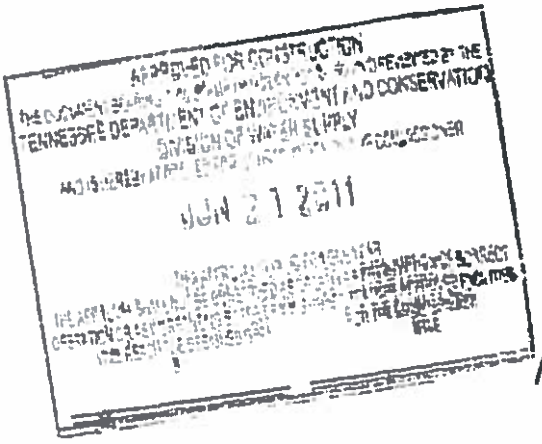
WS 11 0428

STANDARD SPECIFICATIONS
WATER DISTRIBUTION SYSTEM
MUNFORD, TENNESSEE

Lynn Hughes
P.W. Supt
6-1-2011



5-31-11

KING ENGINEERING CONSULTANTS, Inc.
PROFESSIONAL ENGINEERS
3355 POPLAR AVENUE, SUITE 200
MEMPHIS, TENNESSEE 38111

MAY, 2011

STANDARD SPECIFICATIONS
WATER DISTRIBUTION SYSTEM
MUNFORD, TENNESSEE

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SPECIAL CONDITIONS
STANDARD WATER SPECIFICATIONS
MUNFORD, TENNESSEE

SC-1.00 NOTICE

1.01 The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of this section and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents.

1.02 The Engineer shall not have control over or be in charge of and shall not be responsible for construction methods, means, sequences, techniques or procedures. The Contractor shall be responsible for safety precautions and programs in connection with the work. The Contractor shall be responsible for work schedules and the performance of work in accordance with the Contract Documents. The Engineer shall not be in charge of or have control over acts of omissions of the General Contractor, Sub-Contractors or their employees, agents or any other persons performing portions of the work.

1.03 Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both.

1.04 In case of a difference between the drawings and the specifications, the specifications shall govern. If there are further differences between the Special Conditions and other sections of the Technical Specifications, the Special Conditions shall govern.

SC-2.00 SHOP DRAWINGS

Detailed shop drawings, in amplification of the drawings referred to in this Contract, on all equipment, steel, piping arrangements and all other items requiring the Engineer's approval, shall be submitted to the Engineer before proceeding with the work. Five (5) copies of such drawings shall be submitted to the Engineer in the form of blueprints for approval. If approved, two (2) sets of such prints will be returned to the Contractor marked approved. If changes or corrections are necessary, one (1) set will be returned to the Contractor with such changes or corrections noted, and the Contractor shall re-submit corrected or changed prints in five (5) copies. It is understood that the approval by the Engineer of the Contractor's drawings, whether general or detailed, is a general approval relating only to their sufficiency and compliance with the intention of the Contract and shall not excuse or constitute a waiver of errors, discrepancies or omissions. All submittals shall be stamped and signed by the Contractor indicating that items submitted comply to the specifications.

SC-3.00 LIQUIDATED DAMAGES

Bidder hereby agrees to commence work under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the project within the number of days stated

on the Bid Schedule. Bidder further agrees to pay liquidated damages as stated in the bid for each consecutive calendar day thereafter until completion of the project.

SC-4.00 MINIMUM INSURANCE AND SAFETY COVERAGE REQUIREMENTS

4.01 All requirements of the Occupational Safety and Health Act and recommendations of the insurance carrier shall be heeded by the Contractor.

4.02 INSURANCE COVERAGE: The limits of liability for the insurance required in the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

A. Worker's Compensation: Insurance required in connection with the performance of the work:

1. State: Statutory
2. Applicable Federal: Statutory
3. Employer's Liability: $500,000

B. Comprehensive General Liability (including Premises-Operations; Independent Contractors' Protection; Products Liability and Completed Operations; Broad Form Property Damage):

1. Bodily Injury (including completed operations and products liability): $1,000,000 each occurrence; $2,000,000 annual aggregate
2. Property Damage: $1,000,000 each occurrence; $2,000,000 annual aggregate
3. Property Damage Liability insurance will provide explosion, collapse and underground coverages.
4. Personal Injury, with employment exclusion deleted.

C. Comprehensive Automobile Liability: Insurance shall cover all owned, non-owned, and hired motor vehicles subject to the following limits:

1. Bodily Injury: $1,000,000 each person; $1,000,000 each occurrence
2. Property Damage: $1,000,000 each occurrence

D. Contractual Liability:

1. Bodily Injury: $1,000,000 each occurrence
2. Property Damage: $1,000,000 each occurrence; $1,000,000 annual aggregate

E. Umbrella Excess Liability: $1,000,000 Single Limit Bodily Injury and Property Damage.

The Contractor shall carry the above-mentioned minimum coverage for the life of the construction project. This coverage may be in the form of a special policy or an

Endorsement on the basic policy of the Contractor and additional costs (if any) to Owner will be included in the original Contract Total Bid Amount.

Contractor agrees to purchase such insurance from companies acceptable to Owner, to furnish Owner upon request from time to time with satisfactory evidence that such insurance is being properly carried, and to furnish the Owner and the Engineer with Certificates of Insurance of all policies and/or Endorsements before Owner will issue an order to commence Work.

All Contractor's insurance policies shall name the Owner, Contractor, Subcontractor(s), Engineer, and Engineer's Consultants on the Certificates of Insurance as additional insured.

All insurance policies shall provide that no cancellation or modification of the policy or Endorsement shall be effective until thirty (30) days following the mailing of written notices of such cancellation to the Engineer and to the Owner.

The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation.

SC-5.00 INSPECTION

An inspector shall be present during construction of the project. The inspector shall be on-site to observe the conformity of the work to the plans and specifications. Limitations of Authority are as follows:

Resident Project Representative:

1. Shall not authorize any deviation from the Contract Documents or substitution of materials or equipment, unless authorized by OWNER'S REPRESENTATIVE.

2. Shall not exceed limitations of OWNER'S REPRESENTATIVE authority as set forth in the Agreement of the Contract Documents.

3. Shall not undertake any of the responsibilities of CONTRACTOR, subcontractors or CONTRACTOR's superintendent.

4. Shall not advise on, issue directions relative to or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction unless such advice or directions are specifically required by the Contract Documents.

5. Shall not advise on, issue directions regarding or assume control over safety precautions and programs in connection with the Work.

6. Shall not accept Shop Drawing or sample submittals from anyone other than CONTRACTOR.

7. Shall not authorize OWNER to occupy the Project in whole or in part.

8. Shall not participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by OWNER'S REPRESENTATIVE.

SC-6.00 ADDITIONAL HELP BY CONTRACTOR

The Contractor will be required to furnish assistance as needed by the Resident Inspector in measuring for construction record drawings and/or determination of quantities.

SC-7.00 COMPETENCE OF WORKMEN

Any workman on any part of the work shall be competent to perform the task to which he is assigned. Supervision for each crew shall be done by a foreman or superintendent that is capable of directing the work. Conditions which require the constant presence of an Inspector to assure the quality of the work will not be tolerated. Any worker who does not produce quality workmanship through lack of cooperation or incompetence shall be removed from the job. The judge of quality of workmanship shall be the Engineer.

SC-8.00 UNDERGROUND UTILITIES AND STRUCTURES

Location of utilities and underground structures shown on the plans are approximate and those shown are not necessarily all of the existing utilities and structures. It is the Contractor's responsibility to determine the exact location and existence of all utilities and underground structures.

SC-9.00 CONCRETE

Concrete shall be 4000 PSI ready mix concrete designed by an independent laboratory. Placement shall meet the requirements of Section 501 of the Standard Specifications for Road and Bridge Construction, Tennessee Highway Department. If foundation design is higher, the foundation design shall govern.

SC-10.00 FOUNDATION GRAVEL, SAND AND CONCRETE

Foundation gravel, sand or concrete shall be used when existing conditions require stabilization as determined by the Engineer. Foundation gravel shall be washed rock.

SC-11.00 CLEARING

The cost of clearing shall be included in the cost of items bid. There is not a special pay item for clearing. Disposal of debris shall be the responsibility of the water main contractor. Clearing on this project shall be minimized.

SC-12.00 TESTING

The Owner shall pay the cost of all independent laboratory fees and fees charged by an independent laboratory for field tests during construction of the project. Testing or test results for products such as seed, cement, etc. shall be provided by the supplier to the Contractor for approval by the Engineer.

SC-13.00 EXISTING UTILITIES, STRUCTURES, OR OBSTRUCTIONS

13.01 Prior to any excavation, it shall be the responsibility of the Contractor to locate and avoid damage to any existing water, underground utility or structure. The Contractor shall contact the Utility Departments or other responsible agencies to obtain location drawings or other assistance in the location of existing underground work. Avoid all surface obstructions and protect same from damage.

13.02 All fencing, shrubbery, hedges, flowers, etc. shall be moved and replaced in as good or better condition as found at no extra cost to the Owner. Trees are not to be removed or damaged.

13.03 The Contractor shall repair or pay for all damage caused by his operations to any existing utility property, public property, or private property, whether it is below ground or above ground, and shall settle in total cost all damages which may arise as a result of his operations.

13.04 Prior to construction, the Contractor shall videotape the proposed routes of the main and service for a record of conditions prior to crossing property. One copy each shall be provided to the Owner and the Engineer.

13.05 Protect non-owned vehicular traffic, stored materials, site and structures from damage.

SC-14.00 DRIVEWAY AND STREET REPAIRS AND ASPHALT SPECIFICATIONS

14.01 Asphaltic paving mixture, equipment, methods of mixing and placing, and precautions to be observed as to weather condition of base, etc., shall conform to standard practice for first class road work.

14.02 Thickness of asphalt shall be 2-inch compacted.

14.03 Asphalt shall be TDOT 411-E.

14.04 Repairs shall be paid for on a linear foot basis.

SC-15.00 CONSTRUCTION STAKING

15.01 The Contractor shall provide all labor, materials and equipment required to properly stake the work covered by these specifications.

15.02 There will not be a separate pay item for this work. Cost for such work will be included in the bid price for the proposed construction.

SC-16.00 RIGHTS OF ENTRY

The right to enter on any site of construction or material storage is reserved by the Owner, the Engineer, and the agencies of the State of Tennessee.

SC-17.00 PROTECTION OF LIVES AND HEALTH

The Contractor alone shall be responsible for the safety, efficiency and adequacy of this plant, appliances and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation.

SC-18.00 GUARANTEE

The Contractor shall guarantee all workmanship and materials under this contract for a period of twelve (12) months after final acceptance of the contract and shall in the event of failure of any item due to workmanship or materials replace it without cost to the Owner. However, as stated in painting Section, the paint system shall have a 24-month warranty included in this contract. The Contractor shall correct any deficiencies found under the guarantee clause of the contract.

SC-19.00 EXISTING CONDITIONS

19.01 The Contractor shall be responsible for arrangements to locate underground gas, telephone, electricity, and TV lines. Existing sanitary sewers and water lines shall be adequately located by the Contractor to avoid damage to underground facilities. Excessive and/or irresponsible damage to existing facilities will not be tolerated.

19.02 The Contractor shall satisfy himself as to the condition of existing water mains, service pipes, and attachments. No extra price shall be added for leaking valves or deteriorated pipe work.

SC-20.00 EXISTING OBSTRUCTIONS

All fencing, shrubbery, hedges, flowers, etc. shall be moved and replaced in good or better condition as found at no extra cost to the Owner.

SC-21.00 WATER MAIN CONSTRUCTION

21.01 Water mains shall be laid as specified in the WATER MAIN CONSTRUCTION section of the Technical Specifications. Care shall be exercised to locate and avoid other utilities and to avoid excessive cutting of pavement.

21.02 At points in the proposed water system, ductile iron pipe is shown on the Plans. Only ductile iron pipe conforming to the DUCTILE IRON WATER MAINS section in the Technical Specifications may be used at these locations.

SC-22.00 GAS MAIN REPAIR

22.01 Gas mains may exist within the project limits. Before any construction is begun, the Contractor will have a representative from the gas utility company locate all high-pressure mains, low-pressure mains, and all house service lines that will be crossed during construction. The Contractor shall and hereby does assume entire responsibility for determining the exact locations of all gas mains and their proper protection, support, and maintenance during all construction operations of this project.

22.02 Should the trencher or backhoe hit or damage the gas main during construction of the water line, the gas main or gas service, it shall immediately be repaired by the City with cost to be charged to the Contractor.

22.03 Should the trencher yank or bend the gas main substantially, the Contractor shall check the gas main above and below the ditch excavation for possible breaks in the gas main.

22.04 Any damage should be followed by a call to the gas company and an expert should review the damage and repair before it is backfilled.

SC-23.00 BACKFILLING

23.01 All drives and street crossings shall be backfilled and tamped with mechanical tampers in 6-inch layers immediately after crossing same. The above shall be done regardless of other methods used for backfilling and compacting of remaining trench. All timber used for temporary traffic support shall be removed before the work is completed.

23.02 All backfilled trenches shall be maintained by the Contractor until completion and acceptance of the Owner. Upon acceptance of completed construction, maintenance will be assumed by others.

23.03 Base limestone shall be compacted to one hundred percent (100%) of the standard proctor. The Engineer may approve compaction when no movement is experienced under the weight of a loaded gravel truck or road patrol.

23.04 The Contractor shall make such repairs required to maintain traffic and provide safety on the traffic areas. Temporary limestone base shall be placed in the proper thickness and manners to avoid later excavation and re-graveling of the base. Base thickness shall match the existing base except that 8-inch minimum thickness shall be used. Concrete base may be ordered by the Owner.

23.05 The Contractor shall maintain the ditches until his work is substantially completed. The Owner will inspect the areas to be paved prior to beginning of pavement repairs. Upon acceptance of the work for repairs, the Contractor shall be responsible only for the work done by him and the Owner shall be responsible for further maintenance and pavement repairs. Street repairs caused by leaks or other defective workmanship will be charged to the Contractor.

SC-24.00 ROAD GRAVEL

24.01 The driveway shall be 8-inches of compacted gravel base to grade. The granular material for this operation shall be mineral aggregate, Type B base, Stone Grading B or C (Item 303-05 of Standard Specifications of Tennessee Department of Transportation). The described granular material is locally known as "33-C limestone". Road gravel required for entrance road may be 33C or pit gravel acceptable for roads by the Tennessee Department of Transportation.

24.02 Compaction: 100% of the standard proctor. The Engineer may approve compaction when no movement is experienced under the weight of a loaded gravel truck or road patrol.

24.03 Filter cloth shall be placed under 33-C limestone.

SC-25.00 SELECTION OF EQUIPMENT AND MATERIALS

25.01 All equipment, items and materials used in the work are subject to the Engineer's approval. They shall be products of reputable manufacturers and shall conform to specification requirements, accepted standard practice, and to State, Federal and Municipal laws and regulations and approved for use by the Owner.

25.02 These items shall be the best of respective equipment and materials available for the purpose for which used. Equipment and materials not conforming to Specifications will not be considered.

25.03 The material to be used shall conform to the following provisions of the Specifications:

A. WATER MAINS - The water mains shall be polyvinyl chloride SDR-21 as specified in the PVC WATER PIPE (SDR 21) section in the Technical Specifications. Ductile iron pipe conforming to the DUCTILE IRON WATER MAINS section in the Technical Specifications shall be used. Creek crossings and other special locations shown on the Plans shall use restrained joint PVC pipe.

B. SPECIAL FITTINGS - The couplings, joints and fittings shall be M.J. ductile iron conforming to the DUCTILE IRON WATER MAINS section in the Technical Specifications and shall be suitable for the pipe which is being installed.

C. LARGE GATE VALVES - Underground gate valves 6-inches and larger shall be non-rising stem gate valves conforming to the RESILIENT SEAT GATE VALVES section in the Technical Specifications.

D. LARGE VALVE BOXES - Valve boxes shall conform to Part 6.00 of the RESILIENT SEAT GATE VALVES section in the Technical Specifications.

E. FIRE HYDRANTS - Fire hydrants shall meet requirements of the FIRE HYDRANTS section in the Technical Specifications.

SC-26.00 TRACER WIRE

26.01 Tracer wire shall be as follows:

#12 AWG, solid copper, type THHN-THWN, thermoplastic insulated, made in accordance with ASTM designation; B3 "Standard Specification for Soft or Annealed Copper Wire" as last revised and Underwriters Laboratories designation: ANSI/UL83, "Standard for Thermoplastic-Insulated Wires" as last revised.

26.02 Tracer wire connector shall be equal to King, Silicone-filled-10555, wire splice kit capable of joining three #12 copper wires.

26.03 Tracer wire shall be installed parallel to and in the same trench as the water main. The wire shall be brought up at all valve boxes as connect points for the inductive locator signal.

SC-27.00 TESTING AND DISINFECTION OF WATER MAINS

27.01 The Owner shall pay the cost of all independent laboratory fees and fees charged by an independent laboratory for field tests during construction of the project. Testing or test results for products such as seed, cement, etc. shall be provided by the supplier to the Contractor for approval by the Engineer.

27.02 The Contractor shall still be responsible for pressure testing lines and pulling samples for bacteriological testing by the State Health Department. The Contractor shall be responsible for obtaining necessary sample bottles from the Health Department.

SC-28.00 SCHEDULE AND PROGRESS CHART

28.01 Upon starting construction, the Contractor shall submit to the Owner, a schedule and progress chart which indicates the manner in which he anticipates meeting the time schedule requirements of this Contract. This chart shall be realistic and shall meet the approval of the Owner.

28.02 The Contractor shall cooperate in scheduling his work to complete these portions of his Contract as soon as practicable. This scheduling by the Contractor shall meet the approval of the Owner.

SC-29.00 FINAL INSPECTION OF WATER VALVES

Final inspection of all water valves shall include putting the standard valve wrench on each valve to be sure it will fit and to be sure the valve is left open.

SC-30.00 OPERATION AND MAINTENANCE MANUALS

The manufacturer of pump stations installed will be required to furnish three (3) copies of all available operation, maintenance and parts manuals for the equipment furnished by him. It will be the responsibility of the Contractor to gather this material together and assemble. This will be in addition to shop drawings and should reflect any field alterations or deviations from the approved shop drawings. Three (3) copies of the booklet shall be furnished to the Owner before the project is accepted. This requirement will be strictly adhered to.

SC-31.00 UNDERGROUND UTILITIES

Location of utilities and underground structures shown on the plans are approximate, and those shown are not necessarily all of the existing utilities and structures. It is the Contractor's responsibility to determine the exact location and existence of all utilities and underground structures.

SC-32.00 CLEAN UP AND FINAL GRADING

After completion of construction, the Contractor shall remove all surplus material, tools, and temporary structures from the site. All rubbish shall be removed. The site shall be brought to finish grade, seeded and mulched.

SC-33.00 TESTING AND DISINFECTION

33.01 The Contractor shall chlorinate the water mains in accordance with the DISINFECTION Section in the Technical Specifications.

33.02 The Contractor shall obtain water samples for bacteriological testing from a fire hydrant or blowoff.

33.03 All water for testing and disinfection may be obtained from the municipal water system.

SC-34.00 PERMITS

The Contractor shall meet all local and State requirements.

SC-35.00 CASING SPACERS AND END SEALS

Yelomine pipe inserted into steel casing shall be installed with casing spacers and end seals. Spacers shall be installed a minimum of two (2) per pipe, and there shall be two (2) spacers on the carrier pipe just inside each end of the casing. Use Raci casing spacers or approved equal. End seals shall be PWM wrap around end seals made of 1/8-inch thick neoprene rubber with mastic seal and 304 stainless steel bands ½-inch wide.

END OF SPECIAL CONDITIONS

SECTION 02515.4
ROADWAY GRAVEL BASE

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents.

PART 2.00 SCOPE OF THE WORK

The work to be done under this contract includes the furnishing of all labor, equipment and materials, and gravel base necessary for the construction of the roadway as specified and shown on the plans.

PART 3.00 GRAVEL FOR BASE

3.01 IN TENNESSEE:

Gravel base preparation shall meet the requirements of Section 303 of the Standard Specifications for Road and Bridge Construction of the Tennessee Department of Highways, latest edition. Gravel base material shall meet the requirements of Section 903.05 of these Specifications and be composed of one but not both of the following gradations:

TOTAL PERCENT BY WEIGHT, PASSING SIEVES

Grading	1½"	1"	¾"	3/8"	No. 4	No. 16	No. 100
C	100	90-100		45-74	30-55		4-15
D	100	85-100	60-95	50-80	40-65	20-40	9-18

PART 4.00 CURING OF BASE

4.01 After the gravel is added and the street brought to the shape indicated on the plans, the Contractor shall wet the base and roll same to compaction with a water-filled, rubber tired, wobble wheel roller. Compaction lifts shall be between three-inches (3") and four-inches (4") in thickness. Lamination of less than two-and-one-half-inches (2½") shall not be placed on top. Wetting and rolling of fines into the compacted base will not be permitted. Upon completion, the base shall be firm and unyielding to heavy equipment in its entire surface, and be acceptable to the Engineer before priming or paving.

4.02 On roadways where gravel is existing and sufficient, the existing gravel shall be scarified to a maximum depth of three-inches (3") and wet and rolled as described above.

PART 5.00 GUARANTEE

The Contractor shall guarantee all workmanship and materials for a period of one (1) year from the date of acceptance. Defects in workmanship or materials developed or discovered within the guarantee period shall be corrected at no expense to the Owner.

END OF SECTION

SECTION 02676.1
DISINFECTION

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents. All materials specified herein are subject to Engineer's approval.

PART 2.00 SCOPE OF WORK

2.01 The work in this section consists of furnishing all materials, accessories, equipment, tools, transportation, services, labor, and performing all operations required to perform the Disinfection work for this project, as herein specified.

2.02 Disinfection is required for all interior surfaces of all pipes, valves, and other structures or devices designed for containment of potable water.

PART 3.00 JOB CONDITIONS

Refer to General Conditions for detailed information regarding job conditions requirements.

PART 4.00 DISINFECTION OF STORAGE AND OTHER STRUCTURES

4.01 The interior of structure and riser shall be thoroughly washed and disinfected in accordance with the requirements of the State Health Department and ANSI/AWWA C651-92, Section 2, Method 3.

4.02 Bacteriological samples shall be taken and sent to the Health Department for testing. If the results of the tests are positive, the structure shall be disinfected again as set out herein above until negative test results are obtained.

4.03 The structure shall not be placed into service until negative results are obtained.

PART 5.00 DISINFECTION OF WATER MAINS

5.01 When laying pipes, installing valves and hydrants, keep all materials as clean as possible to minimize contamination.

5.02 Disinfect water mains by filling same with water and introducing liquid chlorine or chlorinated lime solutions, during filling operations.

5.03 When filling mains, draw entrained air from pipes at all high points, to permit intimate contact of disinfecting agent with areas of inside surfaces of pipes and appurtenances.

5.04 Disinfecting solution shall remain in pipe lines at least twenty-four (24) hours before draining to waste. In draining system, commence drawing off at outlying parts and gradually work toward source of supply. After fifty (50) parts per million of chlorine has been achieved in the new water mains, it must be allowed to stand for twenty-four (24) hours. At the end of twenty-four (24) hours, test shall show residual chlorine content of at least twenty-five (25) p.p.m. at all points in system. Method of testing chlorine residual shall be the DPD colormetric test.

5.05 Amounts of disinfection agent per one thousand-feet (1,000') of water main shall be not less than the following, based on liquid chlorine applied at fifty (50) parts per million solution strength:

NOMINAL DIAMETER OF PIPE	WEIGHT OF 100% LIQUID CHLORINE PER 1,000 LINEAL FEET OF WATER MAIN	WEIGHT OF 65% GRANULATED HTH PER 1000 LF OF WATER MAIN
6 inches (6")	39.2 ounces	60.3 OZ.
8 inches (8")	69.7 ounces	107.2 OZ.
10 inches (10")	108.9 ounces	167.5 OZ.
12 inches (12")	156.9 ounces	241.4 OZ.
14 inches (14")	213.5 ounces	328.5 OZ.
16 inches (16")	278.9 ounces	429.1 OZ.

5.06 Disinfection agents with available chlorine content less than unity shall be proportionately adjusted as to required weight.

C651

5.07 Disinfection of water mains shall conform to AWWA Specification C601, latest revision.

PART 6.00 ALL DISINFECTION

6.01 After disinfecting, flushing, and refilling water mains, samples of water will be taken by Engineer or Owner's representative. Said samples of water will be submitted to the State Sanitary Engineering Laboratory or other appropriate sanitary regulating agency for bacteriological analysis.

6.02 Should bacteriological test of water samples show contamination still present, the Contractor shall repeat disinfection operations as directed in this section at his own expense and without extra cost to Owner until further tests prove absence of contamination or until public use of the facility is approved and authorized by the State or other regulating agency.

6.03 Two (2) bacteriological samples shall test negative before the disinfected items shall be approved for use.

6.04 All satisfactory bacteriological samples shall contain no coliform bacteria.

END OF SECTION

SECTION 02722.8.7
RESTRAINED JOINT PVC PIPE (SDR 21)

1.0 SCOPE

This specification covers thrust-restrained Polyvinyl Chloride (PVC) pipe, 2" - 16", with Iron Pipe Size (I.P.S.) outside diameters. Pipe is intended for use in pressure-rated potable water delivery systems, as well as in sewer force main and fire protection piping systems.

2.0 REFERENCE DOCUMENTS

American Society for Testing and Materials (ASTM)

ASTM D1784	Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated (SDR Series)
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

National Sanitation Foundation (NSF)

NSF61	Drinking Water System Components – Health Effects
NSF14	Plastic Piping System Components and Related Materials

3.0 REQUIREMENTS

3.1 GENERAL

Products delivered under this specification shall be manufactured only from water distribution pipe and couplings conforming to ASTM D2241. The restrained joint pipe system shall also meet all short and long term pressure test requirements of ASTM D2241. Pipe, couplings, and locking splines shall be completely non-metallic to eliminate corrosion problems.

3.2 MATERIALS

Pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4°F, in accordance with the requirements of ASTM D2837. 16-inch high-pressure couplings shall be made from glass-reinforced thermoset filament-wound materials.

3.3 APPROVALS

Restrained joint PVC pipe products shall have been tested and approved by NSF International. 2-inch through 16-inch PVC pipe and coupling systems up to Class 250 shall be listed in NSF14. All products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF 61 by an acceptable certifying organization. Copies of agency approval reports or product listings shall be provided to the Engineer.

3.4 DIMENSIONS

Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of ASTM D2241. Thrust-restrained pipe shall be furnished in 2-inch, 3-inch, 4-inch, 6-inch, 8-inch, 10-inch, 12-inch and 16-inch sizes, with pressure ratings from 90 psi to 315 psi.

3.5 JOINTS

3.5.1 COUPLED JOINTS

Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted into mating, precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading.

Couplings shall be designed for use at or above the rated pressures of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139.

3.5.2 INTEGRAL BELL JOINTS

Pipe shall be joined utilizing an integral bell system that does not require couplings. A high-strength, flexible thermoplastic spline shall be inserted into mating, precisions-machined grooves in the pipe and integral-bell to provide full 360° restraint with evenly distributed loading. Integral bell shall incorporate an elastomeric sealing gasket meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139.

3.6 WORKMANSHIP

Pipe and couplings shall be homogeneous throughout and free from voids, cracks, inclusions and other defects, and shall be as uniform as commercially practicable in color, density and other physical characteristics.

3.7 QUALITY CONTROL

Q.C. program shall be in accordance with NSF requirements.

3.8 MARKING

Pipe and couplings shall be legibly and permanently marked in ink with the following minimum information:

- Nominal size (for example, 4 in.)
- Outside Diameter System (I.P.S.)
- PVC
- Standard Dimension Ratio (SDR) and pressure rating
- ASTM designation D2241-05 (or latest edition)
- Manufacturer's name or trademark and production record code
- Seal (mark) of the testing agency verifying the suitability of the pipe material for potable water service

3.9 APPROVED MANUFACTURERS

Certa-Lok Yelomine restrained-joint pipe from CertainTeed Corporation, or approved equal.

END OF SECTION

SECTION 02733.8.2
PVC WATER PIPE
(SDR 21)

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents.

PART 2.00 SDR 21 PRESSURE RATING 200 PSI

2.01 Pipe must meet all the requirements as set forth in Product Standard PS 22-70 (formerly Commercial Standard CS 256-63) for PVC Type I, Grade 1, PVC 1120 or PVC Type I, Grade 2, PVC 1220 only, with standard dimension ratio (SDR) of the nominal size to the pipe wall thickness of 21, pressure rating of 200 PSI, and bear the National Sanitation Foundation Testing Laboratories, Inc., seal of approval for potable water. Lower sustained test pressure ratings of 420 PSI for SDR 21 will not be accepted. Pipe must conform to ASTM D2241. Pipe joints must conform to ASTM D3139.

2.02 Dimensions in inches shall be as follows:

NOMINAL PIPE SIZE	OUTSIDE PIPE DIMENSIONS	MINIMUM WALL THICKNESS
2 inches (2")	2.375	0.113
4 inches (4")	4.50	0.214
6 inches (6")	6.625	0.316
8 inches (8")	8.625	0.411
10 inches (10")	10.750	0.511
12 inches (12")	12.750	0.606

2.03 Pipe lengths shall not exceed 20 feet, unless adequate transporting trucks or trailers are available which will adequately support the entire length of a 40-foot joint of plastic pipe.

2.04 Provisions must be made for contraction and expansion at each joint with rubber ring, tapered end and bell as integral part of each full joint with standard dimension ratio SDR 21 being maintained throughout the entire bell section; a factory welded joint with the bell section meeting the latest Commercial Standard for socket type and shall be same material as set forth under Item 2; or Twin gasket Coupling meeting requirements as set forth in Item 2. All plastic fittings, such as Tees, Ells, etc. shall be factory welded, meeting the same specifications as the bell section. Lubricant shall be of the non-toxic type.

2.05 Only pipe manufacturers approved by the State Health Department can be used.

2.06 Mechanical joint cast iron fittings with transition gaskets for plastic pipe shall be used when specified in Special Conditions and/or the bid form. The cast iron fittings shall conform to the latest revisions of the following specifications:

ASA, A21.10 - Short body cast iron fittings 2-inch to 48-inch.
AWWA C100 - Standard Specification for Cast Iron Pressure Fitting.

2.07 Taps shall be made in accordance with the manufacturer's recommendations with a service saddle. The saddle shall be Ford Style S70, sized for PVC pipe and/or any existing pipe requiring a saddle. stainless steel

END OF SECTION

SECTION 02905.1
SEEDING AND LANDSCAPING

PART 1.00 GENERAL

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all said documents.

PART 2.00 SCOPE OF WORK

2.01 This work shall consist of furnishing and placing seed, plant material, commercial fertilizer, agricultural limestone, and/or mulch material, and of caring for such areas until acceptance, all in accordance with these Specifications.

PART 3.00 MATERIALS AND EQUIPMENT

3.01 EQUIPMENT:

Except in areas where it is not practical to do so all work shall be done by machines which will deliver uniform quantities of materials on uniform areas of the ground surface.

3.02 GRASS SEED:

A. The seed shall meet the requirements of the Tennessee Department of Agriculture and no "Below Standard" seed will be accepted. Grass seed furnished under these Specifications shall be packed in new bags or bags that are sound and not mended.

B. The Contractor shall furnish the Owner a certified laboratory report from an accredited commercial seed laboratory or from a State seed laboratory showing the analysis of the seed to be furnished and approving the seed for purity and germination. The report from an accredited commercial seed laboratory shall be signed by a Senior Member of the Society of Commercial Seed Technologists. At the discretion of the Engineer, samples of the seed may be taken for a check against the certified laboratory report. Sampling and testing will be in accordance with the requirements of the Tennessee Department of Agriculture.

C. When a seed group is used, the percentages forming the group shall be as set out below, unless otherwise specified.

NAME	QUANTITY, PERCENT BY WEIGHT
Group A: To be sowed between February 1 and August 1	
Lespedeza (Common or Korean)	20
Sericea Lespedeza	15
Ky. 31 Fescue	40
English Rye	15
White Dutch Clover	5
Unhulled Bermuda	5
Group B: To be sowed between August 1 and December 1	
Ky. 31 Fescue	60
Redtop	15
English Rye	20
White Dutch Clover	5
Group C: To be sowed on rocky hard types of soil only if directed by the Owner.	
Sericea Lespedeza	50
KY. 31 Fescue	30
English Rye	15
White Dutch Clover	5

In mixing or forming "Groups" of seed, they 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.

3.03 FERTILIZER:

Manufactured fertilizer shall be a standard commercial fertilizer containing the specified percentages by weight of nitrogen (N), phosphoric acid (P÷2≈O÷5≈) and Potash (K÷2≈O). The fertilizer shall be furnished in standard containers with the name, weight, and guaranteed analysis of the contents clearly marked. The containers shall insure proper protection in handling and transporting the fertilizer. All commercial fertilizer shall comply with Local, State, and Federal fertilizer laws. Fertilizer may be supplied in bulk if a responsible source of supply is identified and a certification is supplied by the supplier stating the quality of the fertilizer.

3.04 AGRICULTURAL LIMESTONE:

Agricultural limestone shall contain not less than eighty-five percent (85%) of calcium carbonate and magnesium carbonate combined and shall be crushed so that at least 85 percent (85%) will pass the NO. 10 mesh sieve and 100 percent (100%) will pass the 3/8" sieve.

3.05 MULCH MATERIAL:

A. All mulch material shall be air dried and virtually free of noxious weeds and weed seeds or other materials detrimental to plant growth on the work site or on adjacent agricultural lands. Hay shall be stalks of approved grasses, sedges, or legumes seasoned before bailing or loading. Straw shall be stalks of rye, oats, wheat, or other approved grain crops. Both hay and straw shall be suitable for spreading with standard mulch blower equipment. Biodegradeable fabric may be used as an alternate to mulch material at the Contractor's option.

B. If hay is used the type of hay along with a sample of the material shall be named and submitted for approval in time for expert review before work is to begin.

3.06 INOCULANTS FOR LEGUMES:

Inoculants for treating legume seed shall be standard cultures of nitrogen-fixing bacteria that are adapted to the particular kind of seed to be treated. The inoculants shall be supplied in convenient containers of a size sufficient to treat the amount of seed to be planted. The label on the container shall indicated the specified legume seed to be inoculated and the date period to be used.

3.07 WATER:

Water shall be free from any harmful or objectionable qualities or organisms. Seeded area shall be watered three times a week until a stand of grass is obtained. Watering shall be done after 4:00 P.M. or between 5:00 A.M. and 10:00 A.M.

PART 4.00 CONSTRUCTION REQUIREMENTS

4.01 GENERAL:

The Contractor shall notify the Owner at least 48 hours in advance of the time he intends to begin sowing seed and shall not proceed with such work until permission to do so has been granted by the Engineer. Before starting seeding operations on any area, final dressing shall have been completed in accordance with the project requirements. All seeding and related operations shall be continuous operations.

4.02 WEATHER LIMITATIONS:

A. Plant material shall not be installed between December 1 and February 1, unless weather and soil conditions are considered favorable and permission is granted by the Engineer.

B. Group "A" and Group "B" seed shall be used for seeding at times specified above. Either Group "A" or "B" may be used during the month of August. Group "C" seed shall be used only when specified on the Plans or in the Contract Documents. No seeding shall be performed between December 1 and February 1, unless otherwise permitted. Seeding shall be performed only when the soil is in a tillable and workable condition.

4.03 PREPARING THE SEEDBED:

Each area to be seeded shall be scarified, disced, harrowed, raked, or otherwise worked until it has been loosened and pulverized to a depth of not less than 3" inches. This operation shall be performed only when the soil is in a tillable and workable condition. Fertilizer, at the rate of not less than 10 pounds of Grade 24-12-12 or equivalent, per 1,000 square feet, and agricultural limestone, at the rate of not less than 100 pounds per 1,000 square feet, shall be distributed evenly over the seedbed, unless other rates are specified on the Plans or in the contract documents. The limestone and fertilizer shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of approximately 1/2 inch. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment.

4.04 SEEDING:

Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed and thoroughly watered after seeding. Care shall be exercised to not wash seeding by over-watering. Seed shall be sown uniformly by means of a rotary seeder, wheelbarrow seeders, hydraulic equipment, or other satisfactory means, and unless otherwise specified on the Plans or in the Contract Documents, at the rate of 2 pounds per 1,000 square feet. Seeds of legumes when sown alone shall be inoculated before sowing in accordance with the recommendations of the manufacturer of the inoculant and as directed by the Engineer. No seeding shall be done during windy weather, or when the ground surface is frozen, wet, or otherwise non-tillable. If Bermuda seed only is used, roll or harrow 60 pounds per acre to 1/4" depth.

4.05 MULCHING:

A. When seeding with mulch, the mulch material shall be spread evenly over the seeded areas at an approximate rate of 75 pounds per 1,000 square feet immediately following the seeding operations. This rate may be varied by the Engineer, depending on the texture and condition of the mulch material and the characteristics of the area seeded. All portions of the seeded areas shall be

covered with a uniform layer of mulch, so that approximately 25 percent (25%) of the ground is visible.

B. The mulch shall be held in place by the use of an approved mulch binder. Cutback asphalt,Grade SS-1 or emulsified asphalt shall be applied at the approximate rate of 2 gallons per 1,000 square feet or more as required to hold the mulch in place. Mulch in medians and other areas affected by traffic shall be held in place by applying asphalt binder at the approximate rate of 7 gallons per MSF.

C. The Contractor shall cover exposed structures, guardrails, signs, and appurtenances, if the mulch binder is applied in such a way, that it would come in contact with or discolor the structures. All mulching shall be done by machine, except in small areas where machine usage are impractical. No materials shall be sprayed on or allowed to drift on walls and/or walks.

END OF SECTION

SECTION 03001
CONCRETE

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above mentioned documents.

PART 2.00 SCOPE OF WORK

Work covered by this section consists of furnishing all plant, labor, equipment, appliances and material and in performing all operations in connection with the installation of concrete work complete, in strict accordance with this section of the specifications and applicable drawings and subject to the terms and conditions of the contract.

PART 3.00 APPLICABLE SPECIFICATIONS

The Standard Specifications of the American Society for Testing and Materials (ASTM) and the American Concrete Institute (ACI) as they appear herein or on the Plans by reference form a part of this specification.

PART 4.00 SHOP DRAWINGS

Submit for the Engineer's review complete shop drawings for all reinforcing steel required for this project. Refer to the General Conditions for detailed information regarding shop drawings requirements. Detail wall reinforcement in elevation views and slab reinforcement in plan views.

PART 5.00 GENERAL

Full cooperation shall be given other trades to install embedded items. Suitable templates or instructions or both will be provided for setting items in place in the forms. Embedded items shall have been inspected and tests for concrete or other materials or for mechanical operation shall have been completed and approved before concrete is placed.

PART 6.00 JOB CONDITIONS

Refer to the General Conditions for detailed information regarding job conditions requirements.

PART 7.00 MATERIALS

7.01 Ready-mix concrete shall be used. Ready mixed concrete shall conform to ASTM Standard C94, latest revision. Submit proposed mix designs, tested per ACI 350 or ACI 318, a minimum of thirty (30) days prior to concrete placement for engineer's review. Type II cement shall be used for all tanks and basins.

7.02 CURING MATERIALS:

A. Waterproof Paper - ASTM C171, latest revision, Type I.

B. Membrane Curing Compound - ASTM C309, latest revision, Type I.

7.03 Expansion joints shall be premolded, and shall conform to ASTM D1751, latest revision.

7.04 Dumbbell water stops shall be vertical and horizontal, of required types, shapes, sizes as indicated, (Neoprene Rubber). Provide corner and "L" members (flat or horizontal), tees, unions, and split dumbbell. Install per the manufacturer's printed instructions in all joints of liquid containment structures.

7.05 Joint sealer shall be cold application type or hot poured elastic type as approved by the Engineer. Concrete joint sealer cold application type shall conform to ASTM D1850, latest revision. Concrete joint sealer, hot poured elastic type, shall conform to ASTM D1854, latest revision.

7.06 Forms shall be wood, metal or other approved material and shall conform to the following requirements:

A. WOOD:

1. Unexposed Concrete Surfaces - No. 2 common or better lumber.

2. Exposed Concrete Surfaces - dressed and matched boards of uniform thickness of a width not exceeding 10-inches, or plywood.

7.07 Form ties shall be suitable for the purpose of the structure. In liquid containment structures, the portions of single rod ties that remain in the wall shall be provided with an integral waterstop at mid point. The assembly shall provide cone shaped depressions at the surface, at least 1-inch in diameter and 1½ -inches deep, to allow filling and patching.

Through ties that are to be entirely removed shall be tapered over the portion that passes through the concrete. The large end shall be on the liquid side of the wall.

All tie depressions and/or holes shall be filled. The Contractor shall demonstrate and submit for review the methods and materials used for filling the voids formed by the ties. Filling material shall be non-shrink.

7.08 FORM OIL:

Commercial quality, colorless, mineral oil, free of kerosene and of a viscosity suitable for the intended use.

7.09 REINFORCEMENT:

See Structural drawings.

PART 8.00 CLASSES OF CONCRETE AND USAGE

8.01 See table below for requirements of strength, maximum water cement ratio, and slump. Concrete of the various classes required shall be proportioned in such manner to give the following tabulated minimum strength and shall not exceed the listed maximum water cement ratios shown.

Class of Concrete	Compressive Strength PSI at 28 Days	Maximum Water Cement Ration Gal/Bag	Slump	Coarse Aggregate (1½" Max.)
Class A	4000	0.48	4"	Limestone
Class C	3000	0.59	8"	Contractor's Option

8.02 USAGES:

Concrete of the various classes shall be used as follows:

A. Class A Concrete:

For general concrete work, including all steel reinforced structural elements of buildings, tanks and appurtenant structures, slabs, on grade and sidewalks.

B. Class C Concrete:

For all concrete not reinforced including fill concrete in hydraulic structures.

PART 9.00 AIR-ENTRAINED CONCRETE

9.01 Unless otherwise stated, all structures and all concrete exposed to the weather shall be air-entrained.

9.02 Total air content shall be 4½% for 1-inch and 1½-inch aggregates, and 5% for ¾-inch aggregate, with a tolerance of ± 1½%.

9.03 All equipment and labor necessary to determine air content of the concrete shall be furnished by the Contractor. If the Contractor is unable to perform the test, then the Contractor shall coordinate with a Testing Laboratory to perform the necessary tests.

PART 10.00 TESTS

10.01 The Owner shall, as part of this Contract, pay costs of all laboratory and other tests. Contractor shall be responsible for taking cylinders and for notifying Testing Lab when their services are required. At least one (1) sample shall be taken consisting of three (3) cylinders for each twenty-five (25) cubic yards or a minimum of one (1) sample per day. Testing shall be as follows:

One (1) seven (7) days in laboratory.
One (1) twenty-eight (28) days in laboratory (hold as reserve).
One (1) twenty-eight (28) days in laboratory.

10.02 Cylinders shall be properly identified as to placement location of the concrete sampled and cured in the field until the Testing Laboratory takes possession of the cylinders. Cylinders should be covered with damp burlap until initial set occurs. Once initial set occurs, the cylinders should be immersed in water, which is similar to the process used by Testing Laboratories.

PART 11.00 REMOVAL OF FORMS

11.01 Wall and column forms shall remain in place a minimum of seven (7) days. During this time, the forms shall be kept wet. Other forms may be removed at any time that removal does not cause damage to the slab edges. The forms shall be removed carefully so as to avoid damage to the concrete. After the forms have been removed, the sides shall be cured as outlined in one of the methods indicated below. Major honeycombed areas will be considered as defective work, and all unsound material shall be removed and replaced with satisfactory material at the Contractor's expense.

11.02 Remove from work carefully, without using wrecking tools or crowbars directly against concrete. The Contractor shall make good at his own expense, without extra cost to the Owner, all damages to concrete and building occasioned by removal of forms and shores. No wood forms shall remain in place.

PART 12.00 CURING

12.01 In all cases in which curing requires the use of water, the curing shall have prior right to all water supply or supplies. Failure to provide a sufficient quantity of one of the curing materials or lack of water to adequately take care of both curing and other requirements shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than one-half (½) hour between stages of curing or during the curing period. Immediately after the finishing operations have been completed and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be covered and cured in accordance with one of the following methods:

A. COTTON OR BURLAP MATS:

The surface of the slab shall be entirely covered with mats. The mats used shall be of such length (or width) that, as laid, they will extend at least twice the thickness of the pavement beyond the edges of the slab. The mats shall be placed so that the entire surface and both edges of the slab are completely covered. Prior to being placed, the mats shall be saturated thoroughly with water. The mats shall be so placed and weighted down as to cause them to remain in intimate contact with the surface covered, and the covering shall be maintained fully wetted and in position for seventy-two (72) hours after the concrete has been placed or the forms have been removed unless otherwise specified.

B. IMPERVIOUS MEMBRANE METHOD:

1. The entire surface of the slab or wall shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place, or if the slab or wall is cured initially with jute or cotton mats, it may be applied upon removal of the mats. The curing compound shall not be applied during rainfall.

2. Curing compound shall be applied under pressure by mechanical sprayers at the rate recommended by the manufacturer but in no case at a rate less than one (1) gallon to each 150 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed. Should the film become damaged, portions shall be repaired immediately with additional compound.

3. Upon removal of side forms, the sides of the slabs exposed shall be protected immediately by applying curing treatment equal to that provided for the surface.

C. WHITE POLYETHYLENE SHEETING:

The tip surface and sides of the slab or wall shall be entirely covered with polyethylene sheeting. The units used shall be lapped at least 18-inches. The sheeting shall be so placed and weighted down as to cause it to remain in intimate contact with the surface covered. The sheeting, as prepared for use, shall have such dimension that each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement. The surface of the slab or wall shall be thoroughly wetted prior to placing the sheeting. Unless, otherwise specified, the covering shall be maintained in place for seventy-two (72) hours after the concrete has been placed.

D. REQUIREMENTS:

1. For requirements for cold weather concreting, comply with ACI 306, "Cold Weather Concreting", latest edition.

2. For requirements for hot weather concreting, comply with ACI 305, "Hot Weather Concreting", latest edition.

3. Copies of the above publications shall be obtained by the Contractor and kept on the jobsite for reference.

PART 13.00 FINISHES OF CONCRETE OTHER THAN SLABS

13.01 Immediately after removal of the forms, all fins and loose materials shall be removed; honeycomb aggregate pockets, voids and holes of ½-half-inch in diameter or greater shall be cut out to solid concrete or to the limits defined by the Engineer and patched with an approved patching material.

13.02 The surfaces shall be rubbed with a carborundum brick and watered to produce a uniform plane surface free from form marks and other blemishes. Cement mortar or grout shall not be added to the surface during the rubbing operation. Particular care shall be exercised to preserve chamfer lines, mouldings and other treatments at the intersection of two (2) plane or curved surfaces.

13.03 In the event that the Contractor elects to use membrane curing compound, all patchwork noted above shall be completed within one (1) day after removal of forms and before application of curing compound.

PART 14.00 CONCRETE SLAB FINISHES

14.01 Finished slab surfaces shall be true plane surfaces with a tolerance of 1/8-inch in 10-feet, unless otherwise indicated on the drawings. The dusting of finished surfaces with dry cement will not be permitted. All slab surfaces shall be monolithic finish produced as follows:

A. Immediately after placing the concrete, the surface of the slab shall be screeded and floated with highway straight edges to bring the surface to the required finish level. While the concrete is still green, but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood floated to a true, even plane with no coarse aggregate visible. After surface moisture has disappeared, surface shall again be wood floated to a smooth even finish, free from float and shall then be followed by a light coverage with a steel trowel.

PART 15.00 FINISHES FOR CONCRETE SIDEWALK AND DRIVEWAY

Concrete sidewalk and driveway shall be finished true to sections shown on the drawings as specified for concrete slab finished except that the final coverage with steel trowel shall be replaced by a light brushing with a stiff bristled brush.

END OF SECTION

SECTION 13001.10
HORIZONTAL DIRECTIONAL DRILLING
FOR YELOMINE RESTRAINED JOINT PVC PIPE

PART 1 GENERAL

WORK INCLUDED

A. Furnish all labor, materials and equipment required to install (Pipe Size) potable water main, reclaimed main and force main pipe using directional drilling method of installation, all in accordance with the requirements of the Contract Documents. The pipe size, type and length shall be as specified herein and as shown on the Drawings. Work shall include and not be limited to proper installation, testing, restoration of underground utilities and environmental protection and restoration.

B. The directional drill shall be accomplished by first drilling a pilot hole as shown on the approved pilot bore plan, and then enlarging the pilot hole no larger than 1.5 times the outer diameter of the Certa-Lok Yelomine coupling to accommodate the pull back of the pipe through the enlarged hole.

C. Soil borings as required for certain subsurface soil conditions shall be provided by the Directional Drilling Contractor within the scope of this project.

D. See CONDITIONS OF THE CONTRACT and GENERAL REQUIREMENTS, which contain information and requirements that apply to the Work specified herein and are mandatory for this project.

REFERENCE SPECIFICATIONS, CODES AND STANDARDS
CERTAINTEED - CERTA-LOK YELOMINE RESTRAINED JOINT PIPE

1.0 SCOPE

This specification covers thrust-restrained Poly-Vinyl Chloride (PVC) pipe, in nominal sizes 2" – 16" with IPS diameters. Pipe is included for use as a pressure-rated water delivery system, reclaimed water system, as well as in sewer force main.

2.0 REFERENCE DOCUMENTS

American Society for Testing Materials (ASTM)

ASTM D1784: Standard for Rigid PVC Compounds and Chlorinated PVC Compounds

ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials

ASTM D3139: Standard Specification for Joints for Plastic Pipes Using Flexible Elastomeric Seals

ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

National Sanitation Foundation (NSF)

NSF14: Plastic Pipe System Components and Related Materials

NSF61 Drinking Water System Components – Health Effects

3.0 REQUIREMENTS

3.1 GENERAL:

Products delivered under this specification shall be manufactured only from new water distribution pipe and couplings, conforming to ASTM 2241. The restrained joint pipe shall also meet all ASTM 2241 short-term and long-term pressure test requirements. Pipe, couplings, and all locking splines components used thereon shall be completely non-metallic to eliminate corrosion problems.

3.2 MATERIALS:

Pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454-B, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 Degrees F, in accordance with the requirements of ASTM D2837.

3.3 APPROVALS:

Restrained joint pipe products shall be tested by an independent third-party laboratory for continuous use at rated pressure. Copies of Agency listings shall be provided to the ENGINEER. Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF Standard 61 by an acceptable certifying organization.

3.4 DIMENSIONS:

Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of ASTM 2241. Thrust-restrained pipe shall be furnished in sizes 2", 3", 4", 6", 8", 10", 12", 14" and 16" Class 90, 160, 200, 250 and 315. Pipe shall be furnished in standard lengths of 20-feet. Dimensions of the pipe thrust restraint grooves shall be in accordance with manufacturer's specifications.

3.5 JOINTS:

The pipe shall be joined using non-metallic couplings, which have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into mated, precision-machined grooves in the pipe and coupling to provide joint restraint with evenly distributed loading. Integral Bell (IB) Joints utilizing the same design are also acceptable.

Couplings shall be designed for use at the rated pressure of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139 or the Owner's requirements whichever is more stringent.

3.6 QUALITY CONTROL:

Pipe and machined coupling shall pass ASTM 2241 hydrostatic proof test requirements.

3.7 MARKING:

Pipe shall be legibly and permanently marked in ink with the following information.

- Manufacturer and Trade Name
- Nominal Size & SDR Rating.
- NSF-61
- Manufacturing Date Code

Pipe and couplings shall bear the mark of the certifying agency(s), which have tested and approved the product.

3.8 WORKMANSHIP:

As defined in ASTM 2241, pipe and couplings shall be homogeneous throughout and free from voids, cracks, inclusions, and other defects, and shall be as uniform as commercially practicable in color, density, and other physical characteristics.

4.0 SUGGESTED SOURCE OF SUPPLY

Restrained Joint PVC Pipe shall be the CertainTeed's Certa-Lok Yelomine System, or approved equal.

QUALITY ASSURANCE

A. All directional drilling operations shall be performed by a qualified directional drilling CONTRACTOR with at least three (3) years experience involving work of a similar nature to the work required of this project. The CONTRACTOR must have installed a minimum of 10,000 linear feet of pipe (4-inch diameter or greater) using directional drilling operations. A list of project references is required prior to job commencement.

B. All work shall be scheduled through the ENGINEER and the Utility's Construction Coordinator. Notify ENGINEER and OWNER a minimum of three (3) days in advance of the start of work.

C. All work shall be performed in the presence of the OWNER and ENGINEER.

D. All applicable permits and applications must be in place prior to start of work.

PART 2 PRODUCTS

POLYVINYL CHLORIDE (PVC) PIPE

A. The pipe material to be used shall meet ASTM 2241 standards for Polyvinyl Chloride pressure pipe and fittings with a dimension ratio as specified in E. The pipe shall be designated as Certa-Lok Yelomine as manufactured by CertainTeed Corporation. All other pipe shall have the written approval of the ENGINEER and the UTILITY and meet all submittal review as an optional approved product.

B. The pipe shall be joined using a separate PVC coupling, built in sealing gaskets and restraining grooves. The restraining splines shall be square and made from Nylon 101. Integral Bell Joint (IB) Joints, utilizing the same design, are also acceptable.

C. Exposed splines shall be cut ¾" from coupling to reduce soil drag.

D. Couplings shall be beveled on leading edges to minimize soil friction.

E. Using Certa-Lok Yelomine pipe, the CONTRACTOR shall adhere to the pipe manufacturer's most current data regarding tensile load limitations for trenchless application. Generally, the maximum pull-in force shall not exceed the following values.

Size	SDR	Class	Pipe O.D.	Coupling O.D.	Maximum Pull-In Force Tightest Bending	Maximum Pull-In Force Straight Pull (No Bending)
2"	17	250psi	2.375"	3.200"	1,600 lbs.	1,900 lbs.
3"	17	250psi	3.500"	4.380"	4,500 lbs.	5,200 lbs.
4"	21	200psi	4.500"	5.112"	6,800 lbs.	8,700 lbs.
6"	21	200psi	6.625"	7.500"	7,100 lbs.	10,900 lbs.
8"	21	200psi	8.625"	9.750"	14,800 lbs.	20,600 lbs.
10"	21	200psi	10.750"	12.438"	20,400 lbs.	27,200 lbs.
12"	21	200psi	12.750"	14.648"	21,000 lbs.	31,500 lbs.
16"	21	200psi	16.000"	17.500"	45,000 lbs.	62,000 lbs.

CONTRACTOR shall adhere to the following data regarding radius of curvature for Certa-Lok Yelomine pipe used for trenchless application. The confirmation of proposed radius of each bore shall be part of the required submittal prior to work.

Pipe Diameter	Min. Radius of Curvature	Deflection per 20' Length
2"	60'	16.8 Percent
3"	90'	11.2 Percent
4"	100'	10.0 Percent
6"	150'	6.7 Percent
8"	200'	5.0 Percent
10"	250'	4.0 Percent
12"	300'	3.3 Percent
14"	350'	2.9 Percent
16"	400'	2.5 Percent

In any case, the deflection radius shall not exceed 75% of the maximum allowable curvature allowed for standard ASTM 2241 pipe.

DIRECTIONAL DRILLING EQUIPMENT REQUIREMENTS

A. General: The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the

installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a Magnetic Guidance System (MGS) or "walkover" system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

B. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm that automatically sounds when an electrical current is detected.

C. Drill Head: The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.

D. Mud Motors (if required): Mud motors shall be of adequate power to turn the required drilling tools.

E. Drill Pipe: Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tools joints should be hardened to 32-36 RC.

GUIDANCE SYSTEM

A. General: An electronic "walkover" tracking system or a Magnetic Guidance System (MGS) probe or proven (non-experimental) gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall be capable of tracking at all depths up to 50-feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer's specifications of the vertical depth of the borehole at sensing position at depths up to 50-feet and accurate to 2-feet horizontally.

B. Components: The CONTRACTOR shall supply all components and materials to install, operate, and maintain the guidance system.

C. The Magnetic Guidance System (MGS) shall be set up and operated by personnel trained and experienced with the system. The CONTRACTOR shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

DRILLING FLUID (MUD) SYSTEM

A. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water, and

appropriate additives. The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be minimum of 1,000 gallons. Mixing system shall continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids: Drilling fluid shall be composed of potable water and bentonite clay. Water shall be from an authorized source with a pH of 8.5 – 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. No additional material may be used in drilling fluid without prior approval from ENGINEER. The bentonite mixture used shall have the minimum viscosity's as measured by a March funnel:

Rocky Clay	-	60 seconds
Hard Clay	-	40 seconds
Soft Clay	-	45 seconds
Sandy Clay	-	90 seconds
Stable Sand	-	80 seconds
Loose Sand	-	110 seconds
Wet Sand	-	110 seconds

These viscosities may be varied to best fit the soil conditions encountered, or as determined by the operator.

C. Delivery System: The drilling fluid pumping system shall have a minimum capacity of 35-500 GPM and be capable of delivering the drilling fluid at a constant minimum pressure of 1200 psi. The delivery system shall have filters in-line to prevent solids from being pumped into drill pipe. Used drilling fluid and drilling fluid spilled during operations shall be contained and conveyed to the drilling fluid recycling system or shall be removed by vacuum trucks or other methods acceptable to ENGINEER and UTILITY. A berm, minimum of 12-inches high, shall be maintained around drill rigs drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumping equipment and/ or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from containment areas to storage and recycling facilities or disposal.

OTHER EQUIPMENT

A. Pipe Rollers: Pipe rollers shall be used for pipe assembly during final product pull back.

B. Restrictions: Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the ENGINEER/OWNER/UTILITY prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated (by ENGINEER/OWNER/UTILITY) without undue delay and shall maintain line and grade within the tolerances prescribed by the particular conditions of the project.

PERSONNEL REQUIREMENTS

A. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have at least two-years directional drilling experience.

B. A competent and experienced supervisor representing the CONTRACTOR and Drilling Subcontractor shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the job site during the actual Directional Bore operation. The CONTRACTOR and Subcontractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner.

C. Personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with suitable personnel.

D. A professional land surveyor registered in the State of Tennessee may be required to prepare and certify as-builts as per specifications.

PART 3 EXECUTION

GENERAL REQUIREMENTS

A. The ENGINEER and the UTILITY must be notified a minimum of 3-days in advance of starting work. All necessary permits and approvals must be in place prior to commencement of work. The Directional Bore shall not begin until the ENGINEER is present at the job site and agrees that proper preparations for the operation have been made. The ENGINEER'S approval for beginning the installation shall in no way relieve the CONTRACTOR of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of ENGINEER to provide inspection personnel at such time as appropriate without causing undue hardship by reason of delay to the CONTRACTOR. A copy of the UTILITY approved construction drawing must be on the job site during construction.

B. All work under this specification affecting the Florida Department of Transportation (FDOT) property, right-of-way or facilities shall be carried out to the full satisfaction of the FDOT authorized representative. The CONTRACTOR shall fully inform himself of all requirements of the FDOT as pertains to specific project and shall conduct all his work accordingly.

C. All equipment used by the CONTRACTOR on Owner's property and right-of-ways may be inspected by the OWNER or the Owner's Representatives and shall not be used if considered unsatisfactory by OWNER or Owner's Representatives.

D. The CONTRACTOR shall be fully responsible for all damages arising from his failure to comply with all applicable regulations and the requirements of these Specifications.

DIRECTIONAL DRILLING OPERATION

A. The CONTRACTOR shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits. The ENGINEER will supply copies of all permits to the CONTRACTOR.

B. The entire drill path shall be accurately surveyed by the CONTRACTOR with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If CONTRACTOR is using a magnetic guidance system, drill path shall be surveyed for any surface geo-magnetic variations or anomalies.

C. CONTRACTOR shall place silt fence between all drilling operations and any drainage, well-fields, wetland, waterway or other area designated for such protection if required by documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. CONTRACTOR shall adhere to all applicable environmental regulations. Fuel may not be stored in bulk containers within 200-feet of any water body or wetland.

D. Readings shall be recorded after advancement of each successive drill pipe (no more than 10') and the readings plotted on a scaled drawing of 1" = 2' vertical and 1" = 20' horizontal. Access to all recorded readings and plan and profile information shall be made available to the ENGINEER, or his representative, and the UTILITY at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.

E. A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be submitted to the ENGINEER, along with their respective Material Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, the drilling mud and cuttings shall be disposed of by the CONTRACTOR at an approved dumpsite.

F. The pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over the length of the bore unless previously agreed to by the ENGINEER/OWNER/UTILITY. In the event that pilot does deviate from the bore path more than 5% of depth over the length of the bore, CONTRACTOR will notify ENGINEER/OWNER/UTILITY who may require CONTRACTOR to pull-back and re-drill from the location along bore path before the deviation. In the event of a drilling fluid fracture, inadvertent returns, or returns loss during pilot hole drilling operations, CONTRACTOR shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and wait another 30 minutes. If mud fracture or returns loss continues, CONTRACTOR will discuss additional options with the ENGINEER/OWNER/UTILITY and work will then proceed as agreed.

G. Upon completion of pilot hole phase of the operation, a complete set of "as-built" records shall be submitted in duplicate to the ENGINEER, UTILITY and OWNER. These records shall include copies of the pilot bore path plan and profile record drawing, as well as directional survey reports as recorded during the drilling operation.

H. Upon approval of the pilot hole location by the ENGINEER/OWNER/UTILITY, the hole opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pullback operation of the required size of carrier pipe. The type of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. The CONTRACTOR shall select the proper reamer type with the

final hole opening being a maximum of 1.5 times the largest outside diameter pipe system component to be installed in the bore hole.

I. The open bore hole shall be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous / flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pullback shall be calculated based on soil conditions, largest diameter of the pipe system component, capacity of the bentonite mud pump, and the speed of pullback as recommended by the bentontie drilling fluid manufacturer. The bentonite slurry is to be contained at the exit or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation, or shall be hauled by the CONTRACTOR to an approved dumpsite for proper disposal.

J. The pipe section shall be joined together according to manufacturer's specifications. The gaskets and the ends of pipe must be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand. The pipe must be free of any chips, scratches, or scrapes. A pulling eye will be attached to the Certa-Lok C900/RJ pulling head on the lead stick of pipe which in turn will be attached to a swivel on the end of the drill pipe. Tracer wire (#8) solid coated copper wire shall be attached to the pulling eye and the crown of PVC pipe with duct tape @ 24" O.C. and a minimum of two full wraps around the pipe. This will allow for a straight, smooth pull of the product pipe as it enters and passes through the borehole toward the drill rig and original entrance hole of the directional bore. The product pipe shall be elevated to the approximate angle of entry and supported by means of a sideboom with roller arm, or similar equipment, to allow for the "free stress" situation as the pipe is pulled into the exit hole toward the drill rig. The product pullback phase of the directional operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore.

PIPE HANDLING

A. Care shall be taken during transportation of the pipe such that it will not be cut, kinked or otherwise damaged.

B. Ropes, fabrics or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped into rocky or unprepared ground.

C. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects that could damage the pipe. Stacking of the Certa-Lok Yelomine pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary due to ground conditions the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

D. The handling of the assembled pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Slings for handling the pipeline shall not be positioned at pipe joints. Sections of the pipes with cuts and gouges or excessive deformation shall be removed and replaced.

TESTING PIPE

A. Cleaning and flushing are to be done by the CONTRACTOR in order to obtain a clear and debris free product. Only potable water shall be used for flushing and pressure testing.

B. Directional drilling pipe shall be tested by CONTRACTOR after pullback. The average pressure shall be maintained at 150 psi for two hours. The test pump and water supply shall be arranged to allow accurate measurements of the water required to maintain the test pressure. Any material showing seepage or the slightest leakage shall be replaced as directed by the OWNER at no additional expense to the OWNER.

C. The pipe manufacturer's (or ENGINEER'S/OWNER'S/UTILITY'S, whichever is more stringent) recommendations on pipe stretch allowances, bending radius, tensile strength, allowable test leakage allowance, and magnitude and duration of test pressure shall be observed.

D. Pipeline shall be tested end to end.

E. All new service lines connected to the new main and installed with new pipe shall be pressure tested along with the newly installed main.

F. Pressure testing shall not be required for the drilled pipe if the pipe is intended to be used as a casing for a finished product pipe.

SITE RESTORATION

A. Following drilling operations, CONTRACTOR will de-mobilize equipment and restore the work site to the original conditions or better. All excavations will be backfilled and compacted according to the specifications.

B. Surface restoration shall be completed in accordance with the requirements of the contract, approvals or permits to a condition as good or better than existing prior to construction.

RECORD KEEPING AND AS-BUILTS

A. CONTRACTOR shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the ENGINEER/OWNER/UTILITY at completion of project.

B. The guidance system data shall be recorded per Part 3, Directional Drilling Operation section, paragraph G during the actual crossing operation. The CONTRACTOR shall furnish to the ENGINEER/OWNER/UTILITY, "as-built" plan and profile drawings based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation. The guidance data shall be certified accurate by the CONTRACTOR to the capability of the guidance System.

END OF SECTION

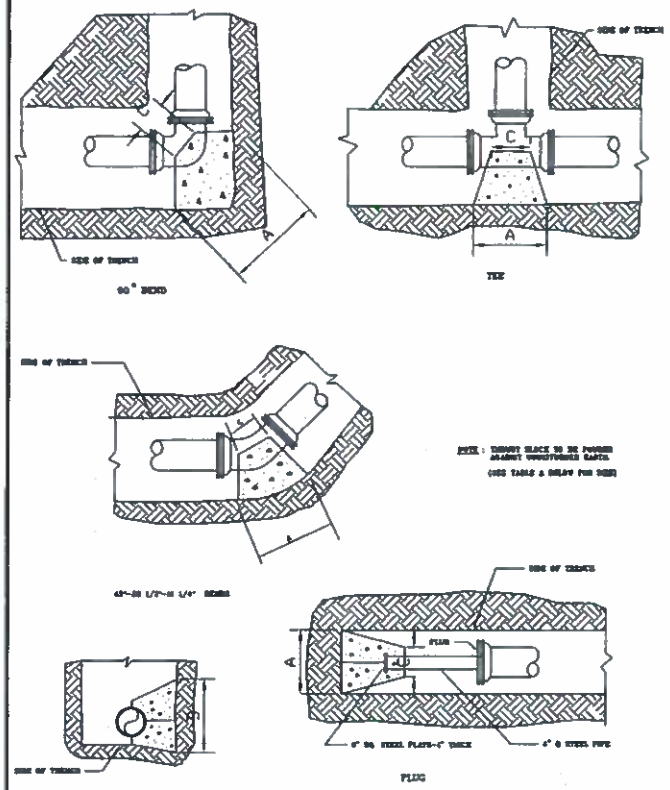


TABLE A

THRUST BLOCKING DIMENSIONS

90° BEND

SIZE	4"	6"	8"	10"	12"	16"
A	16"	16"	24"	32"	48"	72"
B	16"	16"	24"	32"	48"	72"
C	9"	9"	12"	15"	18"	24"
D	8"	8"	12"	16"	20"	24"

11 1/4° BEND

SIZE	4"	6"	8"	10"	12"	16"
A	8"	8"	12"	15"	18"	24"
B	8"	8"	12"	15"	18"	24"
C	4"	4"	6"	7"	8"	10"
D	4"	4"	6"	7"	8"	10"

45° BEND

SIZE	4"	6"	8"	10"	12"	16"
A	12"	12"	24"	32"	36"	48"
B	12"	12"	24"	32"	36"	48"
C	6"	6"	12"	16"	18"	24"
D	6"	6"	12"	16"	18"	24"

TEE

MAIN SIZE	4"	6"	8"	10"	12"	16"	20"
A	24"	24"	48"	60"	72"	96"	120"
B	24"	24"	48"	60"	72"	96"	120"
C	12"	12"	24"	30"	36"	48"	60"
D	12"	12"	24"	30"	36"	48"	60"

22-1/2° BEND

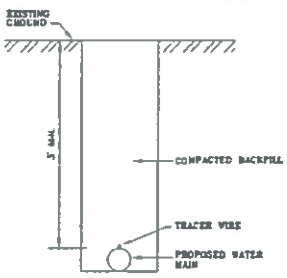
SIZE	4"	6"	8"	10"	12"	16"
A	8"	8"	12"	16"	20"	28"
B	8"	8"	12"	16"	20"	28"
C	4"	4"	6"	8"	10"	14"
D	4"	4"	6"	8"	10"	14"

PLUG

SIZE	4"	6"	8"	10"	12"	16"
A	24"	24"	24"	24"	48"	72"
B	24"	24"	24"	24"	48"	72"
C	12"	12"	12"	12"	12"	24"
D	12"	12"	12"	12"	12"	24"

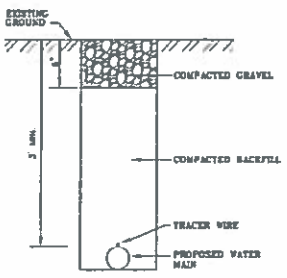
THRUST BLOCKING DETAILS

NO SCALE



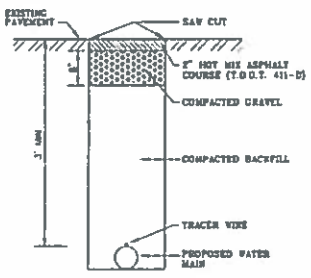
TYPICAL TRENCH DETAIL

SCALE: NONE



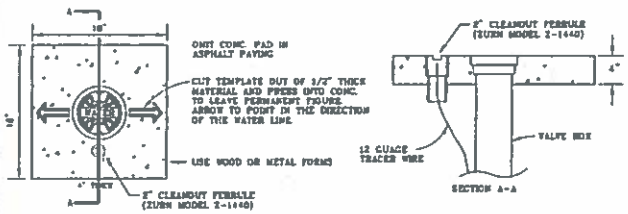
TYPICAL TRENCH DETAIL AT GRAVEL DRIVEWAY

SCALE: NONE



TYPICAL TRENCH DETAIL AT STREET AND ASPHALT DRIVEWAY

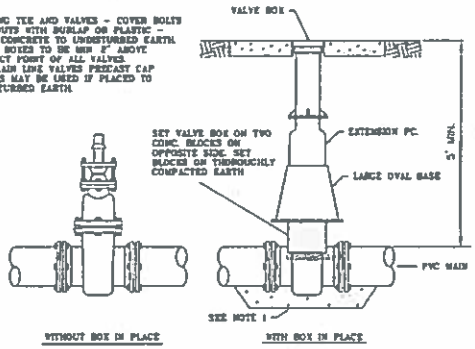
SCALE: NONE



VALVE BOX DETAIL

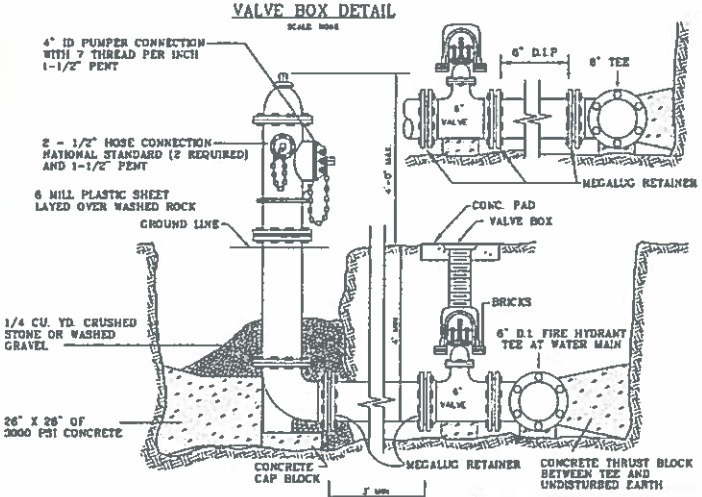
SCALE: NONE

NOTES:
1. TAPPING TEE AND VALVES - COVER BOLTS AND NUTS WITH BURLAP OR PLASTIC - POUR CONCRETE TO UNDISTURBED EARTH.
2. VALVE BOXES TO BE MIN 5" ABOVE CONTACT POINT OF ALL VALVES.
3. FOR MAIN LINE VALVES PRECAST CAP BLOCKS MAY BE USED IF PLACED TO UNDISTURBED EARTH.



DETAIL OF VALVE SETTING

SCALE: NONE



FIRE HYDRANT DETAIL

SCALE: NONE

KENNETH R. KING
REGISTERED ENGINEER
AGRICULTURE
STATE OF TENNESSEE

STANDARD DETAILS
WATER SYSTEM
MUNFORD, TENNESSEE

DATE	BY	REVISION
06/27/2019	OTHERS	FIRE HYDRANT DETAILS

CHECKED	K. KING
LICENSE NO.	15309
DESIGNED	K.E.C.
DRAWN	K.E.C.
SCALE	AS SHOWN
SHEET NO.	1 of 3
DWG. NO.	4529
DATE	05/24/2019

KING ENGINEERING CONSULTANTS
PROFESSIONAL ENGINEERS
MEMPHIS, TENNESSEE

SECTION 15110.7
FIRE HYDRANTS
MUNFORD, TENNESSEE

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents.

PART 2.00 SCOPE OF WORK

The work in this section consists of furnishing all materials, accessories, equipment, tools, transportation, services, labor and performing all operations required to completely execute the fire hydrants work for this project, all as indicated on the drawings, approved shop drawings and as herein specified. Provide all fire hydrants work in place, complete. Refer to drawings, details, and other sections of the specifications for locations and extent of fire hydrants work. See typical details on drawings.

PART 3.00 SHOP DRAWINGS

Before commencing work, submit for the Engineer's approval, complete shop drawings and illustrations of fire hydrants work. Refer to the General Conditions for detailed information regarding shop drawings requirements.

PART 4.00 JOB CONDITIONS

Refer to the General Conditions for detailed information regarding job conditions requirements.

PART 5.00 DESCRIPTION

5.01 Refer to drawings for locations, extent, sizes, and appurtenances of fire hydrants. Provide only the sizes and number of hydrants shown on drawings and approved shop drawings, with valve opening and nozzles as follows:

HYDRANT SIZE	VALVE OPENING APPROXIMATE	LATERAL WATER MAIN CONNECTION	HOSE NOZZLES 2 REQUIRED	PUMPER NOZZLE 1 REQUIRED
6"	5 ¼"	6"	2 ½" National Standard 1 ½" Pent	4" I.D. with 7 threads per inch 1 ½" Pent

5.02 Fit all hydrants with mechanical joint ends to fit standard cast iron pipe.

A. Special Design Hydrants:

Fire hydrants shall be of the compression type closing with the line pressure. Fire hydrant shall have a 5¼-inch valve opening. The bonnet section of all hydrants shall be designed so that the bearing surfaces and stem threads are sealed in an oil reservoir and automatically lubricated each time the hydrant is operated. Hydrants shall be furnished with a two-part breakable safety flange and breakable stem coupling. The upper and lower barrels shall be fluted and ribbed above or below the flange joints.

B. Hydrants:

Compression type of hydrant shall be traffic model and be breakable upon impact without loss of water. Hydrant body shall be cast iron. All hydrants shall have bury of 3½-feet when measured from bottom of connecting pipe to ground line beading of hydrant barrel.

5.03 Fire hydrants shall be Mueller Millington Standard A423 or M & H Millington Standard 129.

5.04 Hose nipples, hydrant seat, drip valve and stuffing box shall be bronze or other approved, suitable, non-corroding metal.

5.05 Face hydrant valve with approved, yielding material, shall be rubber.

5.06 All hydrants shall conform to AWWA C502, latest revision.

5.07 All hydrants shall open counterclockwise.

5.08 The detail on the plans shows 36-inches of cover over the water main. This translates into a fire hydrant having a bury of 42-inches, which are the fire hydrants specified for this project, unless a special extra depth bury is specified elsewhere.

PART 6.00 FOUNDATION

Support fire hydrants at base on foundation at least 18-inches square of approved stone, or solid concrete pad (conforming to requirements of Concrete section for class noted on drawings). Set stone or concrete foundation on firm solid ground, properly graded.

PART 7.00 DRAINAGE

Provide approved, adequate drainage for hydrants when closed, by filling circular space around hydrant with approved, clean, coarse, broken stone or gravel (free from foreign matter), graded from ¼-inch to 1½-inches. Place approved broken stone or gravel carefully so as not to displace hydrant or valve which has been connected. Volume of broken stone or gravel at least one-third (1/3) cubic yard per setting. See detail on drawings. DO NOT CONNECT DRAINAGE PIT TO SEWER.

PART 8.00 INSTALLATION

8.01 Before setting, clean hydrants completely free of dirt and other foreign matter. Set hydrants solidly with sufficient approved stone or concrete backing behind barrel and behind tee connection (in street, road or where shown) to prevent movement of pipe in joints or of hydrants.

8.02 Locate all hydrants where shown on the drawings and so that damage from vehicles and/or injury to pedestrians is minimized. Unless otherwise shown on the drawings or directed by the Engineer, setting of each hydrant shall conform to the following:

A. When placed behind curb, set hydrant barrel so that no portion of pumper or hose nozzle cap shall be less than 6-inches or over 12-inches from gutter face of curb, or less than 20-feet from curb line intersection. If set between street, place hydrant in manner designated by the Engineer.

B. When set in lawn space (parkway) between curb and sidewalk or between sidewalk and property line, no portion of hydrant or nozzle cap shall be within 6-inches of sidewalk.

C. All hydrants shall stand plumb. They shall have their nozzles parallel with or set at right angles to curb with pumper nozzles pointing normal to curb, except that hydrants with hose nozzles at 45° angle shall be set normal to curb. They shall conform to established grade, with nozzles at least 18-inches above ground.

D. All hydrants shall be set to a depth and to the details as shown on the plans. They shall be set at a depth so that the ground line beading shall be at the same elevation as the existing ground line. If hydrant barrel and stem extensions are needed to comply with the requirements outlined above, said extensions shall be paid for in accordance with the terms outlined in the General Conditions.

PART 9.00 FIELD PAINTING

9.01 Clean all surfaces as per NAPF 500-03-04 Brush-Off Blast Cleaning and achieve a minimum 1.5 mil angular surface profile. All surfaces must be clean, dry, and free of contaminants including previously applied coatings. Coat exposed surfaces with one (1) prime coat and one (1) intermediate coat of Tnemic Series 161HS-YO345 applied at 4.0 to 6.0 dry mils per coat. Additionally, apply one (1) finish coat of Tnemec Series 740-02SF UVX at 2.5 to 5.0 dry mils. The color shall be yellow. Products shall be those of Tnemec Company, local contact Justin Taute (615) 333-1000, or equal.

END OF SECTION

SECTION 15112.5
GATE VALVE INSTALLATION

PART 1.00 FOUNDATION

1.01 Set valves securely on concrete cap block 16" x 16" laid on solidly compacted ground. Concrete, if used, shall be Class C, as per requirements of Concrete Section of the Specifications.

1.02 Height of valve and its foundations shall conform to height of connecting pipe so that there is no strain on joints.

PART 2.00 TAPPING SLEEVES AND CROSSES, CUT-IN SLEEVES, TAPPING VALVES

2.01 Provide tapping sleeves and gate valves, where shown on drawings. Tapping valve shall have 8" x 16" x 16" supporting base. Tapping sleeve shall have 8" x 16" x 16" supporting base and 8" x 16" x 16" backer block. Wrap bolts and nuts with burlap or plastic to protect from concrete.

2.02 Tapping sleeves, cut-in sleeves, tapping valves, and cut-in valves shall be installed where shown on the drawing or as directed by the Owner's Representative.

2.03 The above listed items shall comply with all applicable AWWA Specifications.

2.04 The tapping valve and cut-in valves shall also comply with the Specifications for gate valves.

PART 3.00 INSERTING VALVES AND EQUIPMENT

3.01 Inserting valves are to be installed in those locations shown on the drawings or as directed by the Engineer under full line pressure.

3.02 The inserting valves shall comply with any and all applicable AWWA Specifications and the following design Specifications.

3.03 Inserting valves shall be installed without cutting off the water pressure.

PART 4.00 VALVE MARKERS

A sign post to mark valves will be installed on water main valves which are not in the roadway.

PART 5.00 CONCRETE PAD AROUND VALVE BOX

The tops of all water valve boxes shall be encased in a four-inch (4") thick concrete pad. A detail of the pad is shown on the details of the plan.

END OF SECTION

SECTION 15113.2
RESILIENT SEAT
GATE VALVES

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents.

PART 2.00 SCOPE OF THE WORK

The work in this section consists of furnishing all materials, accessories, equipment, tools, transportation, services, labor, and performing all operations to execute the gate valves work for this project, all as indicated on the drawings, approved shop drawings and as herein specified. Provide all gate valves work in place complete.

PART 3.00 SHOP DRAWINGS

Before commencing work, submit for the Engineer's approval, shop drawings and illustrations as required for gate valves work. Refer to the GENERAL CONDITIONS for detailed information regarding shop drawings requirements.

PART 4.00 JOB CONDITIONS

Refer to the GENERAL CONDITIONS for detailed information regarding job conditions requirements.

PART 5.00 DESCRIPTION

5.01 VALVE CASTINGS: Approved, all iron castings, made from superior quality iron.

5.02 ALL VALVES: Open in same direction as those installed on Owner's existing equipment. All valves shall be mechanical joint, with accessories, resilient wedged, epoxy coated inside and out.

5.03 All gate valves are to be iron body, bronze mounted, non-rising stem type.

5.04 Valves 16-inches and larger shall be furnished with either bevel or spur gearing with grease case and bypass valve. Bevel geared valves shall have rollers, track and scrapers.

5.05 Except as otherwise noted on drawings, all valves shall conform to requirements of AWWA C500, latest revision. Valves, 3-inches to 12-inches, nominal size; suitable for pressures of at least 200 psi. Valves 14-inches to 48-inches, nominal size; suitable for pressures of at least 150 psi.

PART 6.00 ADJUSTABLE VALVE BOXES

6.01 Provide all underground valves 3-inches to 14-inches, inclusive, nominal size, and all by-pass valves, with screw top, adjustable metal boxes, approximately 5-inches in diameter, constructed so that removable cover will not be thrown out by travel over same. Provide boxes with approved hoods at base of lower section to section to relieve any strain superimposed on valve bonnet. Valve boxes shall be cast iron, 24-inches to 36-inches adjustable with lid.

6.02 Special design condition valves shall conform to the above Specifications in addition to the following provisions:

A. The valves shall be "WATEROUS" Brand, Series 500 RW M.J. x M.J. w/appropriate gasket, Mueller A2370, M&H 4067, or Clow F-6100.

B. Gate valves shall be furnished with two (2) O-ring stem seals, one below the thrust collar and one above with space between the O-rings filled with oil.

PART 7.00 FOUNDATION

7.01 Set valves securely on solidly compacted ground.

7.02 Height of valve and its foundations shall conform to height of connecting pipe so that there is no strain on joints.

PART 8.00 TAPPING SLEEVES AND CROSSES, CUT-IN SLEEVES, TAPPING VALVES

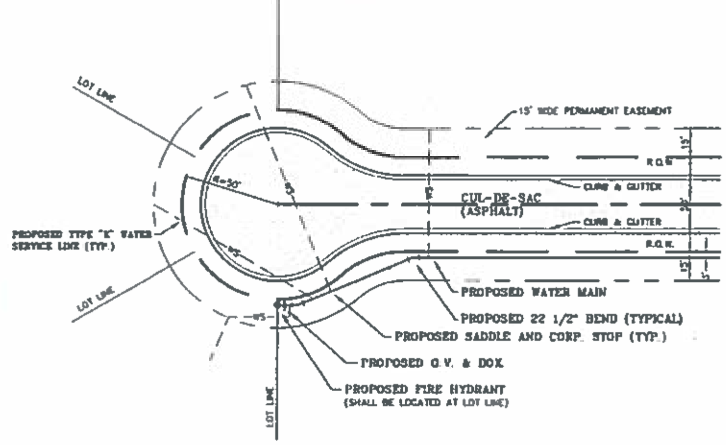
8.01 Provide tapping sleeves and gate valves, where shown on drawings. Tapping sleeves shall be Ford Fast All Stainless Tapping Sleeve, J.C.M. 432 all stainless, Rockwell 633, Romas S.S.T w/ S.S. Flange. Other approved brands are Ford, FTS, and JCM-422. Waterous 500 RW gate valves for use with tapping sleeves shall be used. Tapping valve shall have 8" x 16" x 16" supporting base. Tapping sleeve shall have 8" x 16" x 16" supporting base and 8" x 16" x 16" backer block.

8.02 Tapping sleeves, cut-in sleeves, tapping valves, and cut-in valves shall be installed where shown on the drawing or as directed by the Engineer.

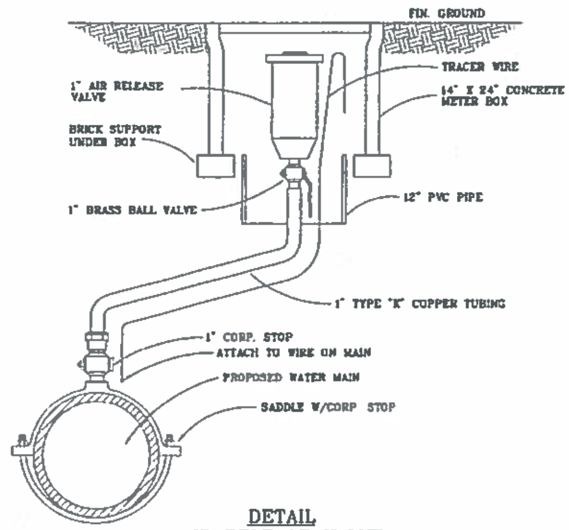
8.03 The above listed items shall comply with all applicable AWWA Specifications.

8.04 The tapping valve and cut-in valves shall also comply with the Specifications for gate valves.

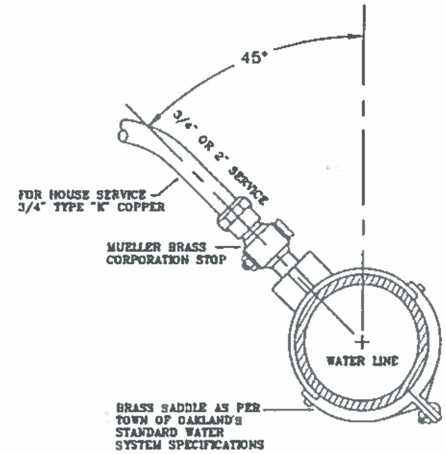
END OF SECTION



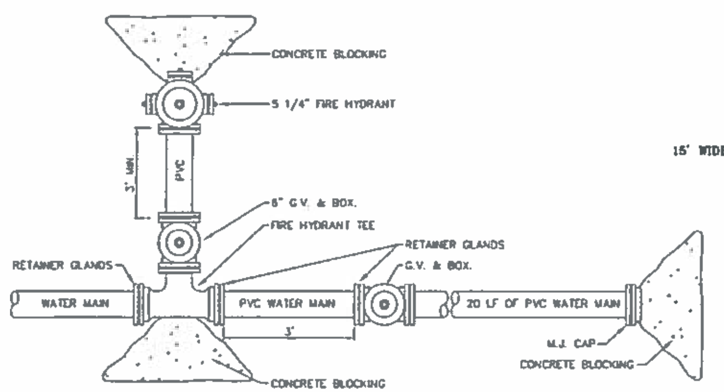
STANDARD DETAIL
INSTALLATION OF PROPOSED WATER MAIN
ALONG THE CUL-DE-SAC
SCALE: NONE



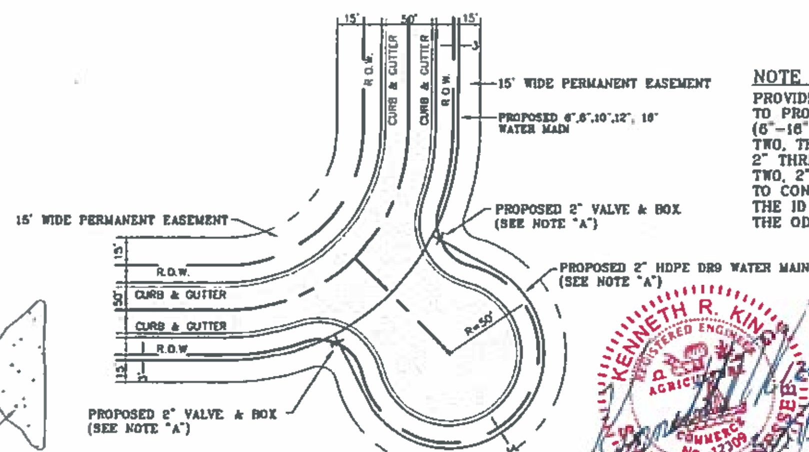
DETAIL
AIR RELEASE VALVE
SCALE: NONE



DETAIL
SERVICE SADDLE
SCALE: NONE



TYPICAL DETAIL
END OF CONSTRUCTION
SCALE: NONE



STANDARD DETAIL
INSTALLATION OF PROPOSED WATER MAIN
ALONG THE SHORT CUL-DE-SAC
SCALE: NONE

NOTE "A" (FOR PROPOSED 2" HDPE DR9):
PROVIDE THE ITEMS LISTED BELOW FOR EACH CONNECTION
TO PROPOSED 6" – 16"WATER MAIN:
(6"–16") x 2" TAPPED TEE
TWO, THREADED NIPPLES (BRASS)
2" THREADED VALVE AND BOX
TWO, 2" MALE x COMPRESION FOR PVC PIPE
TO CONNECT TUBING ON EITHER SIDE
THE ID OF TUBING IS 1.816
THE OD IS CTS (COPPER TUBING SIZE)

KENNETH R. KING, REGISTERED ENGINEER, AGRICULTURE COMMERCE, No. 12709, STATE OF TENNESSEE

DATE	BY	REVISION
06/24/2019	OTHERS	PROPOSED 2" HDPE PIPE ALONG SHORT CUL-DE-SAC

STANDARD DETAILS
WATER SYSTEM
MUNFORD, TENNESSEE

CHECKED: K. KING	KING ENGINEERING CONSULTANTS, PROFESSIONAL ENGINEERS, MEMPHIS, TENNESSEE	SCALE: AS SHOWN
LICENSE NO.: 12709		SHEET NO.: 2 OF 3
DESIGNED: K.R.K.		DWG NO.: 4578
DRAWN: K.R.K.		DATE: 06/24/2001

SECTION 15200.1.2
WATER MAIN CONSTRUCTION

PART 1.00 GENERAL

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all said documents. All materials specified herein are subject to the Engineer's approval.

PART 2.00 SCOPE OF WORK

The work in this section consists of furnishing all materials, accessories, equipment, tools, transportation, services, labor and performing all operations required to execute water main (all types) work for this project, all as indicated on the drawings and herein specified. Provide all water main work in place complete.

PART 3.00 JOB CONDITIONS

Refer to the General Conditions for detailed information regarding job conditions requirements.

PART 4.00 SHOP DRAWINGS

Before commencing work submit for the Engineer's approval, complete shop drawings as required for water main work. See the General Conditions for detailed information regarding shop drawings requirements.

PART 5.00 INSPECTION

5.01 Inspection of pipe and materials will be made at the point of destination. The Engineer reserves the right to provide factory inspection as necessary.

5.02 In case any pipe, fittings, and special castings delivered at the site(s) do not conform to specifications requirements, they will be rejected. The Engineer may appoint a competent inspector who shall inspect all such work at manufacturer's plant(s).

PART 6.00 HANDLING AND STORAGE

6.01 Handle all pipe, special fittings, valves, castings and other accessories with care in accordance with manufacturer's recommendations. Lift by hoists and slings or slide or roll same on skidways in a manner to prevent damage. Dropping and bumping against pipe, accessories or other objects on ground are prohibited. Do not damage coating; repair coating if damaged. Replace all pipe or other items damaged in transit from shop or from cars to job site in unloading and after delivery without extra cost to the Owner.

6.02 The Contractor shall and hereby does assume responsibility for the safe storage of all materials furnished by or to him and accepted by him, required for this work, and until said materials are incorporated in same.

PART 7.00 EXCAVATING

7.01 This paragraph applies to excavating for all types of pipe.

7.02 Do all excavating by any approved, customary method, to shapes and alignment shown on the drawings and of whatever material encountered. Excavating shall be unclassified. No extra compensation will be allowed for rock or hardpan unless a predetermined unit price is specified for it (herein or in the proposal form). Excavate only so far as directed in advance of pipe laying.

Trench-digging machinery may be used, subject to the Engineer's approval, except in places where its operations will cause damage to trees, buildings, or existing structures, above or below ground. In such cases use hand methods.

7.03 Trench width may vary with and depend on depth, also on nature of excavated materials encountered. In any case, width shall be ample to permit proper laying and jointing of pipe, also proper placing and compaction of backfill. Minimum width of unsheathed trench (measured at top of pipe) shall be 12-inches, plus outside diameter of bell or water main to be laid therein. Increase width of trenches necessary or directed, where sheathing and shoring are required. Maximum width of trench (measured at top of pipe) shall be 24-inches, plus nominal diameter of pipe. Minimum depth shall be such that there is at least 3-feet of cover, measured below surface of roadway or natural ground, to top of pipe, except as otherwise indicated herein or shown on the plans.

7.04 Trench shall have flat bottom, conforming to grade to which pipe is laid. Dig bell or coupling holes of proper sizes in earth at each joint to permit proper jointing of pipe, and to permit barrel of pipe bearing on solid foundation for full length of barrel.

Earth mounds can be used for pipe support if the trench bottom is firm, and if firm mounds can be built that will hold pipe from settling during and after assembly until finally backfilled.

7.05 Pile all excavated materials at sides of trenches, beyond reach of slides, and so it does not endanger the work nor obstruct streets, roads and sidewalks, and with minimum inconvenience to public travel and occupants of adjoining property. If necessary to pile excavated material on sidewalks, erect barriers to keep earth at least 4-feet from fronts of all buildings. Provide access to all private property

7.06 Where excavating through cinder fills, rock and other unsuitable backfill materials, excavate trench an additional 6-inches deep. Tamp selected clean earth into trench to bottom of pipe.

7.07 After installing pipe, backfill and tamp trench around sides of same and to thickness 6-inches above top of pipe, with said selected clean earth. Backfill material above this

level may be any kind of earth materials, but shall not contain cinders, boulders, broken concrete or similar unsuitable backfill materials.

7.08 Correct any part of trench which is excavated below grades specified or shown on drawings by filling low portions with approved materials, solidly compacted.

7.09 Provide and maintain during construction progress (and until trenched highway is safe for traffic), approved, adequate barricades, construction and warning signs, red lights, flares and guards. Observe all State and Local laws, ordinances, rules, regulations and provisions, also rules and regulations of utilities, respecting construction and safety.

7.10 Leave unobstructed and accessible during entire construction period except by traffic safeguards the following items:

A. Hydrants under pressure
B. Valve pit covers
C. Valve boxes
D. Curb stop boxes
E. Other utility controls

7.11 Make approved, adequate provision for and maintain flow of all sewers, drains and water courses encountered during construction period.

7.12 Wherever ground is sufficiently firm, lay pipe directly on bottom of trench or on earth mounds. Wherever necessary and shown on the plans, provide approved timber or plank under pipe without extra cost to the Owner.

7.13 Where trench bottom is soft and cannot support pipe, excavate trench deeper and wider and refill same with selected material, properly compacted to assure firm foundation for pipe, as directed.

7.14 Maintain roadways at intersecting streets as long as possible. Where necessary, provide timbering, planking or metal runways.

PART 8.00 SHORING AND BRACING

Wherever character of ground necessitates protecting the work, street, road or employees, shore and brace trenches in approved, suitable manner. The Contractor shall and hereby does assume responsibility for adequacy and safety of all shoring, bracing and sheathing work.

PART 9.00 DEWATERING

All pumping and bailing, building of all drains and all other work, also furnishing of all materials, fuel, electric current and personnel necessary to keep trenches and excavations for water mains work free of water at all times during progress of construction, is included in this contract, under this section and shall be done without extra cost to the Owner. Provide means of conveying water from excavation to approved discharge point.

PART 10.00 STREETS AND ROADS

10.01 This paragraph applies to all streets, see cross section detail

10.02 Removals and replacements of surface and structures mentioned herein shall be done as part of this contract.

10.03 When removing materials of salvageable nature (in suitable condition and so approved) for reuse as directed, do such work carefully and keep such materials separate from the other excavated materials. After laying pipe and backfilling, replace said materials in as good and safe condition as they were before removal. Removals and replacements apply to and include existing planting, culverts, tile and other drainage structures.

10.04 Remove materials of unsalvageable nature as a unit (such as paving, road and drive surfaces, curbs, concrete and brick sidewalks and similar materials) by approved, customary methods of excavation. Where removed, replace road and drive surfaces to original condition. Replace concrete and brick sidewalks and curbs (where removed) to same shapes and dimensions as they were originally. Salvageable materials, such as brick, may be reused in replacement of surface, provided they are in suitable condition and so approved.

PART 11.00 LAYING PIPE

11.01 Lower each separate length of pipe into trench by means of derrick, crane, slings, ropes or other suitable methods with approved tools and equipment. Use care to prevent damage to pipe or coating. Dropping or dumping pipe into trench is prohibited. Do not lay pipe in water, mud or on frozen subgrade.

A. Before lowering and while pipe is suspended, inspect same for defects. Defective, damaged and unsound pipe will be rejected. Replace same without extra cost to the Owner.

B. Before lowering pipe into trench, remove all dirt and other foreign matter from the interior. Keep all pipe clean and free of dirt, trench water, and foreign matter during and after laying. Do not damage coating.

11.02 Lay all pipe on firm bed. Lay pipeline straight. Excavate under each bell or coupling so that entire length of pipe will lie on bottom of trench and not on bells or couplings. Earth mounds, as previously described, will be accepted.

11.03 Unless otherwise directed, lay all pipe (all types) with flange or bell ends facing in direction of laying. For lines with appreciable slope, face flange or bell ends up-grade, when directed.

11.04 Do all required cutting of pipe (all types) for inserting valves or closure pieces in an approved manner and without damaging pipe.

PART 12.00 CONNECTIONS AND BLOCKING

12.01 Cap or plug in approved manner, all unconnected ends of all crosses, tees, branches and wyes.

Properly block with concrete against solid unexcavated earth to take reaction of the following items: all pipes laid around curves and on unsupported changes of direction, all tees, crosses and other fittings. Secure all plugs at blanked openings with blocks or concrete. All concrete shall be as specified in the Concrete section. Blocking shall be included in price per linear foot of pipe. All concrete shall be formed, see Concrete Section. The Dump method of digging a hole and dumping concrete without forming is not allowed.

12.02 Locations of connections, sizes of existing mains and connections with same, shown on drawings attached hereto and hereby made a part hereof, are approximate only. The Contractor shall provide in place complete, proper connections required within limits shown on the drawings.

12.03 Connections with existing mains, cutting of pipe, special castings, plugs and similar appurtenances, labor for shutting off and turning on water or similar items shall be included in the contract price per linear foot of pipe unless otherwise indicated on the bid sheet.

12.04 Necessary regulation or operation of valves on existing mains to permit connections to be made will be performed by or with permission of Owner's authorized employees, at the Contractor's expense and without extra cost to the Owner.

12.05 Carefully support and protect from injury all underground structures and utilities encountered while excavations are in progress or backfilling being finished, as necessary and until proper authorities remove or change same.

PART 13.00 BACKFILLING

13.01 This paragraph applies to backfilling for all types of water main pipes and appurtenances. Where exceptions are specified for certain conditions, they shall govern.

13.02 After pipe is laid and as soon as possible after testing, fill trench to surface of ground, and in unimproved streets, place remaining earth on top of trench, as hereinafter specified. If additional backfill material is required, the Contractor shall furnish same without extra cost to the Owner and in sufficient quantity to fill trench to level of surrounding surface after compaction.

13.03 Do not leave backfilling unfinished more than 500-feet behind finished pipe work unless otherwise directed.

13.04 Do not withdraw sheathing (where used in connection with the work) until trench is sufficiently filled to prevent injury to banks, road surfaces, adjacent pipes, railway tracks, sidewalks and other property, public or private.

Withdraw sheathing in increments of not over 1-foot. Backfill and thoroughly compact voids left by withdrawn sheathing. Except as shown on the drawings or ordered by the Engineer, no sheathing, shoring or bracing shall remain permanently in place.

13.05 Leave backfilling in all cases with smooth, rounded surface, and with minimum obstruction to traffic.

13.06 Compact backfilling solidly around pipes and to distance 6-inches above same, in not over 6-inch layers. Make compaction properly so that it causes no lateral movement to the pipe.

Backfill material shall be selected earth, free of large stones, boulders, trash and foreign matter. Ashes, cinders or other corrosive materials are prohibited.

13.07 In refilling trench at intersection streets, fill and solidly compact backfill in roadway for full depth.

13.08 If approved by the Engineer, backfill trench with properly compacted, approved, bank-run sand and gravel free from foreign substances and of such consistency that it flows readily into the trench. If this method is used, backfill entire space between sides of trench to the bottom of the pavement base with the same material. Additional payment will be made in accordance with unit price bid for foundation sand.

13.09 After backfill has been placed in the trench and before traffic or weathering have hardened the surface, water jet the trench by means of a 2-inch jet running water to the bottom of the trench. Completely wet the entire backfill and break any crust which has inadvertently bridged over the trench. Water jetting will not be required with sand backfill.

PART 14.00 RAILROAD CROSSINGS

14.01 Refer to Highway and Railroad Crossings Section and Special Conditions for detailed information regarding requirements.

14.02 Unless otherwise shown on the drawings, the average depth of casing of enclosure for pipes (for full length as shown on drawings) crossing under tracks shall be at least four-feet six-inches (4'6") below base of rail to top of casing pipe.

14.03 Unless otherwise required by the railroad company, lay all water main pipe in enclosing pipe (plain steel casing, corrugated metal pipe or otherwise as shown on the plans) and of sizes shown on drawings or required by the railroad company. Place said enclosing pipe either by jacking method, tunneling or boring. If tunneling method is used, cribbing or shoring shall remain in place. Fill space between cribbing and enclosing pipe with approved, bank-run sand and gravel. Method of placing enclosing pipe is subject to the Engineer's approval before commencing construction thereon.

PART 15.00 HIGHWAY CROSSINGS

See Highway and Railway Crossings Section and Special Conditions for detailed information regarding requirements.

PART 16.00 NOTE

Submission of proposal implies that the Bidder is fully conversant with all of Highway and Railroad Departments requirements, also as to all of State, County, and Township requirements. No extra compensation will be paid on account of Bidder's failure to be so informed.

PART 17.00 WATER MAINS ADJACENT TO OR CROSSING SEWER LINES

17.01 HORIZONTAL AND VERTICAL SEPARATION

A. Lay water main at least 10-feet horizontally from any existing or proposed drain or sewer line, if possible.

B. Wherever water mains cross house sewers, storm drains or sanitary sewers, lay water main at such elevation that bottom of water main is at least 18-inches above top of drain or sewer. Maintain said vertical separation for that portion of sewer located within 10-feet, horizontally, of any sewer or drain crossed; said 10-feet to be measured as normal distance from water main to drain or sewer.

C. Where conditions exist so that minimum vertical separation (specified in subparagraph 2 above), cannot be maintained, or it is necessary that water main pass under a sewer or drain, lay water main with mechanical joint, ductile iron pipe. Mechanical joint pipe shall extend on each side of crossing until normal distance from pipe to drain line is at least 10-feet. Center length of water main pipe over sewer or drain line to be crossed so that joints are equidistant from sewer and as far from there as possible. Where water main crosses under sewer or drain line, maintain vertical separation of 18-inches between bottom of sewer and top of main, along with approved means to support larger sized sewer lines to prevent their settling and breaking water mains.

17.02 CONSTRUCTION REQUIREMENTS

A. If impossible to obtain proper horizontal and vertical separation as specified above, then construct both water and sewer of approved mechanical joint ductile iron pipe.

B. Approved water main pressure pipe can be substituted for mechanical joint ductile iron pipe.

C. When water lines cross underneath sewer lines, both lines are to meet water main standards and be pressure tested.

PART 18.00 TESTING PIPE AND JOINTS IN TRENCHES (ALL TYPES OF PIPES)

18.01 Make tests between valves and as far as practicable in sections of approximately 1000-feet to 2000-feet long, as directed. Make test when possible, within twelve (12) working days of completion of said sections.

18.02 To determine rate of leakage, provide suitable pump, pressure gauge, water meter, water container and other appliances for measuring the amount of water pumped. Test these instruments for accuracy as frequently as directed.

18.03 Provide all labor and materials necessary to make tests to perform all work incidental thereto. Provide pump to raise pressure to required pressure.

18.04 Before applying test, expel all air from pipe. Make taps if necessary at high points of elevation. Afterward, plug same tightly.

18.05 Examine carefully, all exposed pipe, fittings, valves, hydrants, and joints during open trench test. Where mechanical joint or joints made by rubber couplings show visible leaks, take them apart, clean and reassemble same, with new parts, as necessary, until no leaks are visible.

A. Replace rubber gaskets where necessary to eliminate leaks.

B. Remove and replace without extra cost to the Owner, all cracked or otherwise defective pipe, fittings, valves and hydrants discovered in consequence of pressure test.

C. After making all required repairs and replacements, repeat pressure tests until all work is satisfactory to the Engineer.

18.06 After a section of main is installed, partially backfilled and is ready for testing, fill same with water from existing distribution system, or other approved source; then isolate this section from balance of system.

18.07 Raise pressure to class specified unless otherwise stipulated. Maintain pressure for period of at least two (2) hours. Make determination of amount of water forced into main during these periods; such amount shall be basis for computing leakage for twenty-four (24) hours. Pressure shall not vary over two pounds (2 lbs.) during said periods.

18.08 The maximum allowable leakage is computed on the basis of 10 gallons per inch of pipe diameter, per mile of length, per twenty-four (24) hours. Pressure shall not vary over two pounds (2 lbs.) during said period. Allowable leakage per one thousand (1,000) linear feet of water main is as follows:

TOTAL ALLOWABLE LEAKAGE PER
ONE THOUSAND (1,000) FEET, IN GALLONS

DIAMETER OF PIPE	IN TWO (2) HOURS	IN TWENTY-FOUR (24) HOURS
Two-inches (2")	0.3	3.8
Four-inches (4")	0.6	7.6
Six-inches (6")	1.0	11.4
Eight-inches (8")	1.3	15.2
Ten-inches (10")	1.6	18.9
Twelve-inches (12")	1.9	22.7
Fourteen-inches (14")	2.2	26.5
Sixteen-inches (16")	2.5	30.3
Eighteen-inches (18")	2.8	34.1
Twenty-inches (20")	3.1	37.9

18.09 If leakage is a greater rate than specified in subparagraph (18.08) above, re-excavate trench as necessary, replace defective work until leakage is reduced to allowable amount. All costs for labor and materials for said re-excavation, re-caulking pipe, removing defective valves, pipes, or special casting sand replacing same with new valves, pipes and castings, also for refilling trench and replacing any pavement disturbed shall be paid by the Contractor without extra cost to the Owner.

18.10 Whenever testing of any main is delayed beyond time specified above, the Engineer may give written notice to the Contractor to make said test forthwith. If the Contractor does not comply with such order within five (5) days from date of same, the Owner may make required test and deduct the cost thereof (including cost of all excavation and other work required to make pipe, joints, valves, hydrants and other items water- tight) from monies due or to become due to the Contractor under this contract.

18.11 Wherever it is impracticable to test between valves or near connections to existing mains, place temporary caps or plugs on mains and test sections of new main so closed. Do such capping or plugging without extra cost to the Owner.

PART 19.00 WATER FOR TESTING

19.01 If for any reason the Owner is unable to furnish water for testing, flooding or other purposes, the Contractor shall at his own expense, and without extra cost to the Owner, make all connections and other necessary provisions and shall provide all water mains and pipe (all types), hydrants, valves and appurtenances specified herein, conform to specifications requirements and are of such character as to leave all said pipe and connections watertight.

19.02 When the Owner can conveniently furnish water to the Contractor for flooding trenches, testing pipe, joints and for other purposes, there will be no charge except for labor of shutting off or turning on water. The Owner is in no way obligated to furnish water to the Contractor, with or without charge.

PART 20.00 FLUSHING MAINS

20.01 After mains have been laid and tested, flush out each run of pipe thoroughly to remove all foreign matter from lines. Do flushing by opening fire hydrants along lines. Where hydrants are not available or are of insufficient capacity to permit adequate flushing, open pipelines and provide flumes to carry water up and over the ground surface to outlet for same.

20.02 Introduce sufficient flushing water into mains to produce velocity of at least 4-feet per second. Continue such flow rate until discharge is clean, clear and does not show evidence of silt or foreign matter when a sample is visually inspected.

PART 21.00 DISINFECTION

Disinfect water mains before placing same in active service as per requirements of Disinfection section.

PART 22.00 REUSE OF EXISTING MATERIALS

Transport ductile iron pipe, gate valves, cast iron valve boxes and other materials, when removed from existing water main system during construction period, to Owner's storage yard or other location within corporate limits, as directed by the Owner.

PART 23.00 EXTRA-STRENGTH PIPE

In special locations where extra strength characteristics are required only ductile iron pipe shall be used. Where PVC pipe is specified, alternate materials approved by the Tennessee Department of Public Health are acceptable. Acceptable materials include, but are not limited to, AWWA Specification C-900, C-905, and ductile iron. For pipe not specified in detail, Bidders should pre-submit approved requests to the Engineer.

PART 24.00 CLEAN UP AND DAMAGE REPAIR

24.01 The Contractor shall clean up on a daily basis the waste from the site; provide barriers as required at all times.

24.02 Upon completion of the work, the Contractor shall remove from the sites all construction equipment, unused materials, salvaged materials, and debris resulting from the work.

PART 25.00 GUARANTEE

25.01 The Contractor shall and hereby does guarantee that all material and work for Water Main work shall be free from defects of material and labor and shall be and remain in good condition for a period of one (1) year from date of Owner's final acceptance of same.

25.02 The Contractor shall and hereby does further agree that he will, at his own expense and without extra cost to Owner, remove, repair and replace all said defective work

occasioned by operations under this section of the specifications which occurs during the one (1) year guaranty period and that he will also make good at his own expense and without extra cost to the Owner any and all damages to other work caused by such repair and replacement operations.

PART 26.00 AIR RELEASE VALVE AND CONCRETE METER BOX

The air release valves and concrete meter boxes shown on the drawings are diagrammatic. Air release valves and concrete meter boxes must be located at the high points of the pipe. The items shown on the detail shall be paid for under the bid item "Air Release Valve and Box".

The air release valve shall be APCO No. 55, Val-Matic Model 15 or approved equal.

The size of the valve(s) is/are shown on the plans and/or bid form.

PART 27.00 TRACER WIRE

All plastic piping shall be paralleled with tracer wire per standard practices. The tracer wire shall have a minimum of 2-feet of wire coiled above the ground at each fire hydrant, air release valve, and 6-inch or 8-inch valve box or 2-inch gate valve or 2-inch blow off installed. The tracer wire shall be as follows:

#12 AWG, solid copper, type THHN-THWN, thermoplastic insulated, made in accordance with ASTM designation; B3 "Standard Specification for Soft or Annealed Copper Wire" as last revised and Underwriters Laboratories' designation: ANSI/UL 83, "Standard for Thermoplastic-Insulated Wires" as last revised. Splices to be made using a 3M Direct Burial Splice Kit which is in a plastic sleeve.

PART 28.00 TRACER WIRE TEST STATION

28.01 Tracer wire test stations shall be installed at the locations shown on the plans. The test stations shall be 6-foot (6') Cathod-o-Flex Flexible Test Stations buried 3-feet in the ground. The marker shall serve two purposes. One purpose is to mark the line. The other purpose is to serve as a termination point for the tracer wire to be used in conjunction with the inductive locator. Beneath each marker shall be installed a 3M Direct Burial Splice Kit which is in a plastic sleeve. The splice kit shall serve as the junction box between the marker and the tracer wire.

28.02 Each marker shall have high performance decals with the words "CAUTION WATER PIPELINE. Before digging, call (901) 837-5974". The decal shall be 3M cast vinyl sheeting with UV shield protective coating.

28.03 The flexible marker shall be installed so that it is perpendicular to the water main. In other words, a line drawn between the test points on the marker will be perpendicular to the water main.

END OF SECTION

SECTION 15210
DUCTILE IRON WATER MAINS

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above-mentioned documents.

PART 2.00 DUCTILE IRON PIPE

2.01 All push-on joint and mechanical joint ductile iron pipe for water mains shall conform to Standards of AWWA/ANSI A21.5 and A21.51, latest revision.

2.02 All ductile iron pipe shall be at least 18-feet long with wall thickness as determined by ANSI A21.50 using 250 psi internal working pressure plus 100 psi surge allowance plus safety factor 2, 3-foot earth cover over pipe, standard allowances for water hammer.

2.03 Provide manufacturer's certificate of compliance with specification for each shipment of pipe.

2.04 The Contractor shall purchase all ductile iron pipe from approved, reputable, responsible manufacturers. Furnish to the Engineer duplicate copies of orders for pipes under this contract.

2.05 All ductile iron pipe shall be lined with cement mortar as per ANSI A21.4, latest revision.

2.06 See drawings for locations and extent.

PART 3.00 SPECIAL FITTINGS

3.01 ANSI A21.10 - Fittings 3-inches to 48-inches.

3.02 ANSI A21.11 - Rubber gasket joints for ductile iron pressure pipe and fittings.

3.03 All ductile iron pipe and ductile iron fittings will be mechanical joint, cement-lined as per ANSI A21.4, latest revision, domestic made ANSI-AWWA C151, without gaskets, glands and tee head bolt. Retainer glands shall be Mega Lug, Series 1000 or Uni-Flange Series 1400 mechanical joint, thrust restraint, breakaway, torque heads, domestic brand or equal.

3.04 Weights for mechanical joint fittings will be based on those published by Tyler Pipe for mechanical joint short body, Class 350 fittings. Concrete blocking for fittings shall be included in the unit price bid per foot of water main.

PART 4.00 JOINTS AND COUPLINGS

4.01 Mechanical Joints - Use only if specifically called for on Plans

Mechanical joints shall be stuffing box type, with gasket, cast iron gland and cast iron bolts as per ANSI A21.11. Complete joints as per manufacturer's recommendations and with all applicable sections of this specification.

A. Before installation, clean spigot and opposing socket free of foreign matter and loose rust with a wire brush to insure proper seating of gasket. Immediately prior to installation brush said spigot, opposing socket and gasket with clean soapy water for final cleaning and lubricate gasket as it is forced into its retaining space.

B. After inserting bolts through flange and gland, tighten same uniformly until torque on each bolt is within the following range:

BOLT SIZE INCHES	RANGE OF TORQUE FEET - POUNDS	BOLT SIZE INCHES	RANGE OF TORQUE FEET - POUNDS
5/8	45 - 60	1	100 - 200
¾	75 - 90	1¼	120 - 150

C. As bolts are tightened, bring gland up toward flange evenly and maintain approximately same distance between gland and face of flange at all points around socket. Accomplish this by partially tightening bottom bolt first, then the top bolts, next cycle until all bolts are within above specified range to torques. If effective sealing is not obtained at maximum torque indicated above, disassemble joint, clean same thoroughly and reassemble. Over-stressing bolts to force tight seal is prohibited.

4.02 Push-on Joints - Use unless another type of joint is specifically called for in Plans or Specifications.

Push-on joints shall be pipe joints of type and employing single, molded rubber gasket to effect joint seal, as per ANSI A21.11, latest revision.

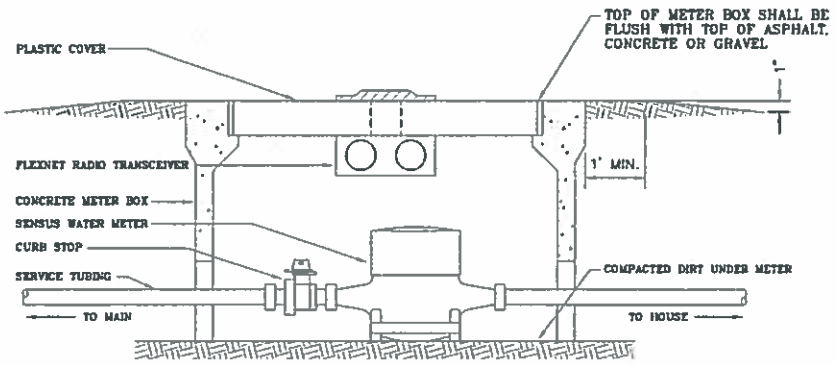
A. Before installation, clean spigot end and opposing socket free of all foreign matter and loose rust with a wire brush, to provide proper seating of gasket.

B. Before inserting spigot end of pipe into bell end, apply proper lubricant to gasket and spigot end. Make joints as per manufacturer's instructions.

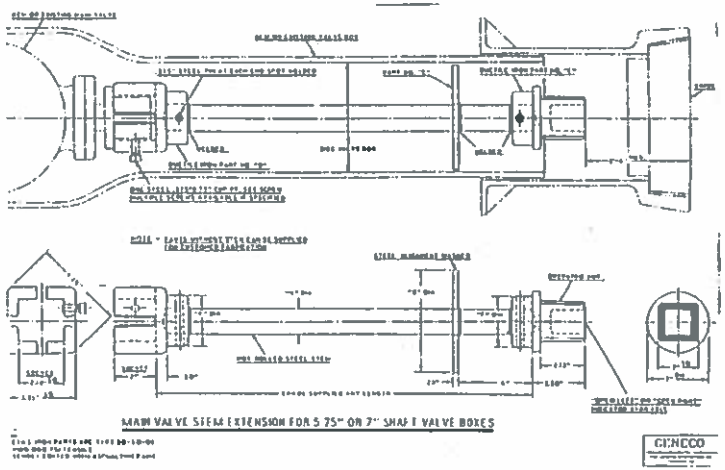
4.03 Push-on Joint with Restrained Joints - Use for all pipe inserted in Casing Pipe

Same as Part 4.02 above, except special American Fast-Grip Joint shall be used for additional restraint. American flex ring joint shall be used for uncased directional bores.

END OF SECTION



DETAIL
WATER METER AND BOX
SCALE: NONE



DETAIL
VALVE STEM EXTENSION
SCALE: NONE

5-31-11

STANDARD DETAILS
WATER SYSTEM
MUNFORD, TENNESSEE

CHECKED: K. KING	KING ENGINEERING CONSULTANTS, PROFESSIONAL ENGINEERS, MEMPHIS, TENNESSEE	SCALE: AS SHOWN
LICENSE NO.: 12308		SHEET NO.: 3 OF 3
DESIGNED: K.E.C.		JOB NO.: 4529
DRAWN: K.E.C.		DATE: 05/31/2011

SECTION 15221.8
WATER METER SERVICE ASSEMBLY
MUNFORD, TENNESSEE

PART 1.00 NOTICE

The General Conditions, Special Conditions and all other herein bound and accompanying documents are part of these Specifications and of the Contract. Submission of proposal implies that the Bidder is fully conversant with all requirements of all above mentioned documents.

PART 2.00 SCOPE OF WORK

2.01 Water meter service assembly shall consist of meter, box, corporation stop and curb stop.

2.02 The work in this section consists of furnishing all materials, accessories, equipment, tools, transportation, services, labor, and performing all operations required to execute the service assembly work for this project, all as indicated on the drawings and as herein specified.

PART 3.00 SHOP DRAWINGS

Before commencing work, submit for the Engineer and Poplar Grove Utility District's approval complete shop drawings of all service assembly work for this project. See the General Conditions for detailed information regarding job conditions requirements.

PART 4.00 JOB CONDITIONS

Refer to the General Conditions for detailed information regarding job conditions requirements.

PART 5.00 METERS

See Section 15222 Water Meters, Two-Inch and Smaller.

PART 6.00 SERVICE LINE AND FITTINGS

The contractor shall furnish and install the following for each service on newly constructed water mains:

6.01 Bronze Service Saddle (on PVC Water Lines): All saddles must have full-length tapered threads and the "O"-ring gasket cemented in place and confined in a retaining groove. Saddles shall be Ford S-70, 6" S70-603, 8" S70-803, 12" S70-1203.

6.02 Corporation Stops: Stop shall be of bronze construction with one end having tapered threads (AWWA (cc) Thread) for connection to service saddle. Corporation stop shall be "Ford" Type F1000-3

6.03 Tubing: Cerro Copper Tube or Nibo shall be installed. Copper shall be UNS Alloys-copper C1220 and C1200. Coils shall be produced in accordance with ASTM B-743, B-68 and B-75. Annealed copper tubing shall meet or exceed ASTM B-280 and B-743 for cleanliness and capped with plastic end caps. Level wound tubing shall be produced to dimensional tolerances as specified in ASTM B-251. Level would coils may range from 210 lbs. to 400 lbs. each or supplied in lengths of 50, 60, and 100 feet for smaller jobs. The tubing shall be type "L" copper. Type "K" copper is also acceptable. Pressure ratings for type "L" and "K" copper shall be in accordance with valves based on formulas in the American Standard Code Power Piping ANSI/ASME 831.1, 1998 or latest revision. All coils shall be eddy-current tested for defects in accordance with ASTM E-243. Typical sizes for thin wall copper tube are as follows:

Size	Wall Thickness Inches	
½" O.D.	.015 min.	.055 max
5/8" O.D.	.016 min.	.060 max
¾" O.D.	.017 min.	.065 max
1" O.D.	.025 min.	.055 max

6.04 Curb Stops: Curb stops shall be Ford Series B41-232W, tail piece if applicable Ford C38-23-2.5.

PART 7.00 METER BOX AND COVER

The contractor shall furnish and install the following for each service on newly constructed water mains, or he has the option of relocating the old meter box.

Meter boxes for residential customers shall be pre-cast concrete, Model 36H-15 as manufactured by Goddard Concrete, Memphis, Tennessee with the following characteristics:

METER SIZE	WIDTH	LENGTH	DEPTH	WEIGHT
¾" and smaller	10½"	17¾"	15"	104#
1"	12"	20"	15"	120#
1½"	13"	24"	15"	179#
2"	17"	28"	15"	243#

Meter box lids shall be plastic with pre-drilled holes to accept AMR. Meter box lids with pre-drilled holes available through G & C Supply, McKenzie, Tennessee, 1-800-238-3836.

PART 8.00 INSTALLATION

8.01 Water meters shall be set as near the property line within 10-foot easement as practical, but not in hedges, unacceptable places, traffic areas or slope greater than 3:1. The service pipe at the meter entrance shall be set at a depth to fit the meter box specified.

8.02 The meter box shall be set with the top 1-inch above the natural grade. The backfill shall be sloped away from the box.

8.03 No service line shall be installed without meter box.

8.04 For duplexes, the Contractor shall install a 1-inch service line to a brass wye with a ¾-inch water line to separate meters. Each side of the duplex is to have its own meter.

8.05 Service lines must be laid at least 24-inches deep under the finished grade to prevent freezing.

PART 9.00 TRACER WIRE

Tracer wire shall be provided and installed according to standard procedure for the service line. The tracer wire shall extend into the meter box and wrap around the curb stop.

PART 10.00 YOKE AND CURB STOP – *NOT APPLICABLE*

The Contractor shall relocate the yoke.

PART 11.00 PAYMENT – *NOT APPLICABLE*

"Relocate Existing Meter and Box" shall include cost of relocating the meter, meter box, and yoke. This bid item shall include the cost of the new curb stop.

END OF SECTION

SECTION 15222
WATER METERS
TWO-INCH AND SMALLER
MUNFORD, TENNESSEE

PART 1.00 GENERAL

Water meters shall be Sensus SR II or approved equal as described herein.

PART 2.00 PRODUCTS

2.01 Type

Magnetic Drive, Sealed Register, Positive Displacement Type Oscillating Piston only.

2.02 Size

Must conform to American Water Works Standard C-700 as most recently revised.

2.03 Length

Must conform to American Water Works Standard C-700 as most recently revised.

2.04 Cases

All meters shall have a non-corrosive Water Works bronze (minimum 75% copper content) outer case with a separate measuring chamber which can easily be removed from the case. All meters shall have cast on them, in raised characters, the size and direction of water flow through the meter. Cast iron frost bottoms or bronze bottoms shall be provided on 5/8-inch, ¾-inch and 1-inch size meters. 1-½-inch and 2-inch meters shall be the split case type with bronze lower and upper shall assemblies. The manufacturer's serial number must be permanently affixed to the maincase to aid in identification and must be visible so that it can be read from directly above the water meter.

2.05 External Bolts and Washers

All external bolts and washers shall be of corrosion resistant material and be easily removed from the maincase. All threaded maincase bolt holes must be covered to aid in removal of the bolts for repair.

2.06 Register

The register must be of the straight reading type with a large red test or sweep hand and shall include a low flow indicator on the dial face. The numeral wheel assembly shall be located at the bottom of the dial face with reading obtained from left to right.

Registration shall be in cubic feet, gallons or metric units. All reduction gearing shall be contained in a permanently hermetically sealed, tamperproof enclosure made from a stainless steel material, covered with a heat tempered glass lens.

The register shall be secured to the maincase by means of a locking device located in the interior of the meter so the register cannot be removed externally by non-utility personnel. An external register box assembly is not acceptable. The register must be covered so as to protect the register by a lid constructed of a copper based alloy or a suitable synthetic polymer.

2.07 Measuring Chamber

The measuring chamber shall be of Water Works bronze (minimum 85% copper content) or a suitable synthetic polymer and shall not be cast as part of the maincase. All piston assemblies shall be interchangeable in all measuring chamber assemblies of the same size. The measuring chamber shall be held in place without the use of fasteners. The measuring chamber piston shall operate against a replaceable control roller, allowing for repair to AWWA standards. The control roller shall rotate on a stainless measuring chamber steel pin, to provided added strength, wear resistance and corrosion resistance. There shall be an elastomeric seal or seals between measured and unmeasured water, preventing leakage around the measuring element.

2.08 Magnetic Coupling

The motion of the piston will be transmitted to the sealed register through the use of a direct magnetic drive without any intermediate coupling.

2.09 Strainers

All meters must be provided with a corrosion resistant strainer which is easily removable from the meter without the meter itself being disconnected from the pipeline.

2.10 Change Gears

Change gears will not be allowed to calibrate the meter. All registers of a particular registration and meter size shall be identical and completely interchangeable. Should meters arrive with registers containing more than one gear combination, the entire shipment will be returned to the manufacturer freight collect and the next responsible bidder will receive the reward.

PART 3.00 EXECUTION

3.01 Accuracy and Headloss Tests

Meters shall conform to current AWWA C-700, current revision, test flows, head loss and accuracy standards.

3.02 Pressure Capability

Meters shall operate up to a working pressure of 150 pounds per square inch (psi), without leakage or damage to any parts. The accuracy shall not be affected when operating at this pressure due to possible distortion. Accuracy shall not be affected by variations in pressure up to 150 psi.

3.03 Shipment Verifications

A statistically controlled sample of each meter shipment will be subject to testing by the utility to insure each shipment meets the utility performance and materials specifications.

3.04 Encoder Register and Remotes

Must conform to American Water Works Standard C-707 as most recently revised.

3.05 Touch Read/RadioRead ECR Encoder Register

The register must be of the straight reading type and have a full test dial on the face of the register that records one-tenth of the right-most odometer wheel. It shall read in gallons and be capable of direct visual reading both at the meter and by remote reading utilizing a visual interrogation device that connects through to the water meter via a TouchPad located external to the meter, and by Meter Interface Unit (MIU/MXU) for remote based Automatic Meter Reading (either fixed base or drive-by). The direct read numeral wheel assembly shall be located in the middle of the dial face with reading obtained from left to right using standard notation (billions, millions, and thousands separators and decimal points). All reduction gearing shall be contained in a permanently hermetically sealed, tamperproof enclosure made of a corrosion resistant material.

The register shall be secured to the maincase by means of a device located in the interior of the meter so non-utility personnel cannot remove the register externally. An external register box assembly is not acceptable.

The meter register shall be provided with three terminal connections. The connection between the meter register and the TouchPad shall be accomplished with the use of only two terminal connections. The connection between the meter register and the MIU/MXU shall be accomplished with the use of all three terminal connections. The register shall transmit the meter reading and register data directly to the interrogation device through the TouchPad or to the MIU/MSU when interrogated by an AMR system.

The terminal connections shall be permanently factory sealed to three wire interconnecting cable with an environmentally approved epoxy to prevent moisture penetration and eliminate the need for field sealing requirements.

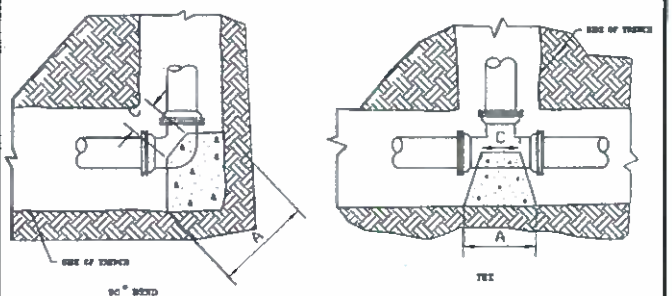
The register output data format shall be 7-bit ASCH (American Standard Code for Information Interchange) digital, plus an even parity bit. Upon interrogation with a TouchPad or AMR product, the register will transmit an odometer reading containing from 1 to 8 digits (field programmable) and a user defined alphanumeric identification of

up to 12 characters (field programmable). The odometer reading is to be obtained from the register by "magnetic field position-sensing" technology to determine the rotational position of each odometer wheel. Encoders with a mechanical brush contact with the odometer wheel will not be acceptable. The register can also be programmed to output a factory set, non-programmable identification number, Customer Text of up to 20 alphanumeric characters (field programmable), a reading multiplier ranging from 10^{-99} to 10^{99} (field programmable), and/or a reading measurement unit indicator (for example, US Gallons – field programmable). Data is to be positive true. The register's ASCH digital output is to be capable of interfacing directly to an AMR transponder to transmit data via cable TV, telephone, radio signal, or power lines to an AMR system.

3.06 Transmitter

Transmitter shall be Sensus M520X-FI-TC-X-E-AL, single port, touch coupling with leak detection and Intel Data in touch read pit with flex net radio. This unit is required in order to transmit data to the fixed based meter reading system.

END OF SECTION



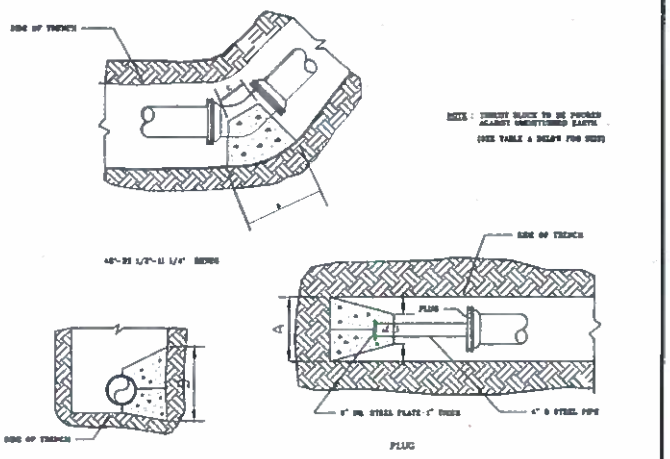


TABLE A
THRUST BLOCKING DIMENSIONS

90° BEND							
SIZE	4"	6"	8"	10"	12"	16"	
A	1'0"	1'0"	2'0"	2'0"	4'0"	5'0"	7'0"
B	1'0"	1'0"	2'0"	2'0"	4'0"	5'0"	7'0"
C	0'6"	0'9"	1'0"	1'0"	1'0"	1'0"	2'0"
D	0'6"	0'6"	1'0"	1'0"	2'0"	2'0"	2'0"

11 1/4° BEND							
SIZE	4"	6"	8"	10"	12"	16"	
A	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"	2'0"
B	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"	2'0"
C	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"	1'0"
D	0'6"	0'6"	0'6"	0'6"	0'6"	0'6"	1'0"

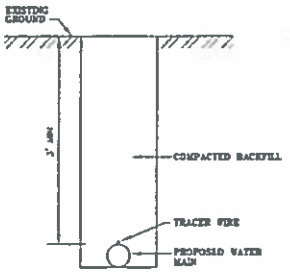
45° BEND							
SIZE	4"	6"	8"	10"	12"	16"	
A	1'0"	1'0"	1'0"	2'0"	3'0"	3'0"	5'0"
B	1'0"	1'0"	1'0"	2'0"	3'0"	3'0"	5'0"
C	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"	1'0"
D	0'6"	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"

TEE							
MAIN	4"-6"	6"-8"	8"-10"	10"-12"	12"-16"	16"	16"
BRANCH	4"	6"	8"	10"	12"	16"	16"-18"
A	2'0"	2'0"	4'0"	2'0"	4'0"	6'0"	7'0"
B	2'0"	2'0"	4'0"	2'0"	4'0"	5'0"	7'0"
C	1'0"	1'0"	1'0"	1'0"	1'0"	1'0"	2'0"
D	1'0"	1'0"	2'0"	1'0"	2'0"	2'0"	2'0"

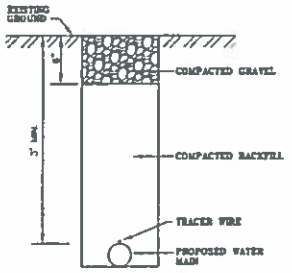
22-1/2° BEND							
SIZE	4"	6"	8"	10"	12"	16"	
A	0'6"	0'6"	1'0"	1'0"	2'0"	2'0"	4'0"
B	0'6"	0'6"	1'0"	1'0"	2'0"	2'0"	4'0"
C	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"	1'0"
D	0'6"	0'6"	0'6"	1'0"	1'0"	1'0"	1'0"

PLUG							
SIZE	4"	6"	8"	10"	12"	16"	
A	2'0"	2'0"	2'0"	3'0"	4'0"	5'0"	7'0"
B	2'0"	2'0"	2'0"	3'0"	4'0"	5'0"	7'0"
C	1'0"	1'0"	1'0"	1'0"	1'0"	1'0"	2'0"
D	1'0"	1'0"	1'0"	1'0"	2'0"	2'0"	2'0"

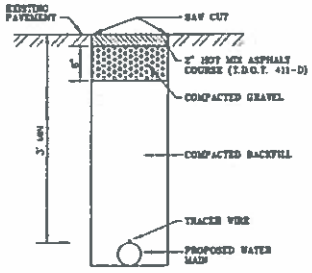
THRUST BLOCKING DETAILS
NO SCALE



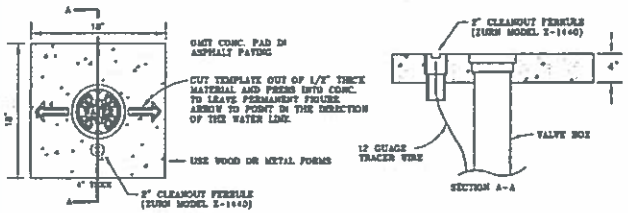
TYPICAL
TRENCH DETAIL
SCALE: NONE



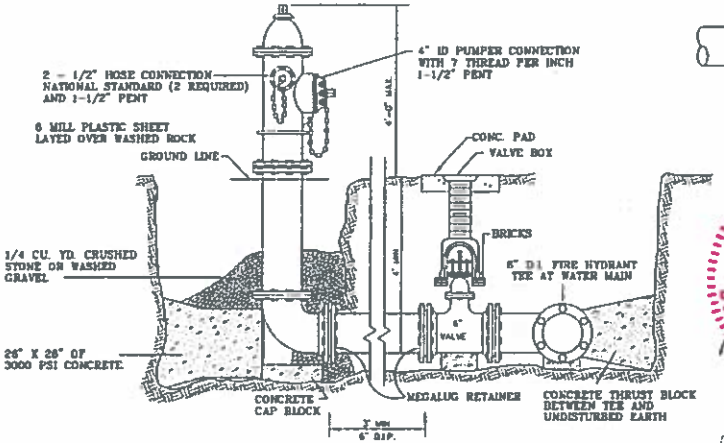
TYPICAL
TRENCH DETAIL
AT GRAVEL DRIVEWAY
SCALE: NONE



TYPICAL
TRENCH DETAIL
AT STREET AND ASPHALT DRIVEWAY
SCALE: NONE

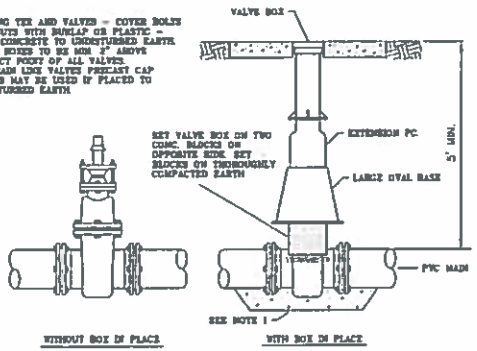


VALVE BOX DETAIL
SCALE: NONE



FIRE HYDRANT DETAIL
SCALE: NONE

NOTES:
1. TAPPING TEE AND VALVES - COVER BOLTS AND NUTS WITH DUNLAP OR PLASTIC - POUR CONCRETE TO UNDISTURBED EARTH.
2. VALVE BOXES TO BE MIN 3" ABOVE CONTACT POINT OF ALL VALVES.
3. PCB MAIN LINE VALVES PRECAST CAP BLOCKS MAY BE USED IF PLACED TO UNDISTURBED EARTH



DETAIL OF VALVE SETTING
SCALE: NONE

KENNETH R. KING
REGISTERED ENGINEER
AGRICULTURAL
AND
12309
STATE OF TENNESSEE

5-31-

STANDARD DETAILS
WATER SYSTEM
MUNFORD, TENNESSEE

DESIGNED	K. KING
LICENSE NO.	12309
DRAWN	K.K.C.
CHECKED	K.K.C.

KING ENGINEERING CONSULTANTS
PROFESSIONAL ENGINEERS
MEMPHIS, TENNESSEE

SCALE	AS SHOWN
SHEET NO.	1 OF 3
DWG. NO.	4529
DATE	05/24/2011