

**STANDARD SPECIFICATIONS  
FOR  
WATER SYSTEM IMPROVEMENTS**

FOR THE

**TOWN OF JONESBOROUGH  
JONESBOROUGH, TENNESSEE**

MAY 2023

GRW PROJECT NO. 7606-03

DW20230442

**APPROVED WATER SPECIFICATIONS**

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

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

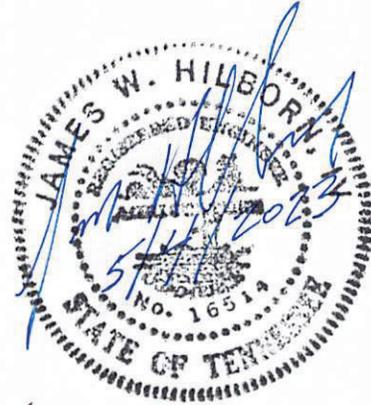
AND IS HEREBY APPROVED FOR USE IN CONSTRUCTION BY THE COMMISSIONER



05/30/2023

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

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE



Accepted by: \_\_\_\_\_

  
Kevin Brobeck, Utility Manager  
Town of Jonesborough

Date: \_\_\_\_\_

5/4/2023

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DIVISION 01

GENERAL RE QUIREMENTS

## SECTION 01 11 00 - PROCEDURES

### PART 1 - GENERAL

#### 1 01 PURPOSE

The purpose of this section is to establish a step-by-step procedure to be followed by the Owner/Developer Engineer and Contractor in initiating and completing the construction of any water lines or services that are to be connected to or become a part of the T distribution system.

#### 1 02 APPLICATION FOR CONNECTION

The applicant shall apply in writing to the T for approval of a water line connection. The letter shall be accompanied by a map of the area showing streets roads property lines and topographical information along with the proposed water facilities. The map shall be to a scale of not less than 1-inch equals 400 feet.

From the information submitted the T will review the various elements of construction necessary to connect the proposed area to the existing water system. After review the T will send a letter of approval and or/comments to the applicant. With the letter of approval the applicant may proceed into the design stage.

#### 1 03 DESIGN

The applicant on receipt of approval letter may authorize his Engineer to prepare plans for the proposed facilities in accordance with the specifications contained herein. The design Engineer shall provide the following information

A minimum pressure of 30 psi must be maintained at all water service connections. Hydraulic calculations should show pressures at high and low points in the area to be served. All lines shall be looped where possible. Dead end lines should be sized for possible extension for future growth.

During the design stage the Engineer shall work closely with the T to ensure the final plans meet all requirements of the T . There shall be no provisional approval of plans.

Plans prepared by the Engineer for the construction of water facilities shall be drawn on plan sheets 24 36 to a scale of 1 100 and contain the following information

##### Title Sheet

1. Name of Development.
2. Name of Owner-Developer.
3. Engineer's Seal License Number and Signature.

Plan Sheets

1. Topography Streets Driveways Property Lines and Utility Easements.
2. Location of Water Lines.
3. Pipe Size and Material.
4. Location of Valves.
5. Location of Hydrants.
6. Location of Flush Hydrants.
7. Location of Water Meters.
8. Location of Air Release/Air Vacuum Valves.
9. Existing Utilities - Water Lines Valves Hydrants Sewer Lines Manholes etc.
10. The Statement ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH ONEIDA S STANDARD SPECIFICATIONS.
11. Engineer s Seal License Number and Signature.

**10 DESIGN REVIEW**

When the plans have been completed two sets shall be submitted to the T for review and approval. The Owner/Developer should allow the T 30 days for the review time.

The T shall review the plans as to the sanitary features of design and the standard specifications contained herein. Any plans submitted that do not completely comply with all requirements of the T shall be returned to the Engineer unapproved with the necessary corrections noted. After all corrections are made the corrected plans shall be returned to the T so that each sheet may be stamped Approved . Once the plans have been approved by the T they shall be submitted to the Tennessee Department of Environment & Conservation for review and approval. Construction cannot begin until approval is granted by the state. The plans shall be submitted to the following address

Tennessee Department of Environment & Conservation  
Drinking Water Section  
6th Floor L & C Tower  
401 Church Street  
Nashville Tennessee 37243-1549

Any review fees charged by the State shall be paid by the Owner/Developer.

One set of stamped State-approved plans shall be kept on the job site at all times. One set of stamped State-approved plans shall be furnished to the T prior to the beginning of construction.

**END OF SECTION**

## SECTION 01 1 00 - SPECIAL PROVISIONS

### PART 1 - GENERAL

#### 1 1 PURPOSE

The purpose of this Standard Specification is to provide information and requirements to land developers design engineers and contractors in the construction of water facilities that are to be connected to or become a part of the **T**. The ultimate goal of this specification is to ensure the protection of the health and welfare of the general public through the use of proper design features and construction methods.

#### 1 2 DEFINITIONS

APPROVED - Material equipment workmanship process or method that has been accepted by the **T** as suitable for the proposed use.

AS-BUILT - A certification by the Engineer whose stamp appears on the plans that the measurements depths materials and facilities that are shown on the plans are true and correct and are constructed in accordance with the Standard Construction Specifications.

CONTRACTOR - The person firm or corporation with whom the Owner-Developer has executed an agreement to perform the utility construction for the project.

ENGINEER - A Registered Professional Engineer registered in the State of Tennessee.

OWNER-DEVELOPER - An individual group of individuals partnership firm association or corporation that is constructing or having constructed water facilities that are to become a part of or be connected to the **T**.

RESIDENT INSPECTOR - The Engineer or his representative who is required to be on the job site during any construction of facilities that are to become part of the **T** s facilities to insure that the facilities are being constructed in accordance with the Standard Specifications.

T \_\_\_\_\_ - Shall mean the mayor the Board of Public Utilities or its designated representative.

SHALL - Means a mandatory requirement.

### **13 AUTHORITY**

The **T** shall decide questions which may arise as to the quality and acceptability of materials furnished. The **T** shall interpret the intent of these Standard Specifications and Standard Drawings.

Nothing contained in these Specifications or Standard Drawings is intended to conflict with any State or Federal law or regulations. If any requirement is found to be in conflict with a State or Federal regulation then the more stringent requirement shall apply.

### **1 SHOP DRAWINGS**

The Contractor shall submit to the **T** detailed drawings of all materials to be installed for water lines and appurtenances. The shop drawings shall be checked and signed by the Contractor indicating compliance with these Specifications before submitting to the **T**. A minimum of two copies of each shop drawing shall be submitted one of which will be retained by the **T** after review.

The Contractor shall be completely responsible for accuracy completeness and compliance with these Standard Specifications and Drawings.

### **1 MATERIALS OR EQUIPMENT TO BE FURNISHED**

Where materials or equipment are specified by a single model number and manufacturer the **T** has established this product as a standard and shall be used on work for the **T**. Where two or more manufacturers are specified it is intended by the **T** that either one or an approved equal may be used. Any deviations from these specifications shall be approved by the **T**. The **T** where practical may require submission of samples of materials or products.

### **1 EXISTING UTILITIES**

Special precautions shall be taken by the Contractor to avoid damage to existing overhead and underground utilities owned and operated by the **T** or private utility companies.

Where existing utilities or other underground structures are encountered they shall not be displaced or molested unless necessary and in such case they shall be replaced in as good or better condition than found as quickly as possible.

### **1 EASEMENTS**

The Developer/Owner shall provide permanent easements for all water lines. The easements shall be wide enough to provide ingress and egress for inspection and repair with a minimum width of 15 feet (10 feet on one side of centerline).

## **1 FINAL INSPECTION AND CERTIFICATION**

Final inspection will be held when the **T** is notified that work is complete and ready for inspection. All concerned parties shall be present for the inspection.

Upon acceptance of construction the Owner/Developer shall certify to the **T** in writing that all payments have been made to all parties involved in the construction of the facilities.

A certified set of as-built drawings on reproducible material shall be furnished the **T** for its use.

## **1 WATER AND UPLIFT**

The Contractor shall by the use of well points pumps or other approved methods prevent the accumulation of water in excavated areas. Should water accumulate it shall be promptly removed. The Contractor shall also provide for dewatering areas adjacent to structures or lines to prevent uplift during construction operations. The Contractor will be held responsible for any damage due to uplift of such structures or lines and to existing structures during construction operations.

### **1 10 BLASTING**

All blasting operations including storage of explosives shall be in accordance with all ordinances and state laws and all explosives shall be stored in conformity with said ordinances and laws. No blasting shall be done within five (5) feet of any water mains except with light charges of explosives. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

To implement this requirement and unless otherwise required by ordinance or law each excavating crew shall be provided with two (2) metal boxes with suitable locks. One of these boxes shall be painted a bright color and stenciled with appropriate warning signs. At night all explosives and caps shall be removed from the boxes and stored in a central magazine. Compliance with laws ordinances and regulations shall be the Contractor's responsibility and he shall save the **T** harmless from any and all claims of any type or nature arising from blasting or storage of explosives.

### **1 11 SOILS AND BANK EROSION**

The Contractor shall maintain all areas where excavation and backfill operations are being performed or have been performed in order that siltation and bank erosion will be kept to a minimum during construction. This requirement includes construction of temporary or permanent erosion barriers and use of special methods to control erosion.

### **1 12 OCCUPATIONAL SAFETY AND HEALTH ACT**

All work shall be done in strict compliance with the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL

91-54).

It is not the intention of these Specifications to conflict with the Act in any way and where conflicts may arise the Act shall govern.

### **1 13 NOISE AND ODOR CONTROL**

Some work may be performed adjacent to or near private residences. The Contractor shall be responsible for noise and odor abatement procedures and shall not commence work in these areas before 7 00 a.m. local prevailing time.

### **1 1 CHEMICAL REQUIREMENTS**

All chemicals used during project construction or furnished for project operation whether herbicide pesticide disinfectant reactant or of other classifications must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

## **PART 2 - PRODUCTS N A**

## **PART 3 - EXECUTION N A**

**END OF SECTION 01 1 00**

## **SECTION 01 22 13 – TESTING AND CONTROL OF MATERIALS**

### **PART 1 - GENERAL**

#### **1 1 PURPOSE**

This Section together with such additions deletions or modifications if any as may appear in any other particular Section of these Specifications shall govern the furnishing and testing of materials to be used in the work.

Materials of construction particularly those upon which the strength and durability of the structure may depend shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.

#### **1 2 COST OF TESTS AND SELECTION OF TESTING AGENCIES**

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 will be selected by the Contractor subject to the approval of the T . The Contractor shall pay for all required laboratory inspection service and shall submit to the T for approval the name and qualifications of the testing firm proposed. Such submission shall be made in adequate time for the T to make a decision in the normal course of business.

#### **1 3 SOURCES OF SUPPL**

The Contractor shall submit a list indicating his sources of supply of all materials including manufactured items and receive the T s approval prior to the placing of orders. The T may require representative samples of any materials prior to approval of the source. The T s approval of the source of any sample shall not be construed to relieve the Contractor of furnishing materials which fully meet all provisions of the Specifications.

If it is found that sources which have been approved do not furnish uniformly acceptable products the approval may be withdrawn. The Contractor and his supplier shall afford the T opportunities for inspecting products and materials at any time during their preparation. The Contractor and/or supplier shall furnish shipment thereof without charge.

These requirements are not intended to stifle or hinder competition but are intended to assure quality and/or performance.

#### **1 APPROVAL OF TESTING AGENCIES AND REPORTS**

Whenever in these Documents inspection and testing of materials is required bureaus laboratories and/or agencies selected by the Contractor for such inspection and testing service shall be approved by the T .

Documentary evidence satisfactory to the **T** that the material has passed the required inspection and testing must be furnished prior to the incorporation of such materials in the work and rejected materials must be promptly removed from the premise.

Test reports shall contain as a minimum (1) the name and location of the supplier's plant (2) the name of the person gathering the sample (3) the date of the sampling and (4) such other like data as may be required by the **T**.

## **1 GOVERNING SPECIFICATIONS**

It is the intention of the **T** in the preparation of these Standard Specifications to define properly the kind and quality of materials to be furnished. The standards and tentative standards of the American Society of Testing Materials (ASTM) standards of the American Waterworks Association (AWWA) standards of the American Standards Association (ASA) standards promulgated by the Federal Specification Board (Fed. Spec.) American Association of State Highway and Transportation Officials (AASHTO) The Federal Aviation Agency (FAA) or other such agencies may be referred to in the Specifications. Where such standards are referred to said references shall be construed to mean the latest amended and/or revised versions of the said standard or tentative specifications unless specifically stated otherwise. In the selection of samples and the routine testing of materials the testing laboratory shall follow the standard procedure as outlined by the ASTM unless otherwise set out.

## **1 EXTENT OF INSPECTION AND TESTING SERVICE**

It is intended that materials of construction particularly those upon which the strength and durability of structures may depend shall be inspected and tested to establish conformance with specifications and suitability for uses intended. The following paragraphs in this section of the detailed specifications describe the extent of testing requirements and methods of reporting test results for various materials that will be utilized on the project. If it is found that this list does not cover all items that will require testing then such materials shall be tested as directed by the **T**.

## **1 CEMENT**

Cement shall have been shipped from the mill not more than three months prior to receipt on the work. Test and certificate showing specification conformance for each shipment from which material is used shall be furnished from the manufacturer.

## **1 FINE AGGREGATE FOR USE IN CEMENT CONCRETE**

Fine aggregate shall consist of natural river sand except that in special cases the **T** may approve manufactured sand. In certain instances sand manufactured from limestone aggregate may be required for acid protection.

Standard tests shall be made in advance of concreting by an approved independent laboratory per ASTM C-33 Pars. 2 3 4 and 5 and ASTM C-40 on each fine aggregate proposed to be used Alkali reactivity tests as per ASTM C-289. Other tests being satisfactory the aggregate may be

used pending results of 28-day mortar strength tests.

## **1 COARSE AGGREGATE FOR USE IN CEMENT CONCRETE**

Standard tests shall be made in advance of concreting by an approved laboratory on each grading of each coarse aggregate proposed to be used per ASTM C-33 Pars. 7 8 and 9 and Alkali reactivity tests as per ASTM C-289.

### **1 10 ADVANCE TESTS OF CONCRETE DESIGN MIXES**

Before commencement of concrete placing and after approval of cement and aggregates an independent laboratory shall make from a single batch for each proposed mix a set of six (6) standard 6" cylinders per ASTM C-31 and cure in accordance therewith. Test two (2) cylinders at 7 days two (2) cylinders at 14 days and two (2) cylinders at 28 days per ASTM C-39. Two (2) beam flexure tests as per ASTM C-78 shall likewise be made and tested from the design batch.

The requirements for tests may be modified at the Engineer's discretion without prejudice to its later requiring same (if it becomes in doubt about the quality of the concrete) if less than 50 cubic yards are required.

### **1 11 REINFORCING STEEL**

- a. A certificate of origin and affidavit will be required for all reinforcing steel. All reinforcing steel shall be manufactured in the United States.
- b. Field inspection for section rust shape and dimensions plus certified test report for heat number(s).

### **1 12 STRUCTURAL STEEL**

Visual inspection at the site and certified copies of mill test on heat number used in fabrication.

### **1 13 CAST AND DUCTILE IRON PIPE AND SPECIAL CASINGS**

Each piece of pipe shall bear the manufacturer's name or trademark and the date cast. Each piece of pipe should also be certified by the manufacturer to have met the requirements of the governing standard specifications. Also each piece shall be visually inspected in the field for specification conformance.

### **1 1 DUCTILE IRON CASINGS**

- a. Field Inspection For dimensions coating holes.
- b. Laboratory Tests Certified test reports by foundry.

**PART 2 - PRODUCTS N A**

**PART 3 - EXECUTION N A**

**END OF SECTION 012213**

DIVISION 03

CONCRETE

## **SECTION 03 31 00 - CAST-IN-PLACE CONCRETE**

### **PART 1 - GENERAL**

#### **1 1 SCOPE OF WORK**

- A. Provide all labor materials equipment and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.
- B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest) Specifications for Structural Concrete for Buildings except as modified by the supplemental requirements specified herein.

#### **1 2 RELATED WORK SPECIFIED ELSEWHERE**

- A. Earthwork Section 31 20 00

#### **1 3 SUBMITTALS**

The Contractor shall submit the following data for Town of Jonesborough's review in accordance with Section 01 33 23.

- A. Concrete mixture proportions test results and curves plotted to establish water-cementitious materials ratio if ACI 301-05 Section 4.2.3.4.b is followed.
- B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301-05 Section 4.2.3.1 is followed.
- C. Mix designs shall be submitted for all mixes proposed or required to be used including all mixes containing admixtures.
- D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.
- E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.
  - 1. Construction Joints
  - 2. Control Joints
  - 3. Steel Reinforcement

## PART 2 - PRODUCTS

### 2.1 CLASSES OF CONCRETE AND USAGE

- A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths
1. Selection of Proportions for Class A Concrete
    - a. 4 500 psi compressive for strength at 28 days.
    - b. Type II cement plus supplementary cementitious materials.
    - c. Max. water-cementitious materials ratio 0.45.
    - d. Min. cement content 584 lbs.
    - e. Nominal max. size coarse aggregate No. 67 (3/4 max.) or No. 57 (1 max.). Walls with architectural treatment shall use No. 67 (3/4 max.).
    - f. Air content 6 plus or minus 1 by volume.
    - g. Slump 3 - 4 when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.
  2. Selection of Proportions for Class B Concrete
    - a. 3 000 psi compressive strength at 28 days.
    - b. Type I cement plus supplementary cementitious materials.
    - c. Max. water-cementitious materials ratio 0.45.
    - d. Min. cement content 470 lbs. (5.0 bags)/cu. yd. concrete.
    - e. Nominal max. size coarse aggregate No. 67 (3/4 max.) or No. 57 (1 max.). Walls with architectural treatment shall use No. 67 (3/4 max.).
    - f. Air content 6 plus or minus 1 by volume.
    - g. Slump 3 - 4 when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.
- B. Concrete shall be used as follows
1. Class A concrete for all concrete work except as noted below.
  2. Class B concrete for fill concrete thrust blocks and topping over hollow-core slabs and where indicated on the Drawings.
- C. Type II cement conforming to ASTM C 150 shall be used in all structural concrete. Cement exposed to view concrete shall have a uniform color classification.
- D. Coarse aggregate for concrete shall be size No. 57 as specified in ASTM C 33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C 33.

### 2.2 ADMIXTURES

- A. An air entraining admixture shall be used on all concrete exposed to freezing and thawing cycles. Product shall be MB-AE 90 MB-VR or Micro Air by BASF Construction Chemicals or

approved equal. Certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished if requested.

- B. Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type A. Product shall be "Pololith" Series or "PolyHeed" Series by BASF Construction Chemicals or approved equal.
- C. High-Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type F. Product shall be "Rheobuild 1000" "Glenium" Series or PS 1466 by BASF Construction Chemicals or approved equal.
- D. Accelerating Admixture shall conform to ASTM C 494/C 494M Type C or E. Products shall be "Pololith NC 534" or "Poutec 20" by BASF Construction Chemicals or approved equal.
- E. Retarding Admixture shall conform to ASTM C 494/C 494M Type B or D. Product shall be "Pololith" Series or "DELVO" Series by BASF Construction Chemicals or approved equal.
- F. A water-reducing set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions specified early strength development finishing characteristics required and surface texture as determined by the Town of Jonesborough.
- G. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494 Type A water-reducing and normal setting admixture and when required for ASTM C 494 Type D water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.
- H. When more than one (1) admixture is used all admixtures shall be compatible. They should preferably be by the same manufacturer.
- I. Calcium chloride will not be permitted as an admixture in any concrete.

## **2.3 REINFORCEMENT**

- A. The minimum yield strength of the reinforcement shall be 60 000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615/A 615M. All bar reinforcement shall be deformed.
- B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.
- C. Smooth dowels shall be plain steel bars conforming to ASTM A 615/A615M Grade 60 or steel pipe conforming to ASTM A 120 Schedule 80. Pipe if used shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

- D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement when in contact with the ground or stone fill shall be precast stone concrete blocks. Particular attention is directed to the requirement of Paragraph 3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement whether in walls or other vertical elements inclined elements or flatwork.
- E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams slabs and columns. In no case shall ends of tie wires project toward or touch formwork.

**2 OTHER MATERIALS**

- A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Town of Jonesborough.
  - 1. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325 Groups I II III or VIII and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05 50 00 Miscellaneous Metalwork . Anchors shall develop ultimate shear and pull out loads of not less than the following values in Class A concrete

<u>Bolt Diameter (Inches)</u>	<u>Min. Shear (Pounds)</u>	<u>Min. Pull-Out Load (Pounds)</u>
2	4 500	4 600
5/8	6 900	7 700
3/4	10 500	9 900

- B. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable
  - 1. Colma by Sika Chemical Corporation
  - 2. Hornfle by A.C. Horn Inc.
  - 3. Sonolastic by BASF Construction Chemicals.
  - 4. Town of Jonesborough approved equal.
- C. Nonshrink grout shall be Embeco 885 grout by BASF Construction Chemicals Euco Firmi grout by the Euclid Chemical Company or approved equal. The approved product shall be delivered to the site of the Work in the original sealed containers each bearing the trade name of the material and the name of the manufacturer.
- D. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen free from earth clay or other foreign substances.
- E. Waterstops Waterstops shall be polyvinyl chloride flat dumbbell shape (no center bulb) of size shown on Drawings complete with fittings as required such as unions vertical tees vertical ells flat crosses flat ells flat tees etc. Waterstops shall be securely wired into place to maintain proper position during placement of fresh concrete as shown on the Drawings. Care

shall be taken in the installation of the waterstop and the placing of the concrete to avoid folding while concrete is being placed and to prevent voids in the concrete surrounding the waterstop.

## **PART 3 - EXECUTION**

### **3 1 FINISHES**

- A. Exposed to Public View Concrete Surfaces
1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces including the outside surfaces of piers.
  2. Forms for exposed concrete surfaces shall be exterior grade high-density overlay plywood steel or wood forms with smooth tempered hard-board form-liners.
  3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.
  4. Chamfer strips shall be one (1) inch radius with leg polyvinyl chloride strips by Gateway Building Products Saf-T-Grip Specialties Corp. Vinyl Corp. or equal.
  5. All formed exposed to view concrete surfaces shall have a smooth rubbed finish. Exterior vertical surfaces shall be rubbed to one foot below grade.
- B. Exterior platforms steps and landings shall be given a broom finish. Broom finish shall be applied to surfaces which have been steel-troweled to an even smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.
- C. Patching of holes due to removal of tie ends and other repairable defective areas shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.4.B. in accordance with manufacturer's specifications and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI 301 Par. 5.3.7.5.
- D. For floors and slabs in which drains occur special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown.

### **3 2 ADDITIONAL REQUIREMENTS**

- A. Unless otherwise directed by the Town of Jonesborough the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Town of Jonesborough before any concrete is placed.
- B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 31 20 00 Earthwork. Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs tank bottoms and foundations. The fill shall be leveled and uniformly compacted to a reasonably

true and even surface. The surfaces shall be clean free from frost ice mud and water. Waterproof paper polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

C. Concrete Mixing

1. Ready-Mixed Concrete Measure batch mix and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.
  - a. When air temperature is between 85 and 90 deg F (30 and 32 deg C) reduce mixing and delivery time from 1-1/2 hours to 75 minutes when air temperature is above 90 deg F (32 deg C) reduce mixing and delivery time to 60 minutes.
2. Project site Mixing Measure batch and mix concrete materials and concrete according to ASTM C94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - a. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller continue mixing at least 1-1/2 minutes but not more than 5 minutes after ingredients are in mixer before any part of batch is released.
  - b. For mixer capacity larger than 1 cu. yd. (0.76 cu. m) increase mixing time by 15 seconds for each additional 1 cu. yd.
  - c. Provide batch ticket for each batch discharged and used in the Work indicating Project identification name and number date mix type mix time quantity and amount of water added. Record approximate location of final deposit in structure.

D. All concrete surfaces shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Town of Jonesborough.

E. Concrete Walks and Curbs

1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns driveways and opposite expansion joints in adjacent curbs. Where curbs are not adjacent transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a broomed finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 #6-W1.4 W1.4 welded wire reinforcement.

3. Concrete curbs shall be constructed to the section indicated on the Standard Detail and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Town of Jonesborough. At the option of the Contractor the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4 inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

F. Watertightness

1. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe the groove shall be filled with a quick setting hydraulic compound similar and equal to Waterplug as made by BASF Construction Chemicals mixed and applied in accordance with the manufacturer's instructions.

- G. Concrete which in the opinion of the Town of Jonesborough has excessive honeycomb aggregate pockets or depressions will be rejected and the Contractor shall at his own expense remove the entire section containing such defects and replace it with acceptable concrete.

- H. Manhole or access steps shall be plastic constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II Grade 16906 material. Step shall be reinforced with ASTM A 615 Grade 60 #4 deformed steel reinforcing bar 9" deep 14" wide provided with notched tread ridge foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries Inc. Peachtree City Georgia or approved equal. Steps shall be installed by drilling 1" diameter holes minimum 3-3/4 inches deep into the wall and then driving steps into hole to the penetration stop resulting in a press fit condition.

**END OF SECTION 03 31 00**

## **SECTION 03 00 – PRECAST CONCRETE STRUCTURES**

### **PART 1 - GENERAL**

#### **1 1 SCOPE OF WORK**

- A. Provide all labor materials equipment and services required to furnish and install all precast concrete structures and accessories appurtenances as shown on the Drawings and specified herein.
- B. Delegated Design Design precast concrete structures including comprehensive Town of Jonesborough analysis by a qualified professional Town of Jonesborough licensed in the state in which the project using performance requirements and design criteria indicated.

#### **1 2 RELATED WORK SPECIFIED ELSEWHERE**

- A. Cast-in-Place Concrete Section 03 31 00

#### **1 3 SUBMITTALS**

The Contractor shall submit the following data for Town of Jonesborough s review in accordance with Section 01 33 23.

- A. Product Data For each type of product indicated included but not limited to standard precast units proprietary precast units embedded items and accessories.
- B. Test Reports Submit test reports for the following
  1. Material certifications and/or laboratory test reports including mill tests and all other test data for Portland cement blended cement po olans ground granulated blast furnace slag silica fume aggregate admi tures and curing compound proposed for use on this Project.
  2. Test reports showing that the mi has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Such tests may include compressive strength fle ural strength plastic or hardened air content free e thaw durability abrasion and absorption. Clearly detail in the specifications special tests for precast concrete or cast-in items.
  3. Sufficient documentation when the use of self-consolidating concrete (SCC) is proposed showing a minimum of 30-days production track records demonstrating that SCC is appropriate for casting of the product.
  4. In-plant A/ C inspection reports upon the request of the Project Representative.
- C. Shop Drawings Submit shop drawings for standard precast units and custom-made precast units prepared under direct supervision of a professional Town of Jonesborough licensed in the state in which the project is located. Shop drawings shall include
  1. The criteria and loads used in the design of the precast components.
  2. All materials used their specifications and their design strengths.

3. Layout piecemark dimensions reinforcing and connection details of each precast member including openings.
  4. Details and instructions for lifting rigging erection and installation of each precast component.
  5. Lists and descriptions of all loose accessory materials supplied.
  6. Instructions on secondary pours (in the field) when required.
- C. Quality Control Procedures Submit certificate from the NPCA C Manual that the precast concrete structure manufacturer participates in their A/ C program.
- D. Manufacturer s Instructions.

## **1 QUALITY ASSURANCE**

- A. Manufacturer of precast concrete structures shall be quality certified by NCPA. Inspect manufacture of structures in accordance with ASTM C1037.
- B. Installer of precast concrete structures shall have a record of at least three (3) years of successful installation of similar products on similar projects.
- C. Inspection of earthwork compaction and backfill shall be in accordance with the earthwork specifications in Division 31.

## **1 DELIVERY STORAGE AND HANDLING**

- A. Deliver precast units to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite all precast concrete units will be inspected by the Project Representative for quality and final acceptance.
- B. Store units off the ground or in a manner that will minimize potential damage.
- C. Handle transport and store products in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Perform lifting with methods or devices intended for this purpose as indicated on Shop Drawings.

## **PART 2 - PRODUCTS**

### **2.1 PRECAST CONCRETE STRUCTURES**

- A. Circular precast vaults and structures shall conform to ASTM C478. Non-circular vaults and structures shall conform to ASTM C857. Access hatch and pipe penetrations shall be cast in the top slab and/or sides as indicated on the drawings.
- B. Manhole frames and covers shall have a clear opening of 24 inches and shall be made of cast iron conforming to ASTM A48/A48M Class 30. Casting shall be smooth clean and free from blisters blowholes and shrinkage. Castings shall be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 144 degrees F and not more than 155 degrees F so as to form a tenacious coating.
- C. Structural design of precast concrete structures is hereby delegated.

- D. All precast concrete structures shall be designed to resist the lateral soil pressures and fluid pressures in accordance with ASTM C857.
- E. All precast concrete structures have integral flanges at the base to engage enough soil resistance to resist the buoyant force from full submergence.
- F. All precast concrete structures shall be designed to support HL-93 or HS25-44 wheel loads in accordance with the AASTHO HB-17 anywhere on the top surface of the structure.
- G. Joints Joints shall be watertight and shall be sealed with one of the following
  - 1. Rubber gaskets conforming to ASTM C443.
  - 2. Pre-formed flexible butyl type joint sealant conforming to AASHTO M198.
    - a. Hamilton Patent Seal No. 2”
    - b. T. Snyder Company Rubber Neck”
    - c. Press Seal Gasket E-Stik”
    - d. Or approved equal
- H. Corrosion Control Follow recommendations outlined in ACPA 01-110 when hydrogen sulfide is indicated as a potential problem.

### **PART 3 - EXECUTION**

#### **3 1 FABRICATION**

- A. Fabricate precast concrete structures in accordance with NPCA C Manual.

#### **3 2 INSTALLATION**

- A. Install precast concrete structures in accordance with ASTM C891 and the manufacturer's instructions.
- B. Lift precast components at designated lifting points in accordance with the manufacturer's instructions and other applicable safety standards.
- C. Precast concrete structures shall bear on a minimum 4 inch thick bedding / base / drainage course of free-draining granular material. See Division 31 for bedding / base / drainage course materials.
- D. Do not bear precast concrete structures on uneven subgrade or grade with high points from rock pinnacles or boulders or rock ledges.
- E. Install precast concrete structures in proper location with the proper alignment and level.
- F. Backfill around the precast concrete structures in accordance with Division 31 specifications.

### **3 3 JOINTS**

- A. Joints shall be sealed with an approved sealant as specified in Part 2 and shall be mortared or grouted.
- B. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound.
- C. Joints shall be watertight.
- D. Pipe Connections into Precast Structures
  - 1. Precast Openings
    - a. Pipe shall be sealed in the precast section pipe opening with a resilient connector meeting the requirements of ASTM C923. Resilient connector shall be Dura-Seal III” by Dura-Tech Dayton Ohio A-Lok” by A-LO Products Inc. or approved equal.
    - b. Resilient connector shall be cast integrally into the wall of the precast section at the time of manufacture. There shall be no mortar placed around the connector on the outside of the manhole and no mortar shall be placed around the top half of the connector on the inside of the manhole when completing the invert work.
  - 2. Cored Openings
    - a. Pipe shall be sealed in cored precast section pipe opening with a resilient mechanical connector meeting the requirements of ASTM C923. Resilient connector shall be NPC or-N-Seal I” (with stainless steel wedge) by Trelleborg Pipe Seals Milford Inc. PS Direct Drive” by Press-Seal Gasket Corporations interlocking link pipe seal or approved equal. All fasteners and hardware shall be Type 304 stainless steel.
    - b. There shall be no mortar placed around the connector on the outside of the structure and no mortar shall be placed around the top half of the connector on the inside of the structure when completing the invert work.

### **3 CLEAN UP**

- A. Upon completion of installation of the precast structures and appurtenances the Contactor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground around and adjacent to the construction area in a uniform and neat manner to the final grade lines.

**END OF SECTION 03 00**

DIVISION 31

EARTHWOR

## SECTION 31 2 00 - EROSION AND SEDIMENTATION CONTROL

### PART 1 - GENERAL

#### 1 1 SCOPE OF WORK

- A. The Contractor shall be responsible for construction of Best Management Practices for control of erosion and sediment as recognized by the Tennessee Department of Environment and Conservation Division of Water Pollution Control. The Contractor shall be responsible for maintaining the BMPs through the construction project and longer if necessary. The Contractor shall be responsible for inspecting and reporting the adequacy of the BMPs per the guidelines established by the Division of Water Pollution Control. The Contractor must designate an individual to be responsible for erosion and sediment control measures and ensure that person is properly trained and responsible for meeting the TDEC requirements for inspections reporting etc.
- B. This Section does not intend to direct the Contractor's means and methods for erosion and sediment control but does place all responsibility on the Contractor for proper construction maintenance and inspection of his erosion and sediment control BMPs. Any fines that may be received by the Town of Jonesborough due to a Notice of Violation that resulted from improper erosion or sediment control practices during construction of the Work shall be borne by the Contractor.
- C. The Contractor shall maintain all areas where excavation and backfill operations are being performed or have been performed in order that siltation and bank erosion will be kept to a minimum during construction. BMPs recognized by the Division of Water Pollution Control are described in the Tennessee Erosion and Sediment Control Handbook Latest Edition (4<sup>th</sup> or later) as conditions exist. BMPs generally include
1. Vegetative Practices
  2. Structural Practices and
  3. Stream Alteration Practices

Specific techniques for each Practice are identified in the Erosion and Sediment Control Handbook. For each technique offered in the Handbook the Contractor will find

1. Definition of technique
2. Purpose for use
3. Conditions for use
4. Design Criteria for technique
5. Construction Specifications for technique
6. Maintenance measures for technique.

#### 1 2 STORM WATER POLLUTION PREVENTION PLAN

- A. If the disturbed area is one acre or greater Contractor and Developer shall submit to the State of Tennessee a Notice of Intent (NOI) for a Construction Storm Water Discharge Permit. Prerequisites for submission of a NOI include documentation of an ARAP if project necessitates such and development of a Storm Water Pollution Prevention Plan (SWPPP). Plan shall be prepared in accordance with Tennessee General Permit No. TNR10-0000 Storm Water Discharges for Construction Activities and is the Contractor's responsibility. *Note: SWPPP has already been submitted and approved for Contractor's use pending Contractor's approval.*

Determination of the required type and extent of erosion control features methods etc. necessary for meeting the State requirements shall be the responsibility of the Contractor regardless of the methods shown on the SWPPP.

- B. General components for an SWPPP include a Site Description Storm Water Runoff Controls Erosion and Sediment Controls Stabilization Practices Structural Practices Storm Water Management Maintenance Plan and Inspections.
- C. If required the Owner and Contractor shall execute a Construction Activity – Storm Water Discharges Notice of Intent (NOI) and a Notice of Termination (NOT) when an SWPPP is required. The NOI and NOT must be submitted to the

Tennessee Department of Environment and Conservation  
Johnson City Environmental Field Office  
Attention Stormwater NOI Processing  
2305 Silverdale Dr.  
Johnson City TN 37601

The Contractor shall pay the Fee associated with submission of the Notice of Intent and shall submit the NOT when the project is complete.

- D. The Division of Water Pollution Control shall issue a Notice of Coverage for the project and allow the project to be constructed under Tennessee General Permit No. TNR10-0000 Storm Water Discharges from Construction Activities. The Division of Water Pollution Control may deny the coverage and require submittal of an application for an individual NPDES Permit based on review of the NOI or other information. The Contractor shall not begin construction activities (i.e. the initial disturbance of soils associated with clearing grading excavation activities or other construction activities) prior to receipt of the NOC.
- E. Deficient Performance
  - 1. If at any time it is determined by the A/E or Town of Jonesborough that the erosion and sediment control measures are not capable of preventing sediment from leaving the construction site under storm conditions then additional control measures shall be implemented. Additional control measures shall be implemented to a level where State criteria are met.
  - 2. If at any time the Town of Jonesborough is fined by the State or other agency due to improper implementation or maintenance of erosion and sediment control measures the Contractor will be held responsible for paying the fine as well as any additional expenses for A/E services. The fee for A/E services will be 150.00 per hour.

### **1 3 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 31 20 11 Earthwork for Utility Work.
- B. Final erosion protection measures shall be the Contractor's responsibility.
- C. Reference the Tennessee Department of Environment and Conservation Division of Water Pollution Control's Tennessee Erosion and Sediment Control Handbook latest revision for Best Management Practices Guidelines.

- D. Seeding and fertilizing is included in Section 32 92 00 Lawns and Grasses.

## **PART 2 - PRODUCTS**

### **2 1 EROSION AND SEDIMENT CONTROL MATERIALS**

Refer to Tennessee Department of Environment and Conservation Division of Water Pollution Control's Tennessee Erosion and Sediment Control Handbook latest revision for product definitions purposes of use and construction specifications.

## **PART 3 - EXECUTION**

### **3 1 EROSION AND SEDIMENT CONTROL INSTALLATION**

Refer to Tennessee Department of Environment and Conservation Division of Water Pollution Control's Tennessee Erosion and Sediment Control Handbook latest revision for conditions for use construction details recommended maintenance and inspection criteria.

### **3 2 MAINTENANCE OF CONTROLS AND PERFORMANCE**

- A. Erosion and sediment controls shall be inspected as mentioned later in this specification section. Replace straw bales which deteriorate filter stone which is dislodged erosion control blanket which is damaged and make other necessary repairs.
- B. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the local state or federal authority the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.
- C. Remove all temporary erosion and sediment controls as final landscaping and grading are performed.

### **3 3 INSPECTION**

The Contractor is responsible for the inspections to meet TDEC requirements the Contractor shall use the required forms and shall utilize a qualified inspector at the frequencies required by TDEC regulations. Records shall be maintained at the site by the Contractor's designated person.

**END OF SECTION 31 2 00**

## **SECTION 32 2 00 - LAWNS AND GRASSES**

### **PART 1 - GENERAL**

#### 1.1 DESCRIPTION OF WORK

- A. Provide all labor materials equipment and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

#### 1.2 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract including General and Supplementary Conditions and Division-1 Specification sections apply to Work of this Section.
- B. Earthwork for Utility Work Section 31 20 11
- C. Erosion and Sedimentation Control Section 31 25 00

#### 1.3 MAINTENANCE

- A. Maintenance shall begin immediately following seeding and mulching of each portion of the project.

#### 1.4 INSPECTION FOR ACCEPTANCE

- A. The inspection of the work of lawns to determine the completion of contract work exclusive of the possible replacement of plants will be made by the Town of Jonesborough upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.
- B. After inspection the Contractor will be notified in writing by the Town of Jonesborough of acceptance of all work of this Section exclusive of the possible replacement of plants subject to guaranty or if there are any deficiencies of the requirements of completion of the Work.

### **PART 2 - PRODUCTS**

#### 2.1 WATER

- A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life.
- B. Hose and other watering equipment required for the Work shall be furnished by the Contractor.

#### 2.2 TOPSOIL

- A. The Contractor shall furnish and place sufficient topsoil for the seeding and installation of sod.

#### 2.3 FERTILIZER

- A. Commercial Fertilizer Commercial fertilizer for lawn areas shall be complete fertilizer formula 10-10-10 for lawns and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition dry and free flowing and shall be delivered to the site in the original unopened containers each bearing the manufacturer's guarantee analysis. Any fertilizer which

becomes caked or otherwise damaged making it unsuitable for use will not be accepted. Fertilizer shall be applied at the rate of 25 pounds per 1 000 square feet.

- B. Lime The lime used for lawn areas shall be agricultural limestone.

#### 2.4 GRASS SEED

- A. The seed shall meet the requirements of the Tennessee Department of Agriculture and no Below Standard seed will be accepted.
- B. Grass seed furnished under these Specifications shall be packed in new bags or bags that are sound and not mended.
- C. All seed shall be fresh and clean and shall be delivered mixed in unopened packages bearing a guaranteed analysis of the seed mixture.
- D. At the discretion of the Town of Jonesborough samples of the seed may be taken for checking against the certified laboratory report. Sampling and testing will be in accordance with the requirements of the Tennessee Department of Agriculture. Sampling and testing will be at the Contractor's expense.
- E. In mixing or forming Groups seed shall be uniformly mixed. Group seed shall not be mixed until after each type seed that is used to form the Group has been tested and inspected separately and approved for purity and germination. Seed mixed before tests and inspection are made will not be accepted.
- F. Germination must be certified to conform to the following minimums
  - 1. Purity 90
  - 2. Germination 85
- G. Permanent Seeding

Seed groups the percentages forming the group and the seasons for the groups use are as follows

##### Group A February 1 – July 1

Common Name	Proportion by Weight
Kentucky 31 Fescue	80
English Rye	5
orean Lespedeza	15

##### Group B June 1 – August 15

Common Name	Proportion by Weight
Kentucky 31 Fescue	55
English Rye	20
orean Lespedeza	15
German Millet	10

##### Group B1 April 15 – August 15

Common Name	Proportion by Weight
Bermudagrass (hulled)	70
Annual Lespedeza	30

Group C August 1 –December 1

Common Name	Proportion by Weight
Kentucky 31 Fescue	70
English Rye	20
White Clover	10

Group C1 February 1 – December 1

Common Name	Proportion by Weight
Crown Vetch	25
Kentucky 31 Fescue	70
English Rye	5

1. When sown on slopes 3:1 and steeper Groups A, B and C shall be overseeded with Sericea Lespedeza at the rate of 15 lbs per acre.
2. When overseeding is performed between February 1 and July 1 Scarified Sericea Lespedeza shall be used with an additional 2 lbs per acre of Weeping Lovegrass.
3. Between July 1 and December 1 un-hulled Sericea Lespedeza shall be used.
4. Group C1 seed shall only be used when specified on the Plans.

H. Temporary Seeding

Seed groups the percentages forming the group and the seasons for the groups use are as follows

Group D January 1 – May 1

Common Name	Proportion by Weight
Italian Rye	33-1/3
orean Lespedeza	33-1/3
Summer Oats	33-1/3

Group E May 1 – July 15

Common Name	Proportion by Weight
Sudan-Sorghum Crosses (Dekalb Sudan S 11 Lindsey 77F TN Farmer s Co-op GHS-1 or GHS-2A)	100
Or	
Starr Millet (GaHi-1)	100

Group F July 15 – January 1

Common Name	Proportion by Weight
Balboa Rye	66-2/3
Italian Rye	33-1/3

2.5 SOD

- A. Sod shall be at least 70% Fescue strongly rooted and free of pernicious weeds.
- B. Sod shall be mowed to a height not to exceed 3" before lifting and shall be of uniform thickness with not over 1-1/2" or less than 1" of soil.

## 2.6 MULCH

- A. Mulch for hydroseeding shall be Conwed Hydro Mulch Silva-Fiber or approved equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.
- B. All hay and straw mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth on the highway or on adjacent agricultural lands.
- C. Hay shall be stalks of approved grasses sedges or legumes seasoned before baling or loading.
- D. Straw shall be stalks of rye oats wheat or other approved grain crops.
- E. Both hay and straw shall be suitable for spreading with standard mulch blower equipment.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Planting operations shall be conducted under favorable weather conditions during seasons which are normal for such work as determined by accepted practice in the locality of the project.
- B. At the outset of permanent seeding operations the area to be seeded shall be prepared shaped and dressed in accordance with these specifications.
- C. Temporary Seeding may be performed without full preparation of the seedbed as specified herein where approved by the Town of Jonesborough and application of permanent erosion and siltation control measures is not practicable.
- D. All seeding and related operations shall be continuous operations.

### 3.2 PREPARING THE SEEDBED.

- A. Each area to be seeded shall be scarified disced harrowed raked or otherwise worked until it has been loosened and pulverized to a minimum depth of 3-inches. This operation shall be performed only when the soil is in a tillable and workable condition.
- B. Stones larger than one (1) inch excessive gravel trash metal glass wood plastic and roots shall be removed prior to continuing.
- C. Fertilizer at the rate of not less than 25 lbs of grade 10-10-10 or equivalent per 1 000 SF and agricultural limestone at the rate of not less than 100 lbs. per 1 000 SF shall be uniformly incorporated into the soil for a depth of approximately 1/2 inch.
- D. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment.

### 3.3 SEEDING

- A. The seed shall be sown as soon as preparation of the seedbed has been completed.
- B. Seed shall be sown uniformly by means of a rotary seeder hydraulic equipment or other satisfactory means.

- C. Seed shall be sown at the rate of 2.5 lbs./1 000 SF for Groups A B and C unless otherwise specified or directed.
- D. Seed shall be sown at the rate of 0.6 lbs./1000 SF for Group B1” unless otherwise specified or directed.
- E. Seed shall be sown at the rate of 1.5 lbs./1 000 SF for all other groups unless otherwise specified or directed.
- F. Group C seed and seeds of legumes when sown alone shall be inoculated before sowing in accordance with the recommendations of the manufacturer of the inoculant.
- G. No seeding shall be done during windy weather or when the ground surface is fro en wet or otherwise non tillable.
- H. No seeding shall be performed during December and January unless otherwise permitted.

### 3.4 MULCHING

- A. Mulch material may be hay straw or other approved materials.
- B. Hydro-mulch shall be applied at the rate of 1 500 lbs. per acre. It may be applied with hydraulic equipment or may be added to the water slurry in a hydraulic seeder and the seeding and mulching combined in one operation.
- C. When the mulching material is hay or straw it shall be spread evenly over the seeded area at an appropriate rate of 100 lbs./1 000 SF for straw and 150 lbs./1 000 SF for hay immediately following the seeding operations. This rate may be varied by the Town of Jonesborough depending on the te ture and condition of the mulch material and the characteristics of the area seeded.
- D. Hay or straw mulch may be held in place by emulsified asphalt or other commercially available tackifier applied at the appropriate rate of 6 gallons/1 000 s.f.as required to hold the mulch in place.
- E. The Contractor shall cover structures if the mulch binder is applied in such a way that it would contact or discolor the structures.

### 3.5 SODDING

- A. Before any sod is laid all soft spots and inequalities in grade shall be corrected. Fertilizer spread shall be raked in.
- B. Sod shall be laid so that no voids occur tamped or rolled and then thoroughly watered. The complete sodded surface shall be true to finished grade even and firm at all points.
- C. Sodding shall be done only within the seasons e tending from March 1st to May 15th and from September 1st to October 15th unless other seasons may be approved by the Designer.
- D. Sod on slopes 2 to 1 or steeper shall be held in place by wooden pins about 1-inch square and about 6 inches long driven through the sod into the soil until they are flush with the top of the sod or by other approved methods for holding the sod in place.

### 3.6 CARE DURING CONSTRUCTION

- A. All seeded areas shall be cared for properly to the Town of Jonesborough's satisfaction until acceptance of the work.
- B. Areas which have been previously seeded and mulched in accordance with this section but which have been damaged or failed to successfully establish an acceptable stand of grasses or legumes shall be repaired.
- C. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly both in a manner to cause minimum disturbance to the existing stand of grass.
- D. If necessary to obtain a uniform stand the Contractor shall re-fertilize, reseed and re-mulch as needed.
- E. Scattered bare spots up to one (1) square foot in size will be allowed up to a maximum of 10 percent of any area.
- F. After an acceptable stand of grass has been attained, seeded areas shall be uniformly top dressed with no less than 10 lbs of fertilizer of grade 10-10-10 or equivalent per 1,000 S.F. at approximately 6 months after initial seeding unless otherwise specified or directed.

### 3.7 CLEAN UP

- A. All soil, peat or similar material which has been brought over paved areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean. Upon completion of the planting, all excess soil, stone and debris which have not previously been cleaned up shall be removed from the site or disposed of. All lawns shall be prepared for final inspection.

### 3.8 OTHER WORK

- A. The Contractor also shall be responsible for the repair of any damage caused by his activities or those of his subcontractors such as the storage of topsoil or other materials, operations or equipment or other usages to all areas outside the contract limits. Such repair operations shall include any regrading, seeding or other work necessary to restore such areas to an acceptable condition.

**END OF SECTION 32 2 00**

DIVISION 33

UTILITIES

SECTION 33 05 23 - BORING AND JACKING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor materials equipment and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork for Utility Work Section 31 20 11
- B. Piping Division 33

1.3 SUBMITTALS

- A. Descriptive literature catalog cuts and dimensional prints clearly indicating all dimensions and materials of construction shall be submitted on all items specified herein to the Engineer for review before ordering.
- B. At the time of submission the Contractor shall in writing call the Town of Jonesborough's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.
- C. Comply with all requirements of Section 01 33 23.
- D. In accordance with the requirements of the General and Special Conditions and this Section the following table includes but is not limited to the items required to be submitted

I D	S D	P D	S	I D	P L	W D	S	O M M	C	W	R	O
Carrier Pipe												
Casing Pipe												
Casing Spacers												
Casing End Seals												

1.4 EXISTING CONDITIONS

- A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information.
- B. So that piping conflicts may be avoided Contractor shall locate the utility (vertically &

horizontally) well ahead of the pipe laying operation to confirm the exact locations of existing piping before installing any new piping.

- C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

**PART 2 - PRODUCTS**

**2.1 CARRIER PIPE**

- A. Carrier pipe shall be as specified in the applicable Division 33 section unless otherwise noted.

**2.2 CASING PIPE**

- A. Casing pipe shall be steel plain end have a minimum yield point strength of 35 000 psi and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be furnished in at least 18 foot lengths. Steel casing pipe shall meet the current BABA requirements.

- B. The required diameter of the casing pipe shall be as follows

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36-inches nominal diameter the casing pipe diameter size shall be determined as shown on the Contract Drawings.

- C. The wall thickness of the steel casing pipe shall be as follows

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches)								
.250 (1/4")	.281 (9/32")	.312 (5/16")	.406 (13/32")	.469 (15/32")	.500 (1/2")	.562 (9/16")	.625 (10/16")	.656 (21/32")

However should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

**2.3 CASING SPACERS**

- A. **Stainless Steel Casing Spacers** Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090 thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction.

Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co. or equal.

- B. Solid Polyethylene Casing Spacers (to be used with PVC pipe only) Solid polyethylene casing spacers shall be bolt-on style with a shell made in two (2) sections. Carrier pipe shall be wrapped with rubber strap inside casing space to prevent slippage. All nuts and bolts are to be 18-8 stainless steel. Solid polyethylene casing spacers shall be made by Calpico Inc. Advance Products & Systems Inc. or equal.

## 2.4 CASING END SEALS

- A. Wrap-around end seals Wrap-around end seals shall be made of a waterproof flexible coal tar membrane reinforced with fiberglass or synthetic rubber. The two exposed edges of the wrap-around seal shall be adhesively bonded forming a watertight seal. The ends of the wrap shall be sealed on the casing and carrier pipe by stainless steel bands. Wrap-around end seals shall be made by Calpico Inc. Advance Products & Systems Inc. or equal.
- B. Upon approval the by Town of Jonesborough in lieu of wrap-around end seals each end of the casing pipe and the carrier pipe shall be wrapped with two (2) layers of roofing felt.

## PART 3 - EXECUTION

### 3.1 CROSSINGS - GENERAL

- A. Where designated on the Drawings crossings beneath state-maintained roads not to be disturbed shall be accomplished by boring and jacking a casing pipe.
- B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the Drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a minimum of eight (8) feet apart along the length of the carrier pipe within the casing pipe within two (2) feet of each side of a pipe joint and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to always keep the carrier pipe at least 0.75" from the casing pipe wall.
- C. At each end of the casing pipe the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.
- D. Wood skids are not an acceptable method of supporting the carrier pipe.

### 3.2 BORING AND JACKING

- A. The Contractor shall excavate his own pits as he may deem necessary and will set his own line and grade stakes which shall be checked by the Engineer. Permits as required will be furnished or obtained by the Owner but shall be in the Contractor's hands before any excavating is commenced.
- B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.

1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
  2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe the pipe shall be abandoned in place and immediately filled with grout.
  3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inches. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch grouting or other approved methods must be used to fill such voids.
  4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
  5. Any method which does not have this boring arrangement will not be permitted. The Contractor's boring arrangement plans and methods must be submitted to and approved by the Town of Jonesborough.
- C. In the event an obstruction is encountered in boring which cannot be removed and it becomes necessary to withdraw the casing and commence elsewhere the hole from which the casing is withdrawn shall be completely backfilled with flowable fill.
- D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.
- E. Before award of the contract the Contractor shall furnish a statement of his experience of such work or if inexperienced shall advise the Owner as to whom he will subcontract the work and give a statement of the experience of the subcontractor which shall be satisfactory to the Owner.

#### 3.4 CONTRACTOR'S RESPONSIBILITIES

- A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.
- B. Attend a preconstruction meeting at the construction site with the City Inspector Railroad Inspector Highway Inspector Town of Jonesborough and Contractor being present.

END OF SECTION 33 05 23

## **SECTION 33 11 13 - WATER DISTRIBUTION PIPING**

### **PART 1 - GENERAL**

#### **1 01 SCOPE OF WORK**

Provide all labor materials equipment and services required for furnishing and installing all piping and appurtenances specified herein.

#### **1 02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Valves - Utility Services                      Section 33 12 16
- B. Hydrants    Section 33 12 19

#### **1 03 SUBMITTALS**

- A. A notari ed certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.
- B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 01 33 23.

#### **1 0 EXISTING CONDITIONS**

- A. The e isting piping shown on the Contract Drawings is based on the best available information. The Town of Jonesborough makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into e isting lines must be made compatible with that piping and be rated for minimum 250 psi working pressure.
- B. So that piping conflicts may be avoided Contractor shall open his trench well ahead of the pipe laying operation to confirm e act locations of e isting piping before installing any new piping.
- C. Contractor shall provide all fittings and adapters necessary to complete all connections to e isting piping.

### **PART 2 - PRODUCTS**

#### **2 01 DUCTILE IRON PIPE AND FITTINGS**

- A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 latest revision with push-on joints incorporating a single molded gasket unless otherwise noted on Drawings. Pipe si es 3-inch through 16-inch shall be pressure class 350 and si es 18-inch and larger shall be pressure class 350 unless otherwise noted. All ductile iron pipe shall be cast cleaned lined coated tested certified etc. in the United States of America and meet the current BABA requirements.
- B. The interior of the pipe shall be cement-mortar lined with seal coat in accordance with ANSI/AWWA C104/A21.4 latest revision. Thickness of the lining shall be as set forth in the ANSI/AWWA C104/A21.4 specification unless otherwise directed by the Town of Jonesborough. The e terior of all pipe unless otherwise specified shall receive either coal

tar or asphalt base coating a minimum of 1 mil thick. Interior lining system shall be NSF approved.

- C. Each piece of pipe shall bear the manufacturer's name or trademark the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.
- D. Fittings shall be ductile iron and have mechanical-joints in accordance with ANSI/AWWA C110/A21.10 latest revision unless otherwise specified. Fittings shall be rated for a minimum of 350-psi working pressure. Fittings shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53 latest revision will also be acceptable. Each fitting shall be certified by the manufacturer to have been tested and to have met the requirements of the governing standard specifications. All fittings shall be restrained with a restrained mechanical-joint gland. Restrained mechanical-joint connection shall be as specified in this section of the Specifications and be compatible for DIP Pipe. Fittings shall meet the current BABA requirements.
- E. Joints for ductile iron pipe and fittings as described hereinbefore shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11 latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.
- F. Provide ANSI/AWWA C110/A21.10 mechanical joint plugs or caps and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

## **2 02 RESTRAINED JOINT DUCTILE IRON PIPE**

- A. Restrained joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 latest revision with locking gasket type push-on joints for pipe sizes 16" and smaller unless otherwise noted on Drawings. Pipe size 3-inch through 16-inch shall be pressure class 350 and sizes 18-inch and larger shall be pressure class 350 unless otherwise noted. Restrained joint pipe for pipe sizes 24" and larger shall be American Flexible-Ring Joint or equivalent joint by other pipe manufacturers. Smaller pipe sizes may be furnished with this restrained joint in lieu of locking gaskets at the Contractor's option. All restrained joint ductile iron pipe shall be cast cleaned lined coated tested certified etc. in the United States of America and meet the current BABA requirements.
- B. The interior of the pipe shall be cement-mortar lined with seal coat in accordance with ANSI/AWWA C104/A21.4 latest revision. Thickness of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Town of Jonesborough. The interior of all pipe unless otherwise specified shall receive either coal tar or asphalt base coating a minimum of 1 mil thick. Interior lining system shall be NSF approved.
- C. Each piece of pipe shall bear the manufacturer's name or trademark the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

- D. Fittings shall be ductile iron in accordance with ANSI/AWWA C110/A21.10 latest revision with the exception of the manufacturer's proprietary design dimensions. Fittings shall be rated for a minimum of 350-psi working pressure. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53 latest revision will also be acceptable. Each fitting shall be certified by the manufacturer to have been tested and to have met the requirements of the governing standard specifications. All fittings shall be restrained with a restrained mechanical-joint gland. Restrained mechanical-joint connection shall be as specified in this section of the Specifications and be compatible for the DIP pipe being supplied. Fittings shall meet the current BABA requirements.
- E. Joints for ductile iron pipe and fittings as described hereinbefore shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11 latest revision. Joints shall have a working pressure rating equal to the pipe pressure rating. Joints shall be installed per the manufacturer's recommendations.
- F. Fittings shown on the Plans are intended to convey the general configuration but the Contractor shall furnish all fittings required. When fittings are used refer to the table on the Plans for associated required restrained joint lengths. Pipe at ends left for future connections shall also have restrained joints.
- G. Restrained joint pipe 16" and smaller shall be Fast-Grip Restrained Joint as manufactured by American Ductile Iron Pipe or approved equal. Restrained joint pipe for pipe sizes 24" and larger shall be American Flexible-Ring Joint or equivalent joint by other pipe manufacturers. Smaller pipe sizes may be furnished with this restrained joint in lieu of locking gaskets at the Contractor's option. Restrained joints shall be designed for a working pressure equal to the pipe pressure rating.
- H. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.
- I. Where spigot end of restrained joint pipe connects with valves or other items that have mechanical-joint ends connection shall be made with a restrained mechanical-joint gland. Restrained mechanical-joint connection shall be as specified in this Section of the Specifications.
- J. All carrier pipe in steel casings shall be restrained joint ductile iron pipe unless otherwise noted.

## **2 03 LOCATOR WIRE**

All water lines shall be laid with No. 12 coated copper wire. The wire shall be laid just below or beside the pipe. Wire shall be continuous with ends stubbed out of metal valve boxes a minimum of 6". Should any splices be necessary in long runs wire shall be stripped back at least 1 inch and connected with solid brass split-bolt connectors tightened very firmly and wrapped with protective tape several times. No wire nuts shall be used. The wire shall not be laid in a manner which will allow it to touch the water pipe.

## **2 0 CONCRETE PIPE ANCHORS THRUST BLOCKS CRADLE OR ENCASEMENT**

- A. Where indicated on the Drawings required by the Specification or as directed by the Town of Jonesborough concrete pipe anchors thrust blocks cradles or encasements shall be installed.
- B. Concrete used for anchors thrust blocks cradle or encasement shall be Class "B" and have a minimum 28-day compressive strength of 3000 psi. Reinforcing bars shall be as installed as indicated on the details.

## **2 0 MECHANICAL JOINT RESTRAINT**

- A. Mechanical joint restraint shall be furnished and installed where shown on the Drawings. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be made of grade 60-42-10 ductile iron conforming to ASTM A536 latest revision. The wedges shall be ductile iron heat-treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges. The mechanical joint restraint shall be rated for a minimum working pressure of 350 psi and shall be UL listed.
- B. The mechanical joint restraint shall be MEGALUG restraint as manufactured by EBAA Iron Sales Inc. or approved equal. The restraints shall meet the current BABA requirements.

## **PART 3 - EXECUTION**

### **3.01 EXCAVATION FOR PIPELINE TRENCHES**

- A. Unless otherwise directed by the Town of Jonesborough trenches in which pipes are to be laid shall be excavated to the depths required by field conditions or as specified by the Town of Jonesborough. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.
- B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore the remainder of the material shall be excavated by hand then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above then a layer of approved material shall be placed so that the lower quadrant of the pipe will be securely bedded.
- C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used the bedding shall be as set out in Paragraph 3.02 hereinafter.

- D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe but unless specifically authorized by the Town of Jonesborough trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe special precaution may be necessary such as providing compacted granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Town of Jonesborough after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.
- E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- F. Before laying the pipe the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Town of Jonesborough. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Town of Jonesborough temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- H. Minimum cover of 36" shall be provided for all pipelines except those located in the State Highway Right of Way. Those shall have a minimum cover of 48".

### 3.02 PIPE BEDDING

- A. All pipe shall be supported on a bed of granular material unless the trench has been prepared in accordance with Paragraph 3.01B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches as well as rock bottom trenches. Bedding material shall be free from large rock foreign material from earth and shall be acceptable to the Town of Jonesborough. Bedding shall be a minimum of 6" below pipe barrel.
- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.
- C. Where flexible pipe is used the compacted bedding material shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant the Town of Jonesborough may require the bedding to be placed above the springline of the pipe. Where suitable earthen material is not available or in rock trench conditions granular bedding shall be required and shall be Si 9-m or ASTM C 33 Si 7 crushed stone fine gravel or sand. Granular bedding is not a separate pay item.
- D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. This undercutting is not a separate pay item.

- E. In wet yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Town of Jonesborough yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material if necessary as determined by the Town of Jonesborough to replace poor subgrade material shall be a separate pay item and classified as Special Granular Fill. Removal of poor material ordered/approved by the Town of Jonesborough shall be classified as Undercutting and shall be a separate pay item.
- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

### 3.03 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.02E granular material for Special Granular Fill when directed by the Town of Jonesborough shall be Department of Transportation crushed limestone Si e 57. Payment for Special Granular Fill must have approval from the Town of Jonesborough prior to installation.

### 3.04 LAYING PIPE

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Town of Jonesborough. Supporting of pipes shall be as set out hereinbefore under Pipe Bedding and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench it shall be thoroughly inspected to ensure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Town of Jonesborough. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 Pipe Bedding shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of compacted earthen material or granular material.
- E. When ordered by the Town of Jonesborough unsuitable materials in subgrades shall be removed below ordinary trench depth to prepare a proper bed for the pipe.
- F. When laying of pipe is stopped for any reason the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell so as to exclude earth animals or other material. Precautions shall be taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Town of Jonesborough has had an opportunity to observe the joints alignment and grade in the section laid.

### 3.05 BAC FILLING PIPELINE TRENCHES

- A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event that pavement is not placed immediately following trench backfilling in paved areas the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement or other travelled surfaces all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.

B. Method A - Backfilling in Open Terrain

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner

1. The lower portion of the trench from the pipe bedding to a point 12 inches above the top of the pipe shall be backfilled with material free from rock and/or material acceptable to the Town of Jonesborough. This material shall be placed in a manner approved by the Town of Jonesborough and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock exceeding 2 inches in size is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Town of Jonesborough but compaction is highly recommended to prevent long-term settling and required maintenance by the Contractor. The trench backfill shall be heaped over or leveled as directed by the Town of Jonesborough.

C. Method B - Backfilling Under Sidewalks & Unpaved Driveways

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner.

1. The lower portion of the trench from the pipe bedding to a point 12 inches above the top of the pipe shall be backfilled with material free from rock and/or material acceptable to the Town of Jonesborough. This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.
2. The middle portion of the trench from a point 12 inches above the top of the pipe to a point 6 inches below the grade line shall be backfilled with material free from rock and/or acceptable to the Town of Jonesborough. This material shall be placed and compacted in layers of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.
  - a. Upon approval of the Town of Jonesborough the Contractor may backfill the middle portion of the trench with crushed stone fine gravel or sand in lieu of materials which require compaction.
3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method C - Backfilling Under Streets Roads and Paved Driveways

Backfilling of pipeline trenches under streets roads and paved driveways shall be accomplished in the following manner

1. The lower portion of the trench from the pipe bedding to a point 6 below the bottom of the pavement or concrete sub-slab shall be backfilled with 9 crushed stone.
2. The upper portion of the trench from a point 6 below the bottom of the pavement or concrete sub-slab to grade shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished the excess base course shall be removed as required.

- E. Before final acceptance the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways rights-of-ways and/or private property all excess earth or other materials resulting from construction.

In the event that pavement is not placed immediately following trench backfilling in streets and highways the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

### 3.06 SETTLEMENT OF TRENCHES

- A. The Contractor shall be responsible for any trench settlement which occurs within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time it shall be replaced by the Contractor. Repair of settlement damage shall meet the approval of the Town of Jonesborough.

### 3.07 CONCRETE THRUST BLOCKS CRADLE ANCHORS OR ENCASEMENT

- A. Concrete thrust blocks cradle anchors or encasement shall be placed where shown on the Drawings required by the Specifications or as directed by the Town of Jonesborough.
- B. For cradle and encasement concrete shall be 3000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.
- C. For thrust blocks and anchors concrete shall be 3000 psi and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.
- D. In tamping concrete care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Town of Jonesborough will not be subject to payment.
- E. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

### 3.08 BITUMINOUS CONCRETE HIGHWAY STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads streets and driveways required to be removed to install the water lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to trenching the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the

paving. Edges of the existing pavement shall be re-cut and trimmed to square straight edges after the pipeline has been installed and prior to placing the new base and pavement.

- C. Backfilling of the trench shall be in accordance with Method C as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation to a depth of six (6) inches in roads and streets and four (4) inches in driveways.
- D. A sub slab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The sub slab shall have a minimum thickness of 6 inches. Concrete for the sub slab shall be 3000 psi in accordance with the Details shown on the Drawings.

### 3.09 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT

- A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method C as described hereinbefore.

### 3.10 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

- A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.
- B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work it shall be replaced using 3000 psi concrete in fully as good or better condition than that which existed prior to the Contractor's operation.

### 3.11 REPLACEMENT OF EXISTING MAILBOXES, CULVERTS, CLOTHESLINE POSTS, FENCES AND OTHER SUCH FACILITIES

- A. Existing mailboxes, drainage culverts, clothesline posts, fences and the like shall not be damaged or disturbed unless necessary in which case they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.
- B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

### 3.12 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

- A. Wherever Portland cement concrete driveways are removed they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.

- B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint as directed by the Town of Jonesborough. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.
- C. Pavement shall be reinforced with 6 # 10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.13 RIP-RAP STREAM BANK SLOPE PROTECTION

- A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Town of Jonesborough. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.14 TESTING

- A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 1.5 times the normal operating pressure of the pipe (at its lowest elevation) but not to exceed the rated working pressure of the pipe or valves. Note Town of Jonesborough shall verify test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4-hour period and 5 psi in a 24-hour period. Any test results that do not meet both requirements shall constitute a failure of the pressure test.
- B. The allowable leakage shall be 0.25 of the AWWA Standard 600 for allowable leakage from a hydrostatic test as listed in the following table

<u>Pipe Size</u>	<u>Test Pressure</u>	<u>Allowable Leakage per 1000 Feet</u>
24-inch	200 psig	0.57 gallons per hour
20-inch	200 psig	0.50 gallons per hour
18-inch	200 psig	0.44 gallons per hour
16-inch	200 psig	0.38 gallons per hour
14-inch	200 psig	0.34 gallons per hour
12-inch	200 psig	0.29 gallons per hour
10-inch	200 psig	0.24 gallons per hour
8-inch	200 psig	0.19 gallons per hour
6-inch	200 psig	0.14 gallons per hour
4-inch	200 psig	0.10 gallons per hour
3-inch	200 psig	0.07 gallons per hour

- C. Contractor shall furnish a recording gauge and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Town of Jonesborough at conclusion of tests. The pressure recording device shall be suitable for outside service with a range from 0-200 psig 24- hour clock and shall be approved by the Town of Jonesborough.
- D. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.
- E. Where leaks are visible at exposed joints evident on the surface where joints are covered and/or identified by isolating a section of pipe the joints shall be repaired and leakage must be minimized regardless of total leakage as shown by test.

- F. All pipe fittings valves and other materials found to be defective under test shall be removed and replaced at no additional expense to the Town of Jonesborough.
- G. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- H. Where nonmetallic joint compounds are used pipelines should be held under normal operating pressure for at least three days before testing.
- I. The cost of testing the piping is incidental and is to be included in the Contractor's unit Contract Price.

### 3.15 CLEAN UP

- A. Upon completion of installation of the piping and appurtenances the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

### 3.16 DISINFECTION OF POTABLE WATER LINES

- A. The new potable waterlines shall not be placed in service--either temporarily or permanently--until they have been thoroughly disinfected in accordance with AWWA Standard C651 latest edition and to the satisfaction of the Town of Jonesborough.
- B. After pressure testing a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm and then may be connected to the system. Also no additional payment will be allowed for providing taps for chlorine injection and/or flushing if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main and shall follow the requirements of AWWA C655 latest edition for dechlorinating the disinfecting water.
- C. The new water line shall not be put into service until bacteriological samples taken at the points specified herein are examined and shown to be negative after disinfection following the requirements of "Standard Methods for Examination of Water and Wastewater". Two consecutive sets of acceptable samples taken at least 24 hours apart shall be collected from the new line. After the chlorinated water has remained in the line for twenty-four (24) hours the line will be flushed and refilled and a bacteriological sample will be taken by the Town of Jonesborough. If a negative sample is obtained the line shall be thoroughly flushed and then may be connected to the system. If a positive sample is obtained the disinfection procedure must be repeated until a negative sample is obtained. The cost of the bacteriological test will be borne by the Contractor.

### 3.17 ALTERNATE METHOD OF INSTALLATION

- A. In lieu of traditional trenching methods for pipe installation with the approval of the Town of Jonesborough the Contractor may choose to install portions of the pipe utilizing the trenchless

technology of horizontal directional drilling (HDD). Horizontal directional drilling shall be as specified in Section 33 05 23.13.

END OF SECTION 33 11 13

## **SECTION 33 12 1 – VALVES UTILIT SERVICES**

### **PART 1 - GENERAL**

#### **1 01 SCOPE OF WORK**

Provide all labor materials equipment and services required to furnish and install all valves shown on the Drawings and/or specified herein. All valves shall meet the current requirements of the BABA regulations.

#### **1 02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Drawings and General Provisions of the Contract and Division 1 Specification sections apply to work of this Section.
- B. Piping is specified in another Division 33 11 13 Specification section.

### **PART 2 - PRODUCTS**

#### **2 01 GATE VALVES**

- A. Gate valves shall conform to AWWA C-500 standard as extended and/or modified herein. All gate valves shall be of the double disc or resilient wedge type iron body fully bronze mounted non-rising stem and have a design working pressure of 250 psi. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.
- B. All gate valves shall be furnished with mechanical joint connections unless otherwise shown on the Drawings or specified hereinafter. The gate valves shall be restrained with mechanical joint restraints.
- C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces. Coating shall be touched up in field as required.
- D. All gate valves shall have the name or monogram of the manufacturer the year the valve casting was made the size of the valve and the working water pressure cast on the body of the valve.
- E. Each gate valve shall be installed in a vertical position with a roadway type valve box. Gate valves set with valve boxes shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counter-clockwise). There shall be a maximum 36" depth to valve operator nut. Contractor must use extension stems if necessary to raise operator nut within 36" of final grade.
- F. All gate valves shall be M&H Mueller American Valve or an approved equal. Gate valves shall meet the current requirements of the BABA regulations.

## 2 02 BUTTERFLY VALVES

- A. All butterfly valves shall be of the tight closing rubber seat type with Buna-N rubber seats which are recess mounted and securely fastened to the valve body or to the valve disc. Seating surfaces shall be stainless steel. Valves shall be rated for 250 psi working pressure and shall be satisfactory for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. Valves shall fully comply with the latest revision of AWWA C504 and NSF600 where applicable.
- B. Valve bodies shall be constructed of cast iron ASTM A126 Class B narrow body design and shall have integrally cast mechanical joint ends. Shafts shall be two-piece stub type and keyed for actuator connection. Body thickness shall be strictly in accordance with AWWA C504. Valve shafts shall be constructed of 18-8 stainless steel or of approved construction.
- C. Disc shall be constructed of cast iron ASTM A48 Class 40 or ductile iron ASTM A536. All disc seating edges shall be stainless steel and be smooth and polished. Disc mounted seats shall be mechanically retained body mounted seats shall be bonded to the valve body. Bonded-in seats must be simultaneously molded in vulcanized and bonded to the body and the seat. Bearings shall be corrosion resistant and self-lubricating.
- D. Operators shall be permanently lubricated and sealed from ground water with a two-inch square-operating nut clearly marked with "open" and a direction arrow.
- E. All operators shall be fully gasketed and grease packed and designed to withstand submersion in water to 10 psi. Valve shall open with a counterclockwise rotation of the operator and operation shall closely resemble conventional distribution valve practice and shall minimize water hammer. Operator shall be equipped for buried service.
- F. Butterfly valves shall be supplied for mains 14" and larger where shown on the Drawings unless otherwise noted.
- G. All surfaces of the valve shall be clean dry and free from grease before painting. An epoxy coating conforming to AWWA C550 shall be factory applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.
- H. Hydrostatic and leakage tests shall be conducted in strict accordance with AWWA C504 Section 5.
- I. Butterfly valves installed in the ground shall have the operator nut in a vertical position for use in a roadway type valve boxes as shown on the Plans.
- J. There shall be a minimum 36" depth to valve operator nut. Contractor must use extension stems if necessary to raise operator nut within 36" of the final grade.
- . Butterfly valves shall be sized as shown on the Drawings and be as manufactured by M & H Mueller Deurick or approved equal. All valves shall meet the current requirements of the BABA regulations.

## **2 03 AIR RELEASE VALVES FOR WATER SERVICE**

- A. Air release valves shall be furnished and installed as shown on the Drawings. Valves shall be designed to automatically exhaust small quantities of air accumulated in the piping system while the system is operating and pressurized.
- B. Valves shall be suitable for average working water pressure of 250 psi and shall be coated as per manufacturer's recommendations for application with potable water.
- C. The main valve parts shall consist of a body cover needle or orifice button float and seat. The needle or orifice button shall be Buna-N or Viton for tight shut-off and be resilient to resist leakage due to pipeline or pump vibrations.
- D. Materials of construction shall conform to ASTM specifications. The valve body and cover shall be cast iron with internal trim of stainless steel bronze Viton or Buna-N. The float shall be stainless steel ASTM 240 T304.
- E. Air release valves shall be of the size indicated on the Plans. All air release valves shall be as manufactured by APCO Valve and Primer Corporation Val-Matic Valve and Manufacturing Corp. ARI Inc. or approved equal. All valves shall meet the current requirements of the BABA regulations.

## **2 0 COMBINATION AIR VALVES FOR WATER SERVICE**

- A. Combination air valves shall be furnished and installed as shown on the Drawings. Valves shall be of the single housing type that combines the operating features of both an air and vacuum valve and air release valve.
- B. The air and vacuum portion shall be designed to automatically exhaust large quantities of air accumulated within the pipe system during filling and allow air to re-enter when the pipe is draining or when a negative pressure occurs. The discharge orifice shall be equal or greater than the inlet of the valve.  
  
The air release portion shall be designed to automatically exhaust small quantities of air accumulated in the piping system while the system is operating and pressured.
- C. The main valve parts shall consist of a body cover floats and seats. The floats shall be stainless steel ASTM 240 T304. The air and vacuum seat shall be Buna-N and air release seat shall be stainless steel.  
  
Materials of construction shall conform to ASTM specifications. The body and cover shall be cast iron.
- D. The combination air valve shall be able to withstand 250-psi operating pressure and shall be coated as per manufacturer's recommendations for potable water service.
- E. The combination air valve shall be as manufactured by APCO Valve and Primer Corp. Val-Matic Valve and Manufacturing Corp. or approved equal. All valves shall meet the current requirements of the BABA regulations.

## **2 0 VALVE BOXES**

- A. Valve boxes shall be 5-1/4-inch standard cast iron two-piece screw type valve box with drop cover marked "WATER" or "SEWER" whichever is appropriate. Valve boxes shall be accurately centered over valve operating nut and backfill thoroughly tamped about them. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes shall be in the same plane as the finished surface of the ground or street. Valve boxes shall be set at valve locations shown on the drawings or designated by the Town of Jonesborough.

Contractor shall also furnish and install at each valve a two-piece HDPE valve box alignment device (BOX LOCATOR) as manufactured by EMMA Sales or approved equal.

- B. Valve boxes inside a paving walk or road surface shall not be set on the valves but shall be supported on crushed stone fill.
- C. Wherever valve boxes fall outside of the roadway pavement the top of the box shall be set in a concrete slab 24" x 24" x 6" thick with the top of the slab and box flush with the top of the ground as shown on the Plans. This provision shall apply to all new and all existing valve boxes which fall within the limits of the contract unless otherwise stated on the plans or ordered by the Town of Jonesborough.
- D. Valve boxes shall have extension stems where necessary when operating nut is raised to be within 36" of the existing grade.
- E. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor or approved equal. All valve boxes shall meet the current requirements of the BABA regulations.

## **2 0 TAPPING SLEEVES AND VALVES**

- A. Tapping sleeves for connections to existing water lines shall be of the cast iron full body mechanical joint type with flanged connection for valve together with a gate valve conforming to the requirements found in this section of the specification. The tapping sleeve and valve shall be suitable for working pressures of 350 psi.
- B. The Tapping sleeves and valves shall be cast iron and as manufactured by Mueller, American Valve and Hydrant, M & H Kennedy or approved equal. All tapping sleeves and valves shall meet the current requirements of the BABA regulations.
- C. The valve shall be supplied with a two-piece valve box and operating nut.
- D. All existing water mains to be tapped under this contract shall be exposed to verify line sizes and material of construction prior to ordering tapping sleeves and valves.

## **2 0 PRESSURE REDUCING VALVES**

- A. Pressure Reducing valves for automatically reducing a higher inlet pressure to a steady lower downstream pressure regardless of the changing flow rate and/or varying inlet pressure shall be provided at the locations shown on the drawings.

- B. The valve shall be provided with a pilot-operated regulator capable of holding downstream pressure to a pre-determined limit. When the downstream pressure exceeds the pressure setting of the control pilot the main valve and pilot valve shall close drip-tight.
- C. This valve will be a CLA-VAL 90-37AS/690-37AS or approved equal. If the line has a wide range of peak flows use model 90-37B /690-37B and the smaller unit in parallel. All valves shall meet the current requirements of the BABA regulations.

## **PART 3 - EXECUTION**

### **3 01 INSTALLATION**

- A. All valves shall be installed in accordance with details on the Contract Drawings and with the manufacturer's recommendations.
- B. All valves shall be anchored in accordance with the details on the Contract Drawings. All mechanical joint valves shall be installed and restrained with mechanical joint restraint glands (Meg-a-lug or approved equal meeting the current BABA regulations).

**END OF SECTION**

## **SECTION 33 12 1 - H DRANTS**

### **PART 1 - GENERAL**

#### **1 01 SCOPE OF WORK**

Provide all labor materials equipment and services required for furnishing and installing all hydrants and appurtenances specified herein.

#### **1 02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Water Distribution Piping Section 33 11 13
- B. Valves - Utilities Services Section 33 12 16

### **PART 2 - PRODUCTS**

#### **2.01 FIRE H DRANTS**

- A. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the Town of Jonesborough. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. All hydrants shall have 6-inch mechanical joint shoe connection two (2) 2-1/2-inch discharge noles with National Standard threads and one (1) brass pumper nole with National Standard Fire Hose coupling screw threads together with caps fastened securely to each hydrant and threaded to fit noles. All connection threads shall comply with standard specifications of the American Insurance Association.
- B. Main valve shall have 4-1/2-inch full opening and be of the compression type opening against water pressure and closing with water pressure. The valve shall be faced with heavy impregnated waterproof ballast or other approved material. The hydrant shall be "dry type."
- C. Hydrants shall be cast iron bodies fully bronze mounted and meet all the requirements of the latest AWWA specifications. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.
- D. The operating nut shall be five (5) sided bronze or bronze with a five (5) sided ductile iron cap mounted so that a counter clockwise motion will open the valve. There must be cast on top an arrow and the word "Open" indicating the direction of turn to open the hydrant.
- E. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

- F. Hydrants shall be shop tested to 300-psi pressure with main valve both opened and closed. Under test the valve shall not leak the automatic drain shall function and there shall be no leakage into the bonnet.
- G. Type of shoe connection shall be mechanical joint and size shall be six inches (6").
- H. Hydrants shall be painted with one (1) coat of red oxide epoxy primer and two (2) coats of Hi-Build Epoxy. Color to be selected by the Town of Jonesborough.
- I. The waterway of hydrants shall be as free as possible of obstructions sharp turns corners or other causes for resistance.
- J. Hydrants shall have a safety "breakable flange" section located above ground line. The distance from the finished ground line of the hydrant to the "break away flange" shall not be less than 2-inches or more than 6-inches.
- K. Each fire hydrant shall be equipped with a 6-inch gate valve and bonnet.
- L. Hydrants shall be suitable for a working pressure of 350 psi be UL listed AWWA Improved Type installed as shown on the Drawings and as manufactured by Mueller Company Centurion M&H No. 129T or approved equal. E. All hydrants shall meet the current requirements of the BABA regulations.

### **PART 3 - EXECUTION**

#### **3.1 SETTING OF FIRE HYDRANTS**

##### **A. Location**

1. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.
2. When placed behind the curb the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of five feet (5') from the back of curb.
3. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line no portion of the hydrant or nozzle cap shall be within six inches (6") of the sidewalk.

##### **B. Position**

1. All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade with nozzles at least eighteen inches (18") above the ground as shown or as directed by the Town of Jonesborough.

##### **C. Connection to Main**

1. Each hydrant shall be connected to the main with a six-inch (6") restrained joint ductile iron branch controlled by an independent six-inch (6") gate valve unless otherwise specified.

D. Hydrant Drainage in Pervious Soil

1. Whenever a hydrant is set in soil that is pervious drainage shall be provided at the base of the hydrant by placing uncrushed coarse aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least six inches (6 ") above the drain opening in the hydrant and to a distance of one foot (1 ') around the elbow. No drainage system shall be connected to a sewer.

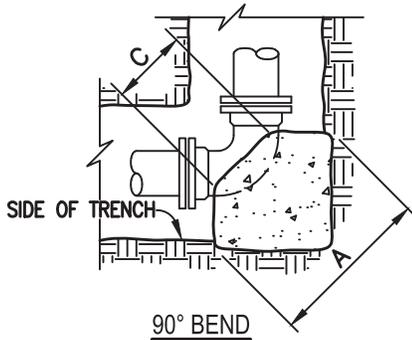
E. Hydrant Drainage in Impervious Soil

1. Whenever a hydrant is set in clay or impervious soil a drainage pit two feet (2 ') in diameter and three feet (3 ') deep shall be excavated below each hydrant and filled compactly with uncrushed coarse aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6 ") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

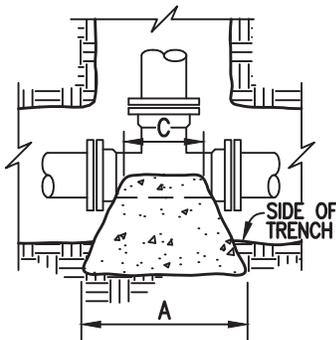
3.4 ANCHORAGE

- A. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings as shown on the Standard Details in the Drawings or as directed by the Town of Jonesborough.

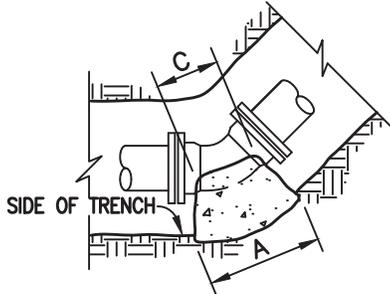
**END OF SECTION 33 12 1**



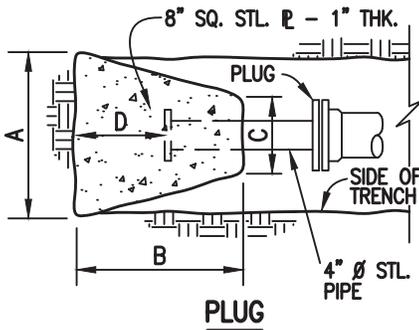
90° BEND



TEE



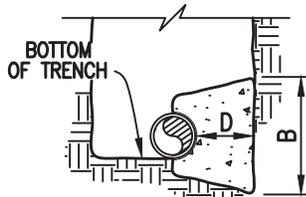
45° — 22 1/2° — 11 1/4° BEND



PLUG

NOTES:

1. THRUST BLOCKS DESIGNED FOR 200 PSI PRESSURE AND 2000 PSF SOIL BEARING. FOR GREATER PRESSURE OR LESS SOIL BEARING, QUANTITIES WILL HAVE TO BE RECALCULATED.
2. THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
3. IF EXACT SIZE PIPE BLOCKING IS NOT SHOWN, USE NEXT LARGER SIZE.
4. THRUST BLOCKING TO BE POURED IN PLACE CLASS C CONC.



TYPICAL SECTION

90° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	84	60	51	42	32	24	18
B	72	60	51	42	32	24	18
C	30	18	16	12	12	9	9
D	34	30	24	17	13	9	9

45° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	58	43	38	32	24	18	12
B	58	43	38	32	24	18	12
C	24	16	14	12	12	8	8
D	24	18	15	12	9	6	6

22 1/2° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	42	32	27	24	18	12	9
B	42	32	27	24	18	12	9
C	18	16	14	12	10	8	8
D	18	13	11	9	6	4	4

11 1/4° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	30	24	21	17	12	9	9
B	30	24	21	17	12	9	9
C	18	16	14	12	10	8	8
D	12	9	8	6	5	4	4

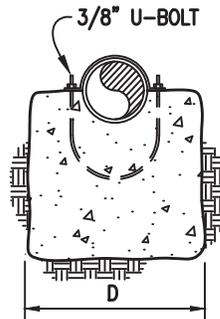
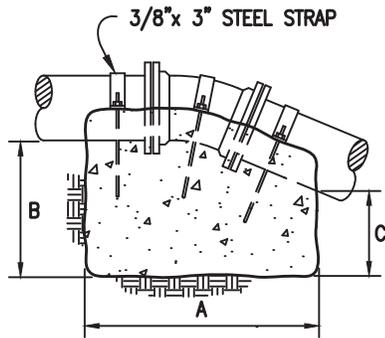
PLUG							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	66	52	43	34	27	20	18
B	66	52	43	34	27	20	18
C	12	12	12	12	12	12	12
D	44	32	22	15	11	11	11

TEE								
SIZE	MAIN BRANCH	16"	12"	12"	8"	8"-10"	8"-12"	2"-6"
		16"	12"	8"-10"	2"-8"	8"-10"	2"-6"	2"-6"
A		66	52	43	34	43	26	26
B		66	52	43	34	43	26	26
C		30	12	12	12	12	12	12
D		30	26	21	14	21	13	13

DIMENSIONS ARE IN INCHES

THRUST BLOCKING DETAIL

NOT TO SCALE



90° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	85	67	60	54	42	34	30
B	85	67	60	54	42	34	18
C	80	63	56	50	38	30	16
D	76	66	60	48	48	36	24

45° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	72	60	50	46	35	30	24
B	72	60	50	46	35	28	24
C	68	56	46	42	30	24	18
D	72	60	60	48	48	36	24

22 1/2° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	58	50	42	38	30	24	18
B	58	48	42	38	30	24	18
C	54	44	38	34	26	20	14
D	60	48	48	36	36	30	24

11 1/4° BEND							
SIZE	16"	12"	10"	8"	6"	4"	2"
A	42	36	30	29	24	20	18
B	42	36	30	29	24	20	18
C	38	32	26	24	20	16	14
D	60	48	48	36	30	24	24

DIMENSIONS ARE IN INCHES

**NOTES:**

1. THRUST BLOCKS DESIGNED FOR 150 PSI PRESSURE. FOR GREATER PRESSURE QUANTITIES WILL HAVE TO BE RECALCULATED.
2. THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
3. IF EXACT SIZE PIPE BLOCKING IS NOT SHOWN, USE NEXT LARGER SIZE.
4. THRUST BLOCKING TO BE POURED IN PLACE - CLASS "C" CONCRETE.

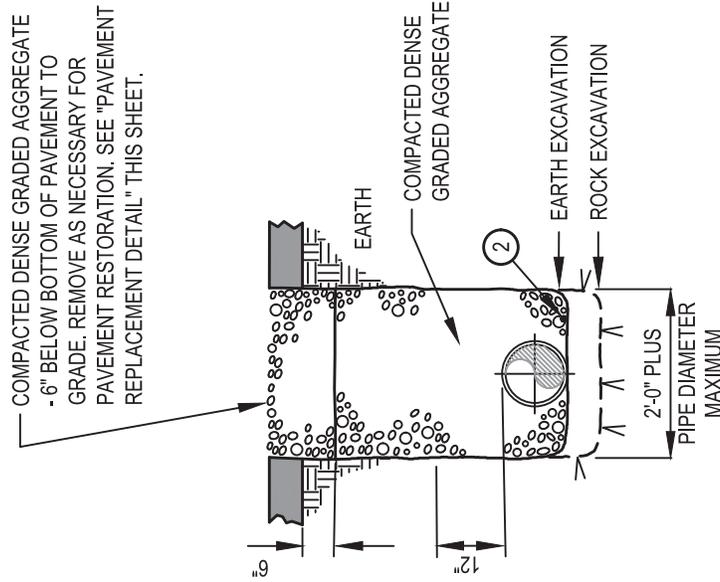
**VERTICAL CONCRETE ANCHOR**

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-2

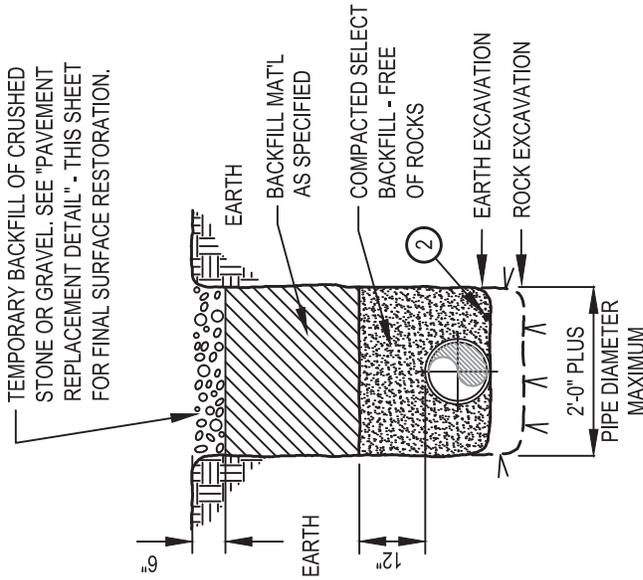
NOTE:

- ① SEE SPECIFICATIONS FOR DEPTH REQUIREMENT OF PIPE.
- ② DETECTOR WIRE, IF REQUIRED. SEE "DETECTOR WIRE DETAIL" FOR CORRECT PLACEMENT.



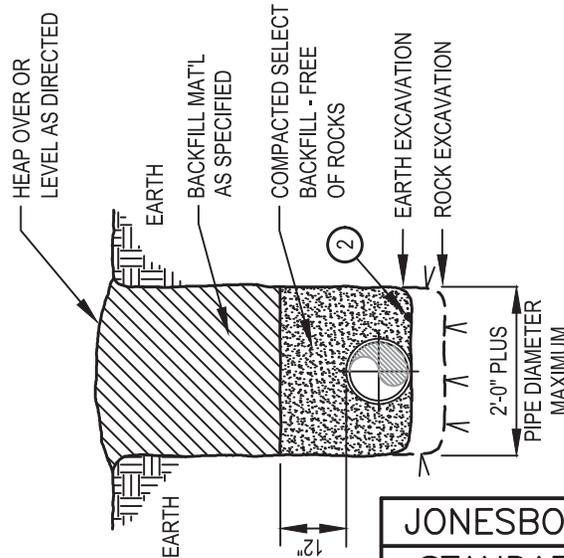
**METHOD "C"**

(UNDER PAVED STREETS,  
ROADS & DRIVEWAYS)



**METHOD "B"**

(UNDER DIRT ENTRANCES)



**METHOD "A"**

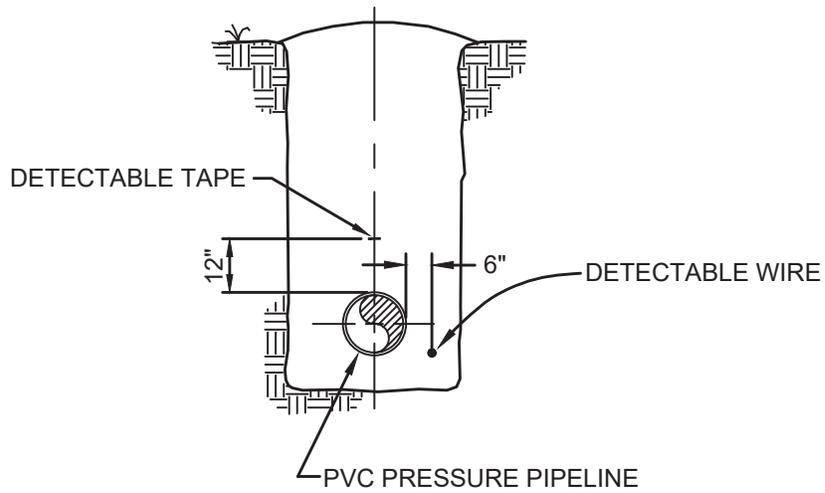
(IN OPEN TERRAIN)

**PRESSURE PIPE BEDDING & BACKFILLING DETAILS**

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-3

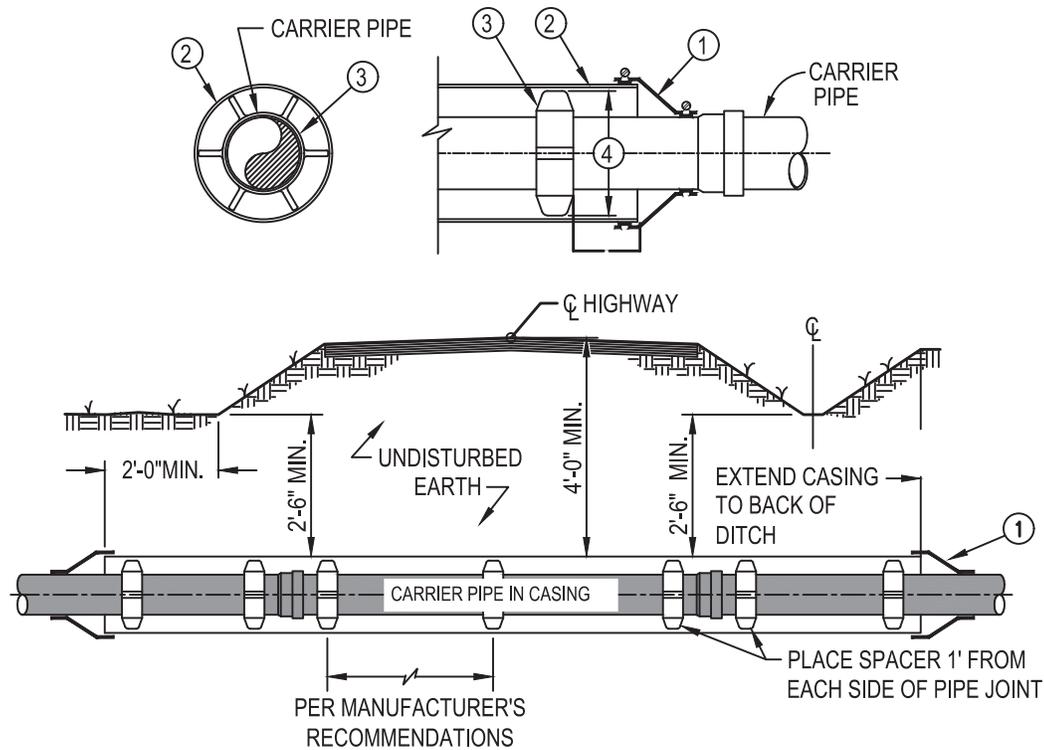
NOTES:  
1. CONNECT WIRE TO METAL VALVE BOXES.



## DETECTOR WIRE DETAIL

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-4



- ① CASING END SEALS PER SPECIFICATIONS.
- ② SMOOTH WALL STEEL CASING PIPE WITH BITUMINOUS COATING OUTSIDE.
- ③ CASING SPACER MODELS PER SPECIFICATIONS. CASING SPACERS SHALL BE INSTALLED IN A CENTERED/RESTRAINED CONFIGURATION. DISTANCE BETWEEN SPACERS PER MANUFACTURER'S RECOMMENDATIONS.
- ④ SPACER RISERS/RUNNERS SHALL BE SIZED AND TRIMMED TO MAINTAIN 1/2" MAXIMUM CLEARANCE BETWEEN RUNNER AND CASING PIPE.

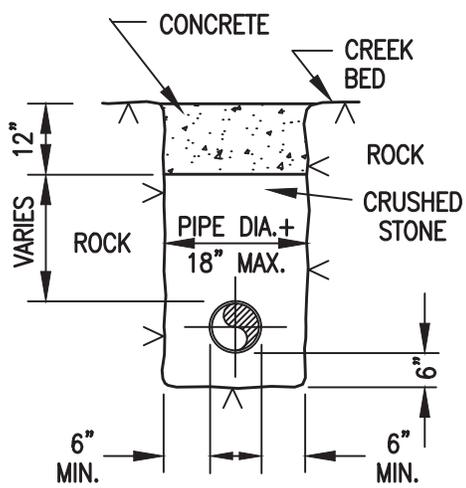
NOTE: CARRIER PIPE IN ALL CASING OVER 60 FEET IN LENGTH SHALL BE DUCTILE IRON WITH LOCKING GASKETS.

(STEEL CASING w/D.I. OR PVC CARRIER PIPE)

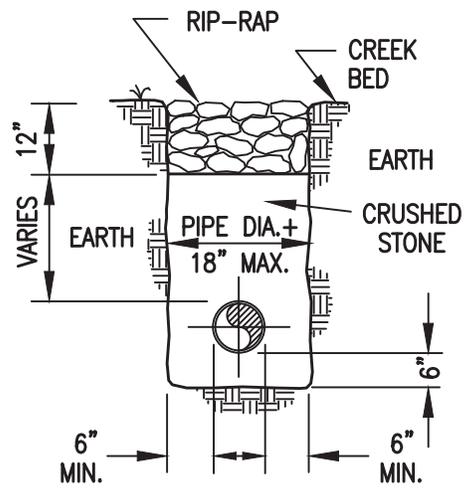
## ROADWAY CROSSING INSTALLATION

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-5



IN ROCK BED



IN EARTH BED

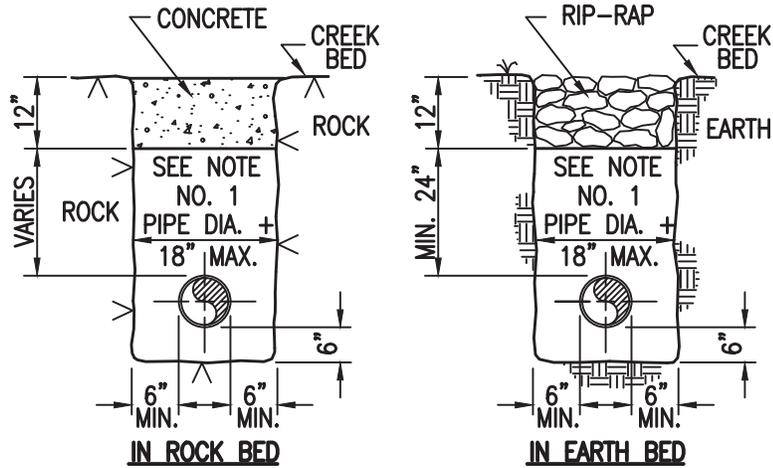
## DITCH CROSSING DETAIL

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-6

**NOTES:**

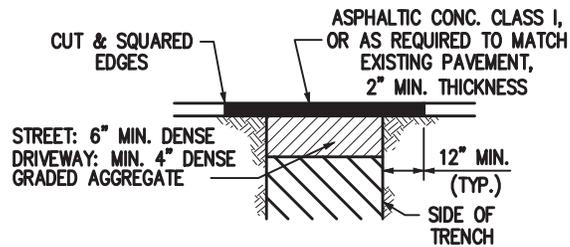
1. CRUSHED STONE OR CONCRETE AS REQUIRED.



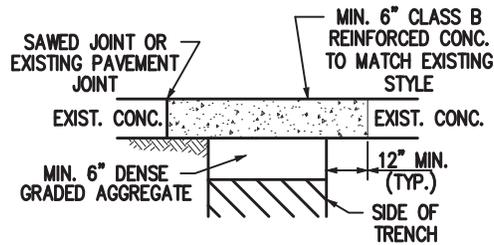
## STANDARD CREEK CROSSING DETAIL

NOT TO SCALE

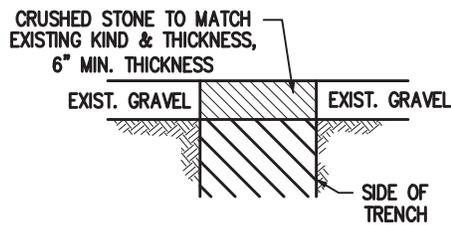
JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-7



**ASPHALT**



**CONCRETE**



**GRAVEL**

**PAVEMENT REPLACEMENT DETAIL**

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-8

90° BEND										
SIZE	30"	24"	16"	12"	8"	6"				
	179	162	108	90	72	54				
45° BEND										
SIZE	30"	24"	16"	12"	8"	6"				
	74	72	54	36	36	20				
22 1/2° BEND										
SIZE	30"	24"	16"	12"	8"	6"				
	36	36	36	18	18	18				
11 1/4° BEND										
SIZE	30"	24"	16"	12"	8"	6"				
	18	18	18	18	18	18				
DEAD ENDS/VALVES										
SIZE	30"	24"	16"	12"	8"	6"				
	319	270	198	162	108	90				
TEE										
SIZE	MAIN	30"	30"	24"	24"	24"	16"	16"	12"	12"
	BRANCH	24"	16"	24"	16"	12"	16"	12"	12"	8"
		225	125	235	140	81	157	105	116	58
REDUCER										
SIZE	30"	24"	16"	-	-	-	-	-	-	-
	24"	16"	-	-	-	-	-	-	-	-
	112	145	-	-	-	-	-	-	-	-

**NOTES:**

1. RESTRAINED JOINT PIPING TO BE USED IN CONJUNCTION WITH THRUST BLOCKS FOR FITTINGS & VALVES UNLESS OTHERWISE INDICATED.
2. RESTRAINED JOINT PIPING REQUIREMENTS DESIGNED FOR 300 p.s.i. PRESSURE, TYPE 3 LAYING CONDITION, AND ML SOIL CLASSIFICATION PER ASTM STANDARD D248 UNLESS OTHERWISE NOTED. FOR GREATER PRESSURE OR DIFFERENT LAYING AND SOIL CONDITIONS, QUANTITIES WILL HAVE TO BE RECALCULATED.
3. IF EXACT FITTING SIZE IS NOT SHOWN, USE NEXT LARGER SIZE.
4. VERTICAL DOWNWARD FITTINGS WILL NOT BE ACCEPTABLE ON 12" AND LARGER LINES UNLESS APPROVED BY THE ENGINEER IN AREAS WHERE AVOIDANCE OF USE COULD NOT BE ACCOMPLISHED. WHERE VERTICAL DOWNWARD FITTINGS ARE APPROVED FOR USE, REQUIREMENTS FOR RESTRAINED JOINT PIPING SHALL BE FOLLOWED. 90° AND 45° BENDS WILL NOT BE ACCEPTABLE. THE SMALLEST ANGLE POSSIBLE SHALL BE USED.

\*\*

VERTICAL DOWN BEND						
45° BEND						
SIZE			30"	24"	16"	12"
			132	110	77	60
22 1/2° BEND						
SIZE			30"	24"	16"	12"
			63	54	54	36
11 1/4° BEND						
SIZE			30"	24"	16"	12"
			31	26	18	18

\*\*

VERTICAL UP BEND						
45° BEND						
SIZE			30"	24"	16"	12"
			74	62	44	35
22 1/2° BEND						
SIZE			30"	24"	16"	12"
			36	30	21	17
11 1/4° BEND						
SIZE			30"	24"	16"	12"
			18	15	11	8

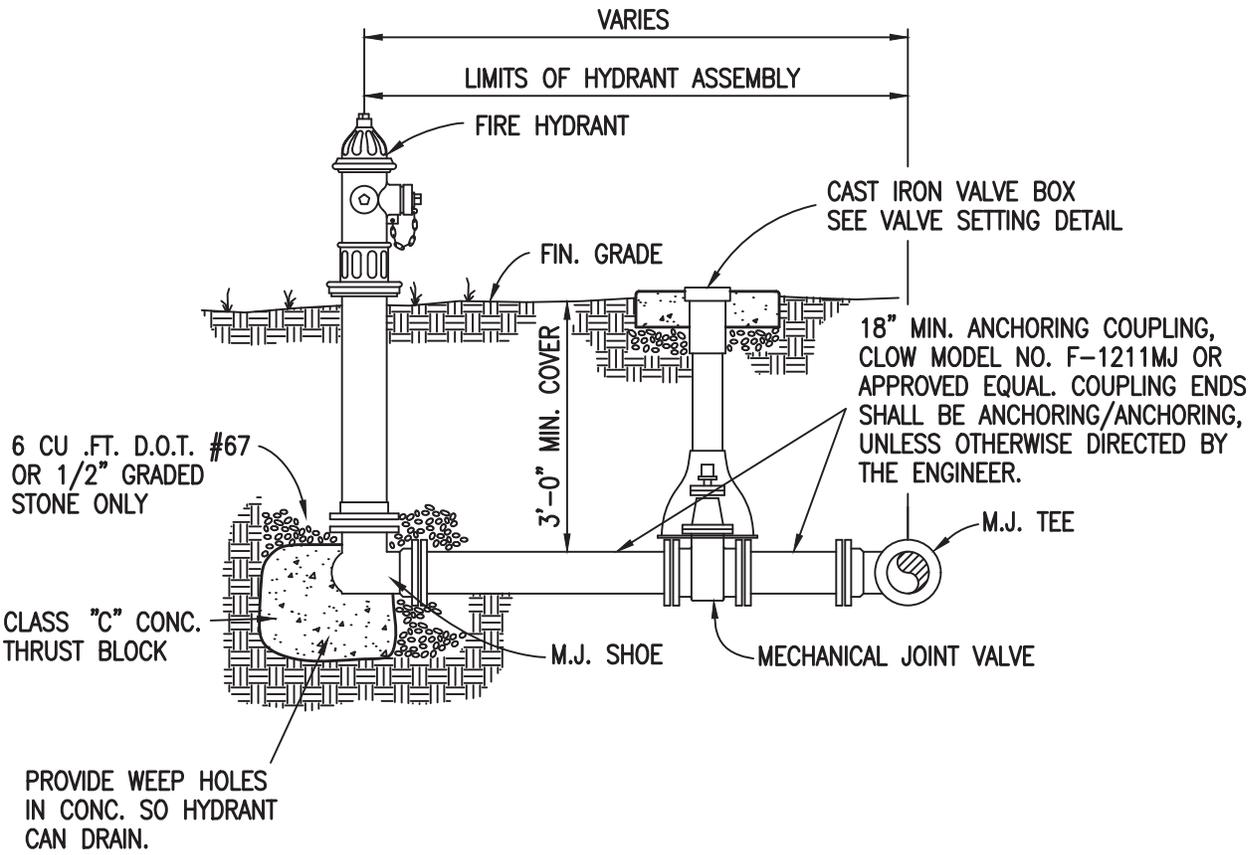
DIMENSIONS ARE IN FEET & ARE THE MINIMUM LENGTH REQUIRED ON EACH SIDE OF THE FITTING, UNLESS OTHERWISE NOTED.

\*\*USE ONLY WITH THE APPROVAL OF THE ENGINEER.

## RESTRAINED JOINT PIPING REQUIREMENTS

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-9



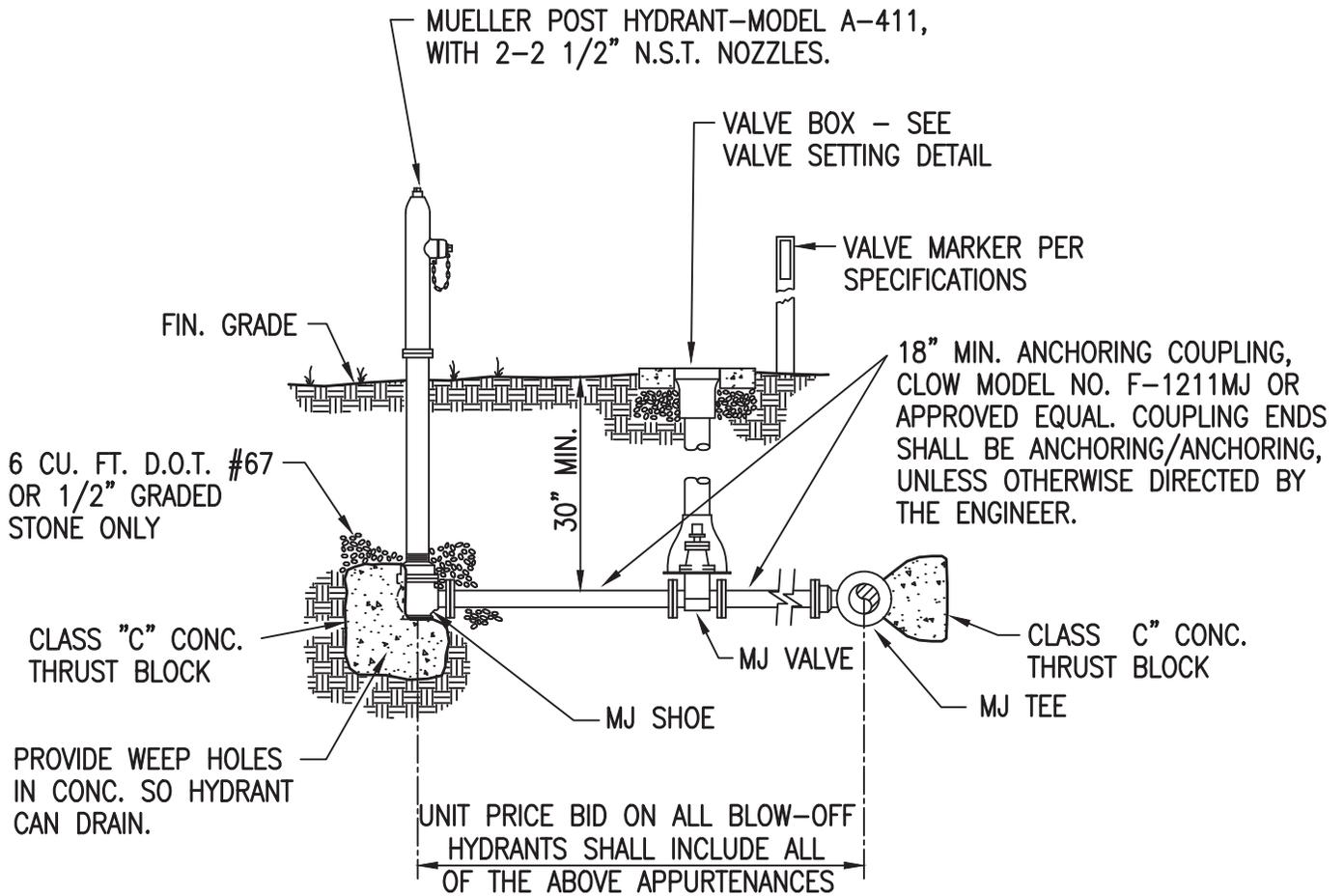
## FIRE HYDRANT ASSEMBLY DETAIL

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-10

NOTES:

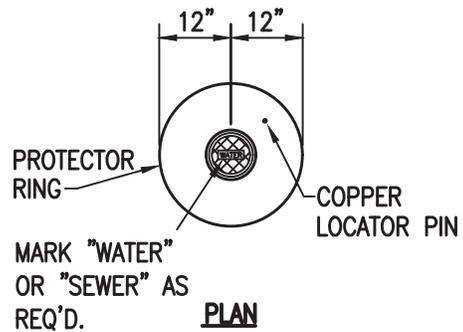
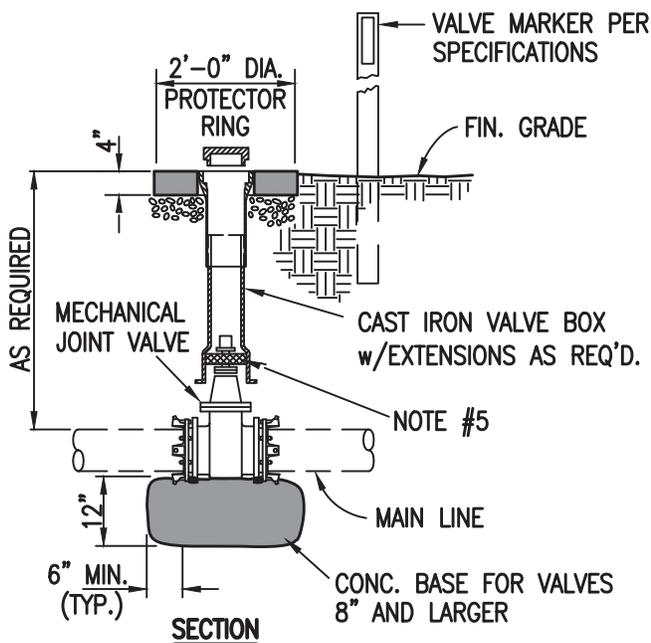
1. SET HYDRANT 12' TO 15' OFF EDGE OF PAVEMENT (MIN.).
2. CAP AND BLOCK TEE FOR END OF LINE APPLICATIONS.



(4" OR SMALLER LINES)  
**POST HYDRANT DETAIL**

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-11



NOTES:

1. USE PRECAST CONC. PROTECTOR RING w/INTEGRAL COPPER LOCATOR PIN, AS MANUF. BY ROSS CONSTRUCTION OR APPROVED EQUAL, FOR VALVES OUTSIDE PAVED AREAS.
2. PLACE GROUT IN SPACE BETWEEN CONCRETE PAD AND VALVE BOX.
3. VALVES IN ROADWAY DO NOT REQUIRE A CONCRETE PAD OR MARKER.
4. VALVES SHALL BE RESTRAINED WITH MEGALUG TYPE RESTRAINT SYSTEM.
5. 2 PIECE, HDPE VALVE BOX ALIGNMENT DEVICE; BOXLOK AS MANUF. BY EMMA SALES OR APPROVED EQUAL.

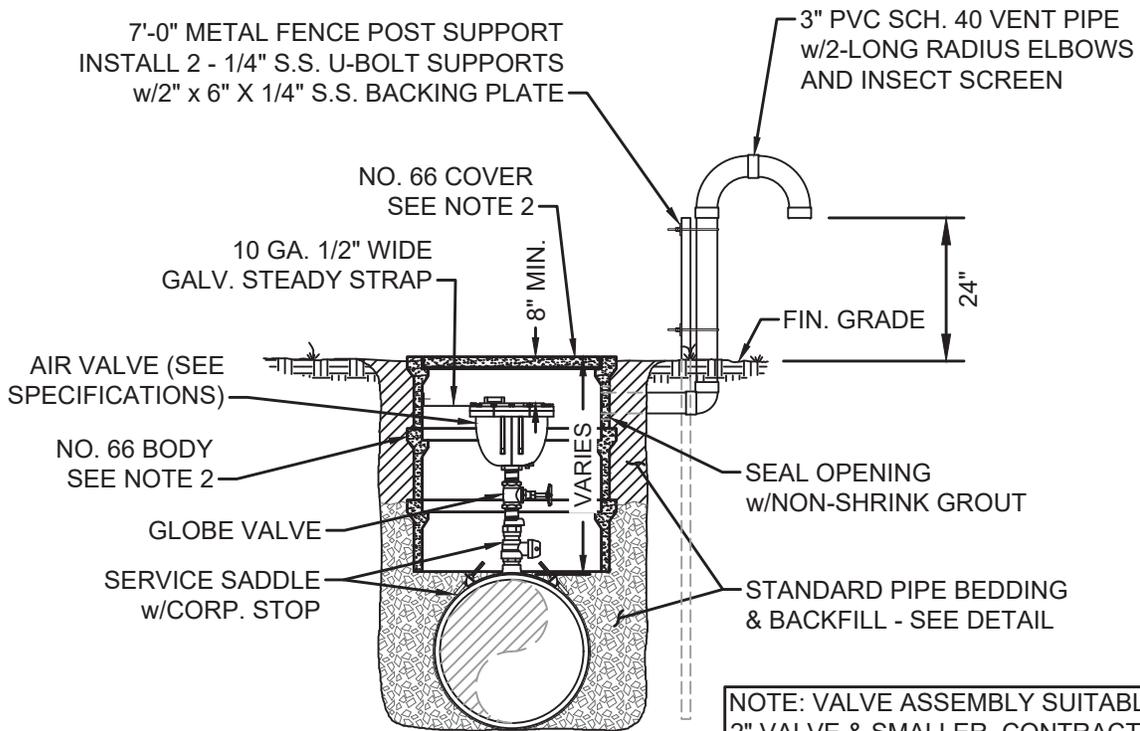
## VALVE SETTING DETAIL

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-12

NOTES:

1. THE CONTRACTOR SHALL MAKE PROVISIONS TO GIVE ADEQUATE SPACE FOR AIR RELEASE APPURTENANCES (SEE SHOP DRAWINGS) NOTE: VERTICAL DIMENSION SHOWN IN METER BOX IS APPROXIMATE.
2. 17"x30" CONC. METER BOX, MODEL 66 - AS MANUF. BY BROOKS PRODUCTS, INC. MEMPHIS, TN - OR APPROVED EQUAL. (UTILIZE ADDITIONAL BOXES AS REQUIRED FOR RISERS.)
3. SEAL SLOTS & ANY UNUSED HOLES IN METER BOX w/NON-SHRINK GROUT.
4. ALL ACCESSORY VALVES AND PIPING SHALL BE BRASS.
5. LEVEL GRAVEL BACKFILL PRIOR TO PLACEMENT OF METER BOX TO ENSURE VERTICAL ALIGNMENT OF A.R.V. ASSEMBLY WITHIN ENCLOSURE.



NOTE: VALVE ASSEMBLY SUITABLE FOR 2" VALVE & SMALLER. CONTRACTOR SHALL CONFIRM DIMENSIONS BEFORE CONSTRUCTION.

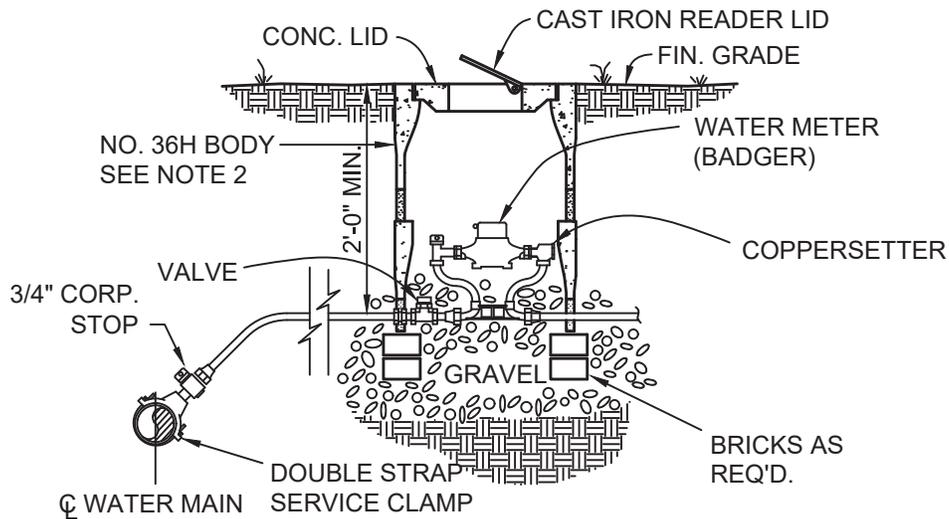
## AIR VALVE ASSEMBLY

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-13

NOTES:

1. SEAL SLOTS IN METER BOX W/NON-SHRINK GROUT.
2. 10"x17" CONC. METER BOX - AS MANUF. BY BROOKS PRODUCTS, INC. MEMPHIS, TN - 36 SERIES OR APPROVED EQUAL. USE EXTENSIONS AS REQUIRED.
3. WHERE PRESSURE REGULATOR IS REQUIRED USE FORD TANDEM SETTER WITH METER BOX SIZED TO FIT.
4. FOR 1" AND LARGER METERS USE 17"x 28" METER BOX - AS MANUF. BY BROOKS PRODUCTS, INC. MEMPHIS, TN - 65 SERIES OR APPROVED EQUAL.



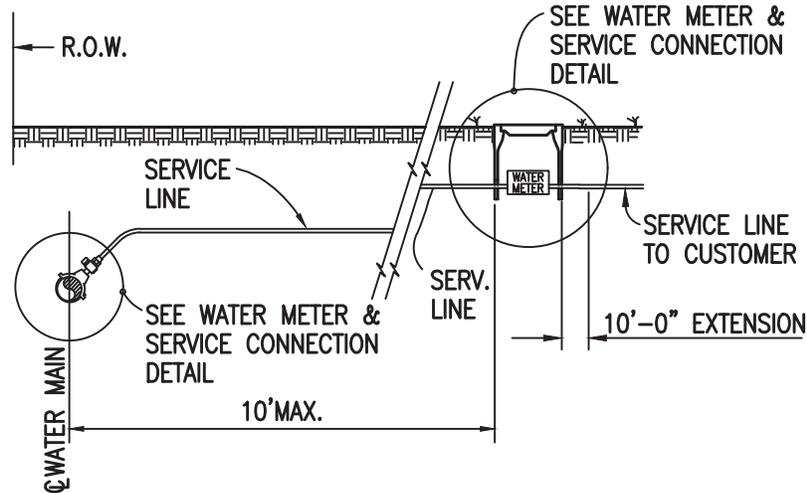
## WATER METER - 3/4 INCH w/SERVICE CONNECTION

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-14

SERVICE CONNECTION NOT UNDER ROADWAY LUMP SUM BID ITEM INCLUDES:

1. METER BOX INSTALLATION AND APPURTENANCES
2. WATER MAIN CONNECTION AND APPURTENANCES

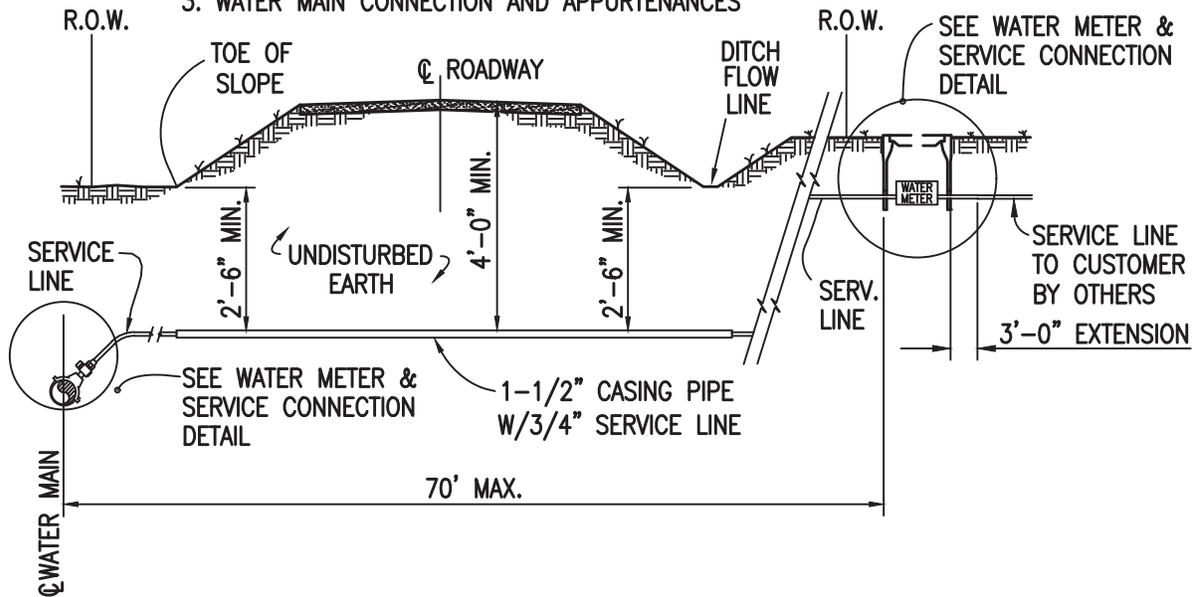


## TYPE "A" SERVICE CONNECTION NOT UNDER ROADWAY

NOT TO SCALE

SERVICE CONNECTION UNDER ROADWAY LUMP SUM BID ITEM INCLUDES:

1. METER BOX INSTALLATION AND APPURTENANCES
2. INSTALL BY METHOD INDICATED IN SPECIFICATIONS AND/OR PLANS UNDER ROADWAY W/CASING PIPE AND SERVICE LINE
3. WATER MAIN CONNECTION AND APPURTENANCES

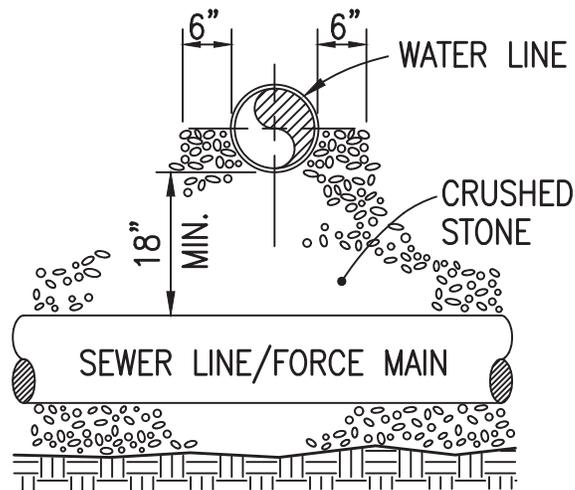


## TYPE "B" SERVICE CONNECTION UNDER ROADWAY

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-15

NOTE:  
SEWER LINES AT WATER MAIN CROSSING SHALL BE  
ARRANGED SO THAT THE SEWER JOINTS WILL BE  
AS FAR AS POSSIBLE FROM WATER MAIN JOINTS

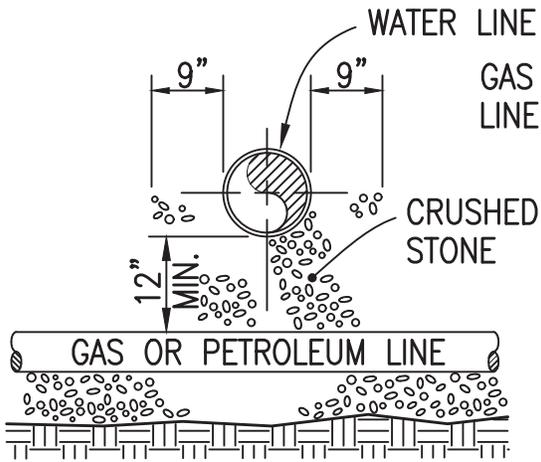


SEWER LINE/FORCE MAIN  
UNDER WATER LINE

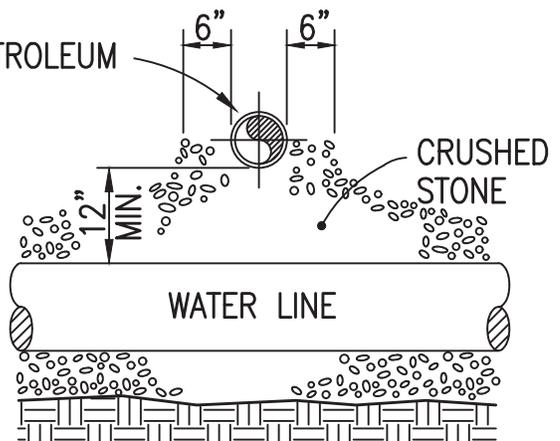
## WATER LINE CROSSING FOR SEWER LINE/FORCE MAIN

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-16



**WATER LINE OVER  
GAS TRANSMISSION LINE**



**WATER LINE UNDER  
GAS TRANSMISSION LINE**

# WATER LINE CROSSING @ GAS MAIN

NOT TO SCALE

JONESBOROUGH, TENNESSEE	DWG.
STANDARD WATER DRAWING	W-17