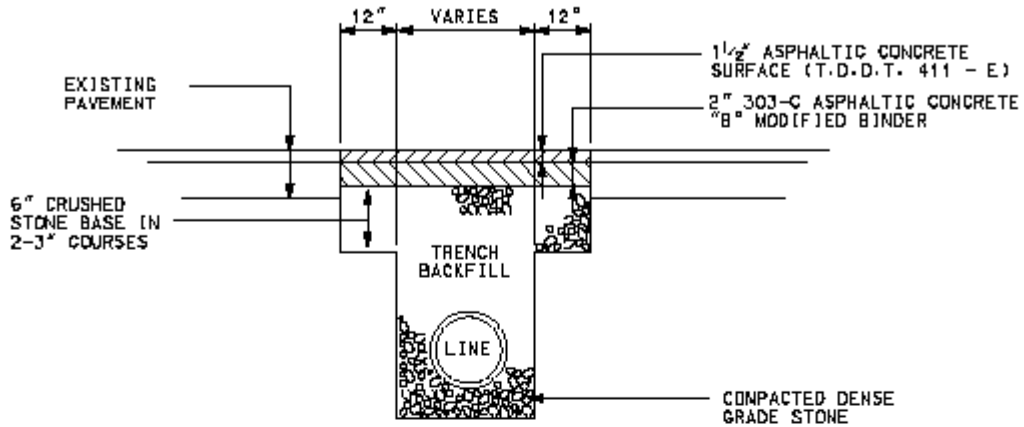


NOTE:  
AUTOMATIC AIR RELEASE SHOWN. FOR MANUAL OPERATION, OMIT APCO VALVE AND  
SUBSTITUTE A 12" NIPPLE W/THREADED END

### **AUTOMATIC AIR RELEASE ASSEMBLY**

N.T.S.

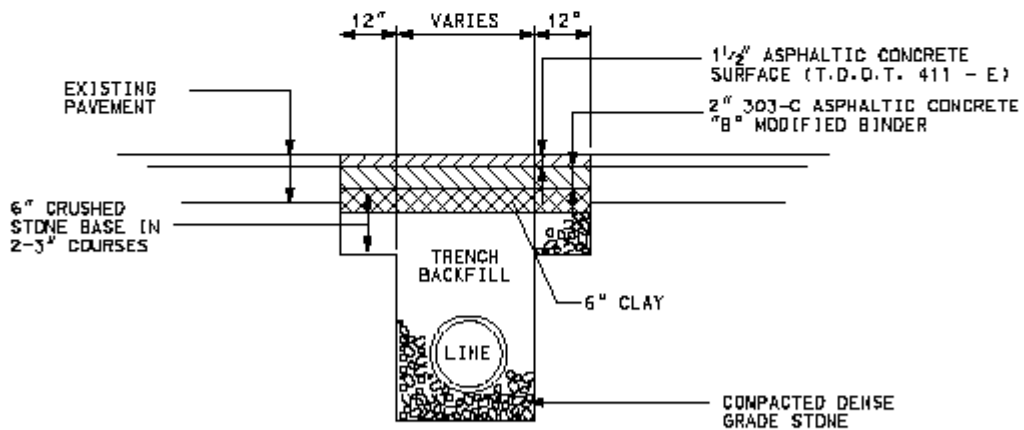
**WB.1**



INSTALLATION PERPENDICULAR TO STREET

**NOTE:**

EDGE OF PAVEMENT TO BE TRIMMED A MINIMUM OF 12" BEYOND EACH SIDE OF TRENCH WIDTH TO OBTAIN HEAT LINES. COLD MIX TO BE PLACED AS A TEMPORARY SURFACE WITHIN 48 HOURS OF MAKING ROAD CROSSING.



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

N.T.S.