

SECTION 02713

WATERLINES

PART 1 – GENERAL

1.1 SCOPE OF WORK

The work covered by this Section relates to waterlines and appurtenances including pipe material permitted, installation, testing, and cleanup.

1.2 PIPE MATERIAL PERMITTED

Pipe for fire lines and domestic waterlines shall be ductile iron except PVC pipe C900, as specified herein and when approved by the Engineer, will be permitted in single family residential subdivisions in sizes of eight (8”) inches or less.

1.3 STORAGE OF MATERIALS

The Contractor shall be responsible for safely storing, in accordance with manufacturer’s recommendations, materials that have been accepted until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

1.4 DEFECTIVE MATERIALS

It shall be the Contractor’s responsibility to insure that all necessary materials are furnished and that those found to be defective in manufacture are replaced at no extra cost to the Owner. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor’s own expense. If installed material is found to be defective before the final acceptance of the work, the cost of both the material and labor needed to replace it shall not be passed on to the Owner.

1.5 RELATED WORK SPECIFIED ELSEWHERE

Refer to following Sections of these Specifications for work related to this Section:

- A. Section 02221W – Trenching, Bedding and Backfilling for Water Lines, Sewage Force Mains and Repurified Water Lines
- B. Section 02640 – Valves, Hydrants and Blow-Offs **for Water Lines**
- C. Section 03303 – Concrete for Water Lines, Sanitary Sewer Mains and Repurified Water Lines and Appurtenances

1.6 STANDARDS

Where materials and methods are indicated in the following specifications as being in conformance with a standard specification, it shall refer in all cases to the latest edition of

the specifications and shall include all interim revisions. Listing of a standard specification without further reference indicates that the particular material or method shall conform with such listed specification.

All materials to be incorporated in this project shall be first quality, new, and undamaged material conforming to all applicable portions of these specifications. Where deviation from the specifications is necessary because of changes in manufacturing procedures, inability to obtain the specified product, or other extenuating circumstances, a request for the proposed substitution shall be submitted to the Engineer in writing for consideration. Materials failing to conform to these specifications shall not be delivered to the job site unless the Contractor has written approval from the Engineer covering the substitute materials.

The supplier must provide and deliver pipe manufactured by one company per project/job only. The mixing of different pipe manufacturers will no longer be accepted. Jobs can be broken into separate sections and/or phases as approved by the Murfreesboro Water & Sewer Department.

PART 2 – PRODUCTS

2.1 GENERAL PIPE REQUIREMENTS

A. QUALITY AND INSPECTION

Latitudes in workmanship and finish allowed by ASTM Specifications notwithstanding, all pipe shall be first quality, of smooth exterior and interior surfaces, free from cracks, blisters, and other imperfections, and true to theoretical shapes and forms throughout each length. All pipe, independent of laboratory tests, shall be subject to the inspection of the Engineer at the pipe plant, trench, or other point of delivery for the purpose of culling and rejecting pipe which does not conform to the requirements of these Specifications. Pipe which does not conform shall be marked as such by the Engineer and shall not be delivered or used in the work. Repairing of rejected pipe will not be permitted.

B. EXPERIENCE OF MANUFACTURER

The manufacturer of the pipe shall submit evidence, if requested by the Engineer, of having consistently produced both pipe and joints of specified quality and satisfactory performance results in service over a period of at least two years. The manufacturing process shall be subject to the approval of the Engineer.

2.2 DUCTILE IRON PIPE

A. MATERIAL

Ductile iron pipe for waterlines shall be designed in accordance with the latest revisions of ANSI/AWWA C150/A21.50 for a minimum 350 psi rated working pressure plus a 100 psi minimum surge allowance; a 2 to 1 factor of safety on the sum of working pressure plus surge pressure. Also required is special thickness Class 52 for pipe sizes 12" and smaller.

Ductile iron pipe for waterlines shall be manufactured in the U.S.A. in accordance with ANSI/AWWA/C151/A21.51, latest revision, for centrifugally cast ductile iron pipe. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

Pipe shall be furnished with standard thickness cement lining on the inside with asphaltic seal coat and an asphaltic coating on the outside. Cement lining shall conform to ANSI/AWWA/C104/A21.4, latest revision. All pipe shall have a pressure class of 350 psi unless noted otherwise on the Plans.

B. JOINTS

Joints shall be compression type slip joints equal to the "Fastite" joint as manufactured by American Cast Iron Pipe Company, "Tyton" as manufactured by U.S. Pipe and Foundry or "Bell-Tite" as manufactured by James B. Clow and Son. Gaskets and lubricants shall be furnished with the pipe. Where restrained joints are called for on the Plans, the pipe joints and fittings shall be either American "Fastite" with fast-grip gasket, Flex Ring, or Lok Ring joint pipe and fittings or equal.

C. TESTING

Testing of ductile iron pipe and joints shall be performed in accordance with ANSI/AWWA/C151/A21.51 and ANSI/AWWA/C111/A21.11, latest revisions.

D. MARKING

The exterior of the pipe shall be clearly marked to indicate the class or nominal thickness, manufacturer, date of manufacture, the pipe class, and weight. Exterior markings shall also positively identify the pipe as being ductile iron.

E. CERTIFICATIONS

Pipe manufacturers shall furnish written certification that the pipe and joints have been manufactured and tested in accordance with the latest revision of ANSI/AWWA/C151/A21.51 and ANSI/AWWA/C111/A21.11 for ductile iron pipe centrifugally cast in metal or sand lined molds.

F. LENGTHS

Pipe shall be furnished in lengths of eighteen to twenty (18' to 20') feet, except for special construction conditions.

G. MANUFACTURER

Ductile iron pipe shall be as manufactured by U.S./Griffin Pipe and Foundry Company, American Cast Iron Pipe Company, McWane/James B. Clow and Sons, or an approved equal.

2.3 POLYVINYL CHLORIDE (PVC) PIPE

A. MATERIAL

PVC pipe shall conform to the requirements of AWWA C900 “Standard for Polyvinyl Chloride (PVC) Pressure Pipe, four (4”) inches through twelve (12”) inches for Water Distribution” and furnished in cast iron pipe equivalent outside diameters of DR 18 with integral wall thickened bell ends and pressure class 150 unless directed otherwise by the Engineer, or shown otherwise on the Plans.

B. JOINTS

Provision must be made for contraction and expansion of each joint with flexible ring gaskets from rubber or other suitable material. Gasket materials shall meet the requirements established in ASTM F477. Joints for pressure class 150 pipe shall be manufactured in accordance with ASTM D3139. Lubricant shall be nontoxic and shall not promote biological growth. Solvent cemented joints in the field are not permitted.

C. TESTING

The following tests shall be run for each machine on each size and type of pipe being produced as specified:

1. FLATTENING TEST

Once per shift in accordance with ASTM D2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.

2. ACETONE TEST (Extrusion Quality Test)

Once per shift in accordance with ASTM D2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the tests.

3. QUICK BURST TEST

Once per twenty-four (24) hours in accordance with ASTM 1599.

4. WALL THICKNESS AND OUTSIDE DIMENSIONS TEST

Once per hour in accordance with ASTM D2122.

5. BELL DIMENSIONS TEST

Once per hour in accordance with ASTM D3139.

If any specimen fails to meet any of the above-mentioned tests, all pipe of that size and type measured between the test periods must be scrapped and a full set of tests rerun.

D. MARKING

Certain information shall be applied to each piece of pipe. At the least, this shall consist of:

1. Nominal size
2. Type of material
3. DR or class
4. Manufacturer
5. NSF Seal of Approval

E. CERTIFICATIONS

The manufacturer shall furnish certifications as follows:

1. That the pipe and joints have been manufactured in accordance with AWWA C900 "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, four (4") inches through twelve (12") inches, for Water Distribution".
2. That the pipe and joints have been tested in accordance with the ASTM designations for the respective tests designated in C.

F. LENGTHS

Pipe shall be furnished in lengths of twenty (20') feet, except for special construction conditions.

G. DETECTION WIRE

Pipe shall have a fourteen (14) TW solid copper wire with a white coating installed in such manner that detection with electronic equipment is possible. The detection wire shall be continuous and shall be installed at the side of the trench adjacent to the pipe.

H. MANUFACTURER

Pipe shall be as manufactured by JM-Eagle Manufacturing, National, North American Pipe, , Diamond Plastics, Royal Building Products, Pipelife Jet Stream, Inc., or an approved equal.

2.4 FITTINGS

Fittings furnished for use with PVC or ductile iron pipe shall be fittings conforming to ANSI/AWWA/C110/A21.10, latest revisions. Unless otherwise indicated, ends shall be mechanical joint. Fittings shall have interior lining and exterior coating as specified for pipe. Fittings shall be of ductile iron. Ductile iron compact fittings shall conform to ANSI/AWWA/C153/A21.53. Fittings shall have a pressure rating of 350 psi.

Fittings shall be in accordance with standard mechanical joint fittings as manufactured by the U.S./Griffin Pipe and Foundry Company, American Cast Iron Pipe Company, McWane/James B. Clow and Sons, Tyler/Union, Sigma, Star or an approved equal.

2.5 CASING PIPE

The minimum material requirements for casing pipe used in highway and railroad crossings shall be steel conforming to ASTM A139, Grade B. Minimum yield strength shall be 35,000 psi. All casing pipe used must meet the approval of the permitting authority. If the casing pipe is being used in a bore situation within the City's rights-of-way, the bore must extend to 10 feet on either side of the toe of the slope and/or the back of the ditch and at minimum from right-of-way to right-of-way. Nominal casing diameter shall be as indicated on the plans as determined by the Department, but in no case shall be smaller than 2 sizes larger than the carrier pipe size. Joints shall be continuously welded. Casing pipe and joints shall be leakproof and capable of withstanding Cooper E-80 loading. Casing pipe shall be coated as specified herein.

The minimum wall thickness of casing pipe shall be as shown in the table below:

<u>Nominal Diameter (Inches)</u>	<u>Minimum Wall Thickness (Inches)</u>	
	<u>With Coating</u>	<u>Without Coating</u>
Under 14	0.188	0.251
14 and 16	0.219	0.282
18	0.250	0.313
20	0.281	0.344
22	0.312	0.375
24	0.344	0.407
26	0.375	0.438
28 and 30	0.406	0.469
32	0.438	0.501
34 and 36	0.469	0.532
38, 40, 42	0.500	0.563

Where specified, coating for steel casing pipe shall be a two component, self-priming, chemically cured coal tar epoxy-polyamide protective coating. Minimum dry film

thickness of completed coating shall be sixteen (16) mils. Material shall be Kopcoat 300 M, Tnemec 46H-413 Hi Build Tneme – Tar or equal. Preparation shall be SP6 commercial blast.

2.6 CONCRETE

A. CLASS “A” CONCRETE

Class “A” concrete shall have a minimum compressive strength of four thousand (4,000) pounds per square inch in twenty-eight (28) days and shall contain not less than six hundred (600) pounds of cement per cubic yard.

B. CLASS “B” CONCRETE

Class “B” concrete shall have a minimum compressive strength of three thousand (3,000) pounds per square inch in twenty-eight (28) days and shall contain not less than five hundred fifty (550) pounds of cement per cubic yard.

2.7 RUBBLE STONE RIPRAP

Where riprap is called for on the drawings, coarse stone from the excavation may be conserved and used. Riprap for bank stabilization shall be sound, dense, and durable, free from excessive cracks, pyrite intrusions, and other structural defects. At least ninety (90%) percent of the stone shall be not less than eight (8”) inches wide by twelve (12”) inches long by twelve (12”) inches deep and shall be approximately rectangular in shape.

PART 3 – EXECUTION

3.1 GENERAL

The Contractor will be held completely responsible for any damage to pavement, sidewalks, curbs, gutters, meter or valve boxes, street inlets, or other structure or appurtenances as a result of construction operations. It should be specifically noted that the Contractor shall be responsible for damage even though the character or nature of the original pavement or structure was such that it was not capable of carrying the load of the construction equipment regardless of the construction methods used.

The Contractor shall take precautions as may be necessary to avoid endangering personnel, pavement, adjacent utilities or structures through cave-ins, slides, settlement, or other soil disturbance resulting from construction operations. The Contractor shall furnish and maintain barricades, signs, flashing lights, and other warning devices as necessary for public safety and as required by the Manual on Uniform Traffic Control Devices, Part 6.

The Contractor shall plan construction operations so as to cause a minimum of inconvenience to property owners and to traffic. Flaggers shall be provided as required on heavily traveled streets to avoid traffic jams or accidents. No road, street, or alley

may be closed unless absolutely necessary, and then only if the following conditions are met:

- A. Permit is secured from appropriate State, County, or Municipal authorities having jurisdiction.
- B. All emergency agencies are notified before road is closed.
- C. Suitable detours are provided and are clearly marked.

No driveways shall be cut or blocked without first giving twenty-four (24) hour notice to the occupant of the property. Every effort shall be made to schedule the blocking of drives to suit the occupant's convenience, and except in case of emergency, drives shall not be blocked without an alternative access being provided.

Whenever pipe laying operations are to be discontinued for an extended period of time, the end of the pipe shall be carefully secured to avoid displacement or misalignment, and a tight fitting plug or stopper shall be placed in the line. Upon resumption of laying operations, the plug or stopper shall not be removed from the line until any water, mud, or other debris has been removed to avoid entry into the completed section of the waterline.

Installation of waterlines shall conform to provisions of these specifications and recommendations of the pipe manufacturer. Installation instructions provided by the pipe manufacturer shall be available at all times at the location of the work.

The proper gaskets and lubricants shall be furnished by the pipe manufacturer, and lubricants shall be delivered to the job site in properly labeled, unopened containers.

When waterlines are to be constructed near sewer and/or repurified water lines, horizontal and vertical separation shall be maintained as described below:

Horizontal Separation: Whenever possible, waterlines should be separated horizontally from sewer and/or repurified water lines a minimum of ten (10') feet. If this is not possible, the lines may be laid closer provided they are in separate trenches, and if the elevation of the top of the sewer is at least eighteen (18") inches below the bottom of the water main.

Vertical Separation: When a waterline must cross a sewer and/or repurified water line, the top of the sewer should be at least eighteen (18") inches below the bottom of the water main.

If the elevation of the waterline cannot be varied to meet the above requirements, reconstruct the sewer with mechanical joint ductile iron pipe for a distance of ten (10') feet on each side of the waterline with a full joint of the water main centered on the sewer. If it is impossible to obtain proper horizontal and vertical separation as stipulated herein, construct both the water main and the sewer of mechanical joint ductile iron pipe and pressure test each.

3.2 EXCAVATION AND BEDDING

The trench excavation for waterlines and other structures, including excavation in solid rock, and any necessary foundation stabilization, dewatering, sheeting or shoring, and the disposal of materials shall be done in accordance with Section 02221W, Trenching, Bedding and Backfilling for Water Lines, Sewage Force Mains and Repurified Water Lines.

In wet or mucky areas where the subgrade of the trench walls have insufficient stability to support the installed waterline, the Contractor will be directed to remove such unstable material and replace same with crushed stone size No. 67 as given in Section 903 of the latest Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction. Where the wet or mucky condition is caused by the Contractor's failure or neglect to properly handle ground water or protect against the entrance of storm water, the Contractor will be required to remove and replace the unstable material at no expense to the Owner.

Unless otherwise indicated on the Plans or Standard Detail Drawings, all waterlines shall have a minimum of forty-two (42") inches of cover. No departure from this policy shall be made except with the approval of the Engineer.

3.3 PIPE INSTALLATION

Waterlines shall be installed in accordance with details shown on the Plans. The work shall be done by experienced personnel; and pipe, fittings, valves, and accessories shall be installed in strict accordance with these specifications and the recommendations of the manufacturer. Gaskets, bolts, lubricant, and other accessories shall be furnished by, or as recommended by, the manufacturer.

Pipeline alignment and gradients shall be straight or shall follow true curves as nearly as is practicable. Curves or changes in grade will be made by making deflections at the pipe joints where feasible, but the maximum permissible deflections shall be as recommended by the pipe manufacturer. The Contractor shall have on hand at the site of the work a table showing the permissible deflections whenever the pipe laying is in progress. All fittings, valves, and hydrants shall be at the required locations, the spigots centered in the bells, and all valve and hydrant stems plumb.

After the pipe has been swabbed and inspected, it shall be lowered into the trench. The Contractor shall exercise care in the handling of pipe. Suitable clamps, slings, or other lifting devices shall be provided for handling pipe and fittings. Pipe and fittings shall be carefully loaded into the trench piece by piece. AT NO TIME SHALL A SECTION OF PIPE BE ROLLED OR DROPPED INTO THE TRENCH. Bell holes of ample depth and width shall be excavated in pipe trenches at the location of each joint to permit the joint to be properly made and to insure uniform bearing of the pipe barrel on the bottom of the trench. The spigot end of the pipe and the bell or socket of the previously laid pipe shall be wiped clean. The gasket shall be inserted, lubricant shall be applied, and the joint shall be made up by shoving the pipe home. Care shall be taken to insure that the

gasket is not twisted or dislodged and that the pipe spigot is inserted the proper distance into the socket. Secure the pipe in place by tamping an approved backfill material around it.

Mechanical joints shall be made only by experienced workmen. Sockets and spigots shall be washed with soapy water before slipping the gland and gasket over the spigot end of the pipe. The spigot shall be inserted into the socket full depth, after which the gasket shall be pushed into position making sure that it is evenly seated in the socket. The gland shall then be moved into position for compressing the gasket. Bolts and nuts shall be tightened "finger-tight", after which they shall be tightened to a uniform permanent tightness, using a torque wrench for tightening. Bolts shall be tightened alternately one hundred eighty (180°) degrees apart.

Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the Engineer.

Cut pipe so that valves, fittings, or closure pieces can be inserted in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.

Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug or by other means approved by the Engineer. If the joints of any pipe in the trench cannot be completed until a later time, caulk them with packing in order to make them as watertight as possible; this shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.

3.4 THRUST BLOCKS OR RESTRAINTS

A. THRUST BLOCKS

Poured-in-place concrete thrust blocks must be provided at all points of unbalanced pressure where the pipeline could pull apart. Thrust blocks shall conform to details and minimum bearing areas as shown on the Standard Detail Drawings, and they shall bear against the undisturbed trench face. Care shall be taken to avoid pouring concrete over or around pipe joints and to protect bolts, glands, or other component parts of the joint while the thrust block is being poured.

Where over bends (downward bends) cannot be avoided, the fitting must be held in place by one of the following methods:

1. Steel rods anchored for at least eighteen (18") inches in solid rock.

2. Concrete, of sufficient volume as directed by the Engineer, placed under pipe to counteract unbalanced force, with steel clamp and anchor bolts to hold fitting to concrete as shown on Standard Detail Drawing.
3. Approved type of locked flexible joint extending a minimum of two (2) pipe joints on each side of the bend. (Number of lengths to be reviewed by Engineer.)

Rods and bolts shall have a minimum diameter of three-quarter (3/4") inch and clamps or straps shall be of steel having at least one-fourth (1/4") inch thickness. Steel rods, bolts, clamps, etc. shall be coated with coal tar epoxy. Concrete used in thrust blocks shall be Class "B".

3.5 CONNECTIONS TO EXISTING WATER MAINS

A. GENERAL

The Contractor shall make connections to existing water mains in the manner shown on the Plans. Usually, the connections will either be a pressure connection or made at dead end lines which are to be extended.

B. PRESSURE CONNECTIONS

Where pressure connections are called for on the Plans, the Murfreesboro Water and Sewer Department will furnish the tapping machine and the crew to make the tap and furnish and install the tapping sleeve and valve, and perform all excavation, blocking, and backfill and make a temporary pavement patch. The Contractor will excavate the temporary pavement patch and make the permanent pavement repair. The Contractor shall notify and give the Murfreesboro Water and Sewer Department seventy-two (72) hours advance notice to schedule the work crew.

C. DEAD END CONNECTIONS

Connections which are to be made at dead end lines, which are to be extended, will require valving off the line, removing a plug and blocking, and continuing with the installation of the new line. The location of the nearest existing valves have been shown on the Plans, and it is assumed that the valves are in operating condition, but the Owner makes no claim as to the effectiveness of the valves. In the event any valve fails to operate, or does not provide drop tight shut-off, the Owner will assist the Contractor in locating other valves which may be used, but the Contractor will not be entitled to additional compensation for any delay or extra cost resulting therefrom.

Arrangements for shut-down of any line for the purpose of making a connection thereto shall be made through the Office of the Director of the Water and Sewer Department at least twenty-four (24) hours in advance of the time the water service is to be interrupted. Where the line to be shut off is an integral part of the

feeder system or serves more than five (5) services, the Owner may stipulate that the connection be made at night or on weekends.

The Contractor shall request the Owner to valve off the desired area at the agreed upon time. The Contractor's forces are not to operate valves on the existing system unless specifically authorized to do so by the Owner.

D. RESTRAINTS

All dead end mains shall be adequately restrained to prevent separation when operating under pressure or during pressure surges. Unless otherwise directed the dead ends shall consist of a mechanical joint plug and a one (1') foot length of pipe bracing between the plug and a concrete thrust block. The length of the thrust block shall be such as to bear against the undisturbed trench face. The brace pipe shall be steel pipe, and shall be sized as indicated on the Standard Detail Drawing. Pipe ends shall be cut square, and a one-fourth (1/4") inch steel plate of the dimensions shown on the Standard Detail Drawing shall be tack welded over each end of the brace pipe.

The pipe brace shall be in contact with the dead end main and be 6" into the concrete brace to eliminate any movement.

3.6 BACKFILLING

The backfilling for waterlines and other appurtenances shall be done in accordance with Section 02221W.

3.7 TESTING AND DISINFECTION

A. GENERAL

Upon completion of the construction work under this Contract, the Contractor shall conduct the necessary pressure and leakage tests. The Murfreesboro Water and Sewer Department shall disinfect the completed water main and appurtenances and conduct required bacteriological tests. The Contractor shall furnish all labor, tools, equipment, and materials for making the pressure and leakage tests, except for water which will be furnished by the Owner at no cost to the Contractor. In the event that the pressure or leakage test is unsatisfactory, the Contractor shall take corrective measures and shall repeat the tests until satisfactory results are obtained.

B. TESTING

Wherever, in the opinion of the Engineer, conditions will permit, the pipeline shall be tested before the trench is backfilled. All joints shall be examined during the open trench test and all visible leaks entirely stopped. Joints which leak shall be remade and retested until the lines pass the required test. Any cracked or broken pipe, fittings, valves, hydrants, or other work shall be removed and

replaced, at the expense of the Contractor, with sound pieces or units as may be required.

The Contractor shall furnish, install, and remove all necessary temporary flanges, plugs, or bulkheads required for conducting the pressure tests, as well as all material, labor, and equipment required to carry out the tests and to replace defective material.

The Owner shall furnish and install corporation stops at high points on the lines for blowing the lines free from air. One corporation stop shall be furnished and installed for each test pump location.

Each section of the completed water main extensions shall be subjected to a pressure test. The section to be tested shall be valved off by gate valves, after having been filled with water, and a positive displacement test pump shall be used to pump clean water into the section to build up a test pressure equal to one hundred fifty (150) psi or one and one-half (1½) times the working pressure, whichever is greater. The test pump shall then be valved off from the system, and the pressure shall be observed over a period of one hour. A drop in pressure of five (5) psi or more during the one-hour test period shall be taken as an indication of leakage. After leaks are found and corrected, the Contractor shall repeat the pressure test using the same procedure described above. Should the Contractor be unable to obtain a satisfactory pressure test over a duration of one hour, he shall then be required to perform a leakage test conforming to AWWA Standard C600-93, and the leakage allowed must be calculated according to the formula required therein.

C. DISINFECTION

After the newly installed main has been pressure tested, all pipe and fittings connected to or forming a part of a potable water supply shall be sterilized by the Owner in accordance with AWWA Standard C651. The above method or others shall be as acceptable to the State Department of Environment and Conservation, Division of Water Supply.

In general, the point of application of the chlorinating agent shall be at the beginning of the pipeline extensions, or any valved sections thereof, and through a corporation cock inserted in the top of the newly laid pipe. Water from the existing distribution system shall be controlled so as to flow slowly into the newly installed pipeline during the application of chlorine. Valves shall be manipulated so that the strong chlorine solution in the pipe being treated will not flow back into the line supplying the water.

The chlorine solution shall be left in the mains for a period of twenty-four (24) hours after which the mains shall be flushed until only the normal residual chlorine found in tap water is present.

Samples of water shall be taken by the Department in accordance with AWWA C651 and shall be submitted to the bacteriological laboratory of the Owner. In the event any of the bacteriological samples show the presence of coliform organisms or an excessive total count, the disinfection procedure shall be repeated until samples of satisfactory bacteriological quality can be obtained.

The Owner shall furnish the chlorine for main disinfection and shall furnish all labor, tools, and equipment for the disinfection and sampling.

3.8 CLEANUP PROCEDURES AND REQUIREMENTS

The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated therefrom which may be suitable for backfilling or surfacing until the excavation has been refilled and surfaced.

As soon as the backfilling of an excavation is completed, and when in areas of existing development, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of the fill. The Contractor shall also remove all the pipe and other material placed or left on the street except material needed for the replacement of paving, and the street shall be opened up and made passable for traffic. Following the above work, the repairing and complete restoration of the street surfaces, bridges, crossings, and all places affected by the work shall be done as promptly as possible.

All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, parkways, railroads, grass plots, yards, etc., and the whole work shall be left in a tidy and acceptable condition.

Unless indicated on the Plans or instructed otherwise by the Engineer, the Contractor will be required to regrass lawn areas, road right-of-way areas, fields, pastures, woods, or other areas where any type of ground cover was originally present. Also, trees, shrubs, or other ornamental plants damaged by the Contractor's operation shall be replaced to the satisfaction of the Owner and in accordance with the City's Tree Management Ordinance.

The Engineer shall be the sole authority in determining time in which rough and final cleanup shall be accomplished. Rough cleanup shall consist of removal of rocks larger than one (1') foot in any dimension, grading of excess backfill material over pipeline or removal of said material, opening of any drainageways, restoration of any street or roadway to condition so that traffic may safely and conveniently use street or roadway, restoration of pedestrian ways to condition where pedestrians may safely and conveniently use same. Rough cleanup shall, in general, be prosecuted no later than one (1) day after pipe laying and backfilling or no farther behind pipe laying operations than one thousand (1,000') feet; whichever time limit is shortest shall govern. Final cleanup consisting of pavement replacement, sidewalk replacement, removal of rocks, hand raking with seeding, strawing, etc., of lawns and neutral grounds, adjusting grade of ground over pipeline, property repairs, and other items shall, in general, be accomplished no later than three (3) weeks after completion of backfilling.

3.9 SPECIAL WORK AREAS

A. GENERAL

The Contractor's attention is called to special conditions that exist in certain special areas that are commonly encountered in the installation of waterlines, namely:

1. In easements
2. On state highway and railroad right-of-way
3. Stream Crossings

The special conditions for these areas are discussed herein in Sections B, C, and D. All, some, or none of these areas may be encountered in the project for which these specifications apply.

B. WORK IN EASEMENTS

The Contractor shall take care in working on private property where easements have been obtained in order to install the waterline. At no time shall the Contractor remove any excavated material from the property without permission of the property owner. Any excess material, if not desired by the property owner, shall be disposed of in accordance with Section 3.8.

C. WORK ON STATE HIGHWAY AND RAILROAD RIGHT-OF-WAY

The installation of waterlines along and across state highways shall be made in accordance with the details shown on the Plans, as specified herein, and with all requirements of the Tennessee Department of Transportation (TDOT) with reference to construction operations, safety, traffic control, road maintenance and repair, etc.

The installation of waterlines along and across railroads shall be made in accordance with the details shown on the Plans, as specified herein, and with all requirements of the Railroad Company with reference to construction operations, safety, maintenance of service, etc.

Permits for such work will be obtained by the Owner/Developer. All costs for labor, materials, and supervisory personnel furnished by the TDOT and the Railroad Company in connection with the work, if any, shall be at the expense of the Contractor. The Contractor shall fully inform himself/herself of the conditions and insurance requirements of the permit and fully comply with those conditions and requirements.

The Contractor shall be responsible for fully informing himself/herself with regard to all TDOT and Railroad Company regulations and conditions relating to pipeline crossings.

The Contractor shall be responsible for notifying TDOT and the Railroad Company when work is about to begin on the crossing.

D. STREAM CROSSINGS

Where indicated on the Plans, special construction shall be used at stream crossings. Details shall be as shown on the Plans. These stream crossings require special construction materials or procedures.

When required, the Owner/Developer will submit the appropriate permit applications and details to TDEC and the U.S. Army Corps of Engineers so that appropriate permits can be obtained for the stream crossings. The Contractor shall be required to adhere to the permit requirements from each agency for the water line crossing of the stream.

END OF SECTION 02713