

**FEES - REPURIFIED WATER**

**1. Schedule of repurified water rates**

(a) *Rates established.* The schedules of repurified water service fees and usage rates to be charged and collected by the City from consumers of repurified water served by the City and its water and sewer department is hereby fixed and established as follows:

(b) *Repurified water monthly service charge.*

1	inch meter	\$ 5.00
2	inch or larger meter	10.00

(c) *Repurified water usage rate.* The water rate shall be \$0.05 per 100 cubic feet of consumption (\$0.0005 per c.f. One cubic foot equals seven and one-half (7½) gallons.

(d) *Outside rates.* Rates for customers outside the corporate limits shall be one and one-half (1 1/2) times the applicable water monthly service charge and the repurified water usage rate set out above.

(e) *Exemption of first year charges.* During the first twelve consecutive month period following initiation of service, customers shall pay the repurified water monthly service charge but shall be exempt from paying the repurified water usage rate.

(f) *Conditions.* All rates and charges are subject to all rules and regulations of the water and sewer department now or hereafter from time to time in force and effect.

(g) *Application of gross rate.* The above charge and rates are net, the gross rate and service charge being ten percent (10%) higher. In the event that the current monthly bill is not promptly paid by the due day applicable to and shown on the respective bills rendered, the gross rate shall apply. Generally, the due day shall be ten (10) days after the date of mailing of the respective bills rendered to consumers.

**2. Charges for taps made by City.**

(a) The charges for repurified water taps made by the Pigeon Forge Utility Department shall be as hereinafter set forth:

(1) *Stubs:* The charges for a one inch repurified water service line stub installed by the department in a street under construction or an easement shall be Three Hundred sixty-five Dollars (\$365.00), and the cost for a two inch shall be Five Hundred Dollars (\$500.00).

(2) *Meter Connection:* In areas where the service line stub has been installed, the charge for a one inch repurified meter connection shall be Five Hundred Dollars (\$500.00), and for a two inch repurified meter connection the cost shall be One Thousand One Hundred Dollars (\$1,100.00).

(3) *Complete tap:* In areas where the water service line stub has not been installed, the charge for a one inch repurified water tap shall be One Thousand One Hundred Dollars (\$1,100.00). The charge for a two inch repurified water tap shall be One Thousand Eight Hundred Fifty Dollars (\$1,850.00). A complete tap consists of both the stub and meter connection.

(4) *Large taps:* Charges for taps and service lines installed larger than two inch shall be the costs of labor, equipment, and materials.

(b) *Delayed connection:* If any person paying any such charge for any such repurified water tap shall, within two years thereafter, fail to request the City to make the repurified water tap so paid for, and if in the meantime the charge for such repurified water tap be increased, then such person shall be required to pay to the City such additional amount which, together with the amount already paid, will equal the increased charge then required to be paid for such repurified water tap, before such repurified water tap shall be made or be permitted to be made.

### **3. Outside City repurified water service charge.**

Where any repurified water main or line has heretofore been, is now being or is hereafter constructed and installed in any public street or streets, road or roads, highway or highways, other thoroughfare or thoroughfares or place or places located outside the corporate limits of the City of Pigeon Forge, no owner or owners of any property, or part or portion thereof, shall be permitted to make connection for repurified water service to, or to receive repurified water service through, any such repurified water main or line without first paying to the City of Pigeon Forge an outside the city repurified water service fee or charge of Two Hundred Fifty Dollars (\$250.00) with respect to each connection of such property, or part or portion thereof, for repurified water service to said repurified water main or line, which fee or charge shall be in addition to the charge for applicable repurified water tap.

## TECHNICAL SPECIFICATIONS FOR REPURIFIED WATER

### 1.1 GENERAL

These specifications cover the design, review of plans and specifications, installation, inspection, testing and acceptance of repurified water distribution systems and appurtenant items which are owned and maintained by Pigeon Forge. This includes developer built on site repurified water distribution systems in residential areas, commercial and industrial developments, off site transmission main extensions to development sites, and on site requirements for repurified water customers connected to the Pigeon Forge system.

#### 1.1.1 DEFINITIONS

- (a) Contractor shall mean any legal entity that builds or constructs appurtenances connected to the Pigeon Forge repurified water system.
- (b) Customer shall mean any legal entity that receives service from Pigeon Forge.
- (c) Director shall mean the Director of Public Works City of P i g e o n F o r g e
- (d) Engineer of Record shall mean the design engineer whose stamp appears on the set of plans submitted for consideration Pigeon Forge shall mean the water and sewer department of the City of Pigeon Forge.
- (e) Owner shall mean the City of Pigeon Forge

1.1.2 On site: Pigeon Forge shall own and maintain all portions of the repurified water system up to and including the meter.

1.1.3 Off site: Pigeon Forge shall own and maintain all portions of the repurified water transmission system.

### 1.2 PLANS PREPARATION

All on site and off site repurified water systems shall be designed in accordance with applicable regulations of Pigeon Forge, the Sevier County Health Department and the Tennessee Department of Environment and Conservation or their successors.

1.2.2 When a repurified water distribution main will serve existing or future developments beyond the borders of the proposed site, Pigeon Forge may require oversizing.

1.2.3 The repurified water distribution system shall be constructed in an easement or right of way dedicated to the City.

### 1.3 PLANS REVIEW

The Developer shall comply with the procedures and requirements land development within the City. This includes the requirement for submittal, review and approval of a preliminary plat and a repurified water master plan for the development.

#### 1.4 PROJECT ACCEPTANCE

Following completion of construction and testing, the Customer's Engineer of Record shall submit Record Drawings of the project. Record Drawings shall be sealed by a Registered Land Surveyor or Registered Engineer. Additionally, Record Drawings shall be submitted in digital format using Tennessee State Plane Coordinates - NAD 83.

**SECTION \_\_\_\_\_**

**REPURIFIED WATER LINES,  
VALVES, AND APPURTENANCES**

**PART 1 – GENERAL**

**1.1 SCOPE OF WORK**

The work covered by this Section relates to repurified water lines, valves and appurtenances including pipe material permitted, installation, testing, and cleanup.

**1.2 PIPE MATERIAL PERMITTED**

Pipe for repurified water lines shall be PVC pipe C900, C905, or ductile iron, as specified herein and shown on the contract drawings.

**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 be the responsibility of the Contractor.

**1.5 RELATED WORK SPECIFIED ELSEWHERE**

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

- A. Section \_\_\_\_\_ – Trenching, Bedding and Backfilling for Water lines and Sewage Force Mains and Repurified Water Lines
- B. Section \_\_\_\_\_ – Grassing
- C. Section \_\_\_\_\_ – Pavement Repair and Replacement

- D. Section \_\_\_\_\_ - Polyethylene Encasement for Ductile iron Pipes
- E. Section \_\_\_\_\_ - Concrete for Water Lines, Repurified Water Lines and Sanitary Sewer 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.

## 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 POLYVINYL CHLORIDE (PVC) PIPE

### A. MATERIAL

PVC pipe shall conform to the requirements of AWWA C900/905 and shall be furnished in cast iron pipe equivalent outside diameters. For pipe (4") inches through (12") inches in diameter, pipe shall be minimum pressure class 200 psi (DR14) with integral wall thickness bell ends. For pipe 14" in diameter and larger, minimum pressure class shall be 200 psi (DR 21) with integral wall thickness bell ends and furnished in cast iron pipe equivalent outside diameters.

### 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 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. Where restrained joints are called for on the plans, the pipe joints and fittings shall be as follows:

1. For C900 PVC pipe and fittings shall be EBAA Iron, Inc. Series 1600.
2. For C905 PVC pipe and fittings shall be EBAA Iron, Inc. Series 2800.

The restraining glands shall have a pressure rating equal to that of the pipe on which it is used.

### 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

1. All new buried pipe, including service lines, valves and other appurtenances shall be colored purple, Pleutone 522 or equivalent. Pipe shall be marked in accordance with AWWA C900/905 and shall also be marked with two lines in opposite sides of the pipe reading "**CAUTION REPURIFIED WATER - DO NOT DRINK**" in intervals not to exceed five (5) feet.

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

- a. Nominal size
- b. Type of material
- c. DR or class
- d. Manufacturer
- e. NSF Seal of Approval

3. Detection wire must be included.

### E. CERTIFICATIONS

The manufacturer shall furnish certifications as follows:

1. That the pipe and joints have been manufactured in accordance with AWWA C900/905 "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 minimum lengths of thirteen (13') feet, except for special construction conditions.

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## G. DETECTABLE TAPE

Detectable tape and wire is required for repurified water system pipe line. It shall be 2" wide and shall be an inert, bonded layer plastic with a metallic foil core and shall be highly resistant to alkalis, acids or other destructive chemical components likely to be encountered in soils. The tape shall be colored bright purple to denote location of repurified water line and shall bear the imprint: "**CAUTION REPURIFIED WATER - DO NOT DRINK**".

## H. MANUFACTURER

Pipe shall be as manufactured by Certainteed, Johns-Manville, LCP National, North American Pipe, or an approved equal.

### 2.3 POLYTUBING

Polyethylene Tubing will be acceptable for usage for repurified water in sizes 3/4" to 2" in diameter. Tubing for service lines shall be of a type approved by the National Sanitation Foundation for use in transmitting fluids for human consumption. The tubing shall be designed for a minimum burst pressure of 630 psi for water at 23 – C and shall be manufactured in accordance with the requirements of ASTM D2737.

### 2.4 DUCTILE IRON PIPE

A. Where directed by the Owner or Engineer or shown on the Contract drawings for use in special locations, ductile iron pipe shall be used in the repurified water system.

#### B. MATERIAL

Ductile iron pipe for repurified water lines shall be designed in accordance with the latest revisions of ANSI/AWWA C150/A21.50 for a minimum 200 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 repurified water lines 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 bituminous seal coat and a bituminous coating on the outside per ANSI/AWWA C151/A21.51. Pipe shall have an interior cement lining. Cement lining shall conform to ANSI/AWWA/C104/A21.4, latest revision. All pipe shall have a pressure class of 200 psi unless noted otherwise on the Plans.

All Ductile Iron Pipe (DIP) installed for use as repurified water main shall be wrapped in a polyethylene encasement as specified in Section 02735.

#### C. 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 American Lok-Fast joint pipe or equal.

#### D. 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.

#### E. 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. Pipe shall also be marked with two lines on opposite sides of the pipe reading "**CAUTION REPURIFIED WATER - DO NOT DRINK**" in intervals not to exceed five (5) feet. (Letters shall be minimum 2" in height).

#### F. 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.

#### G. LENGTHS

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

#### H. MANUFACTURER

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

### 2.5 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 ductile iron 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. Pipe and Foundry Company, American Cast Iron Pipe Company, James B. Clow and Sons, McWane Cast Iron Pipe Company, Griffin Pipe Products, or an approved equal.

## **2.6 REPURIFIED WATER SYSTEM VALVES AND VALVE BOXES**

- A. GENERAL - Valves on repurified water lines 3" - 12" in diameter shall be gate valves and valves on 16" in diameter and larger shall be butterfly valves as specified herein.
- B. GATE VALVES
  1. Gate valves shall be resilient seated, solid wedge, manufactured to meet or exceed the requirements of AWWA C509 of latest revision and in accordance with the following specifications, and shall be American Flow Control, Mueller, U.S. Pipe Company, M & H, or approval equal.
  2. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
  3. The valves are to be non-rising stem with the stem made of cast, forged, or rolled bronze as described in AWWA C509. Two stem seals shall be provided and shall be of the O-ring type.
  4. The stem nut, also made of bronze, may be independent of the gate or cast integrally with the gate. If the stem nut is cast integrally, the threads shall be straight and true with the axis of the stem to avoid binding during the opening or closing cycle.
  5. The sealing mechanism shall consist of a cast iron or ductile iron gate having a vulcanized synthetic rubber coating or a rubber seat mechanically retained on the gate. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
  6. The valve body, bonnet, and bonnet cover shall be cast iron ASTM A126, Class "B" or ductile iron ASTM A395 or A536.
  7. Valves shall be designed to withstand a hydrostatic test pressure of three hundred (300) pounds per square inch, applied internally with the gates closed, and shall be

guaranteed for not less than one hundred fifty (150) pounds water working pressure unless otherwise shown on plans.

8. Buried valves shall be mechanical joint and equipped with a two (2") inch square operating nut. Valves in structures shall be flanged and equipped with removable hand wheel operators. Wedges shall be of all bronze, side wedge type, for valves eight (8") inch diameter and smaller, and cast iron bronze mounted for ten (10") inch and larger valves. Stem collar bushings shall be all bronze. **Valves for all repurified water lines shall open to the right.**

#### C. BUTTERFLY VALVES - Rubber Sealed Butterfly Valves (16" through 48")

1. All valves to be furnished under these specifications must be manufactured by: Henry Pratt Company, Aurora, Illinois; American Darling Valve manufactured by American Cast Iron Pipe Company, Birmingham, Alabama; Mueller Company, Linesal III, Decatur, Illinois.
2. All butterfly valves shall be furnished for installation in a horizontal line with the operating nut in a vertical position. Each shall be furnished for buried service with a valve box as specified and as detailed on the Drawings.
3. All butterfly valves shall be of the tight closing, rubber seated type. Valves shall be bubble tight (in both directions) at rated pressures and shall be satisfactory for applications involving throttling service and/or frequent operations and for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. Valves shall conform to Class 150-B of AWWA Specifications C-504, latest revision. The manufacturer shall have manufactured tight closing rubber seated butterfly valves for a period of at least five years. All valves shall be designed for the most severe operating conditions such as free discharge of "line break" conditions.
4. Valve bodies shall be constructed of cast iron ASTM A-126 Class B. Body thicknesses shall meet or exceed the requirements given in AWWA Specification C-504 of latest revision, for Class 150-B Valves.
5. Valve discs shall be constructed of ductile iron conforming to ASTM A-536 or cast iron conforming to ASTM A48, Class 40 or alloy cast iron conforming to ASTM A-436, Type 1. Shafts shall be constructed of either 18-8, Type 304 stainless steel, turned, ground and polished, mechanically secured to the valve disc by the use of 18.8, Type 304, stainless steel taper pins, or high-tensile carbon steel, furnished with permanent rubber static shaft seals and Type 304 stainless steel shaft journals to completely isolate the shaft from line fluid. Non-circular hex shafts will be acceptable.

6. Valve seats shall be of either new natural rubber or of synthetic rubber, Buna N compound. Rubber seats may be applied to either the body or the disc. Seats applied to the body shall be simultaneously molded and vulcanized into the body, and seat bond must withstand 75 lbs. pull under test procedure ASTM D-429, Method B. Rubber seats applied to the disc edge shall be vulcanized to an 18-8 stainless steel locking screw fasteners. Valves with the rubber seat integral with the body and machined to provide a permanent corrosion resistant seating area. Valves employing a complete rubber liner will not be acceptable in any size.
7. Valves shall be fitted with sleeve type bearings. Bearings shall be corrosion resistant and self-lubricating.
8. Both valve ends shall be mechanical-joint as per AWWA Specification C-111/A21.11.
9. All surfaces of the valves shall be clean, dry and free from grease before painting. The valve interior surfaces, except seating surfaces, and the exterior surface shall be evenly coated with black asphalt varnish in accordance with Federal Specification TT-V-51c and AWWA C-504. In addition, butterfly valves shall be coated on the outside with an epoxy coating. **Coating shall be colored purple to denote use in the Repurified Water System.**
10. Valve operators shall be designed to hold the valve in any intermediate position between full open or fully closed without creeping fluttering. Valve operators shall be manual and shall be of the traveling nut type. Units shall be designed for buried service and shall be fully gasketed and grease packed. Adjustable mechanical stops shall be provided to stop valve in the fully opened and fully closed positions. The 2" square operating nut shall have cast on it an arrow indicating the direction of turning for opening the valve. **Valves for use Repurified Water Lines shall open to the right.** Manual operators shall require at least 30 turns of the operating nut to rotate the disc 90 degrees.
11. Hydrostatic and leakage tests shall be conducted in compliance with AWWA Specification C-504, and copies of the certified reports shall be submitted to the Engineer.
12. The Contractor shall submit specifications and blueprints of manufacturer showing detail dimensions and giving the kind of material used, also tensile strength and elastic limit of metal, and shall give weight of valves and diameter of stem at bottom of thread.
13. The Contractor shall furnish the Engineer with certificates of inspection, sworn to be from the factory inspector in the presence of a Notary Public, stating that the valves were made and satisfactory tested in full compliance with AWWA C-504.

## 2.7 VALVE BOXES AND COVERS

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- A. Valve boxes shall be Russco Screw Type B-129, three piece style, with a base measuring 8-3/4" diameter by 9" high.
- B. The drop cover shall be Russco B-115, lock cover, marked "**Repurified Water**" cast on the cover with a cast arrow indicating the valve opens to the right (clockwise).

## 2.8 BLOW-OFF VALVE ASSEMBLIES

Blow-off valve assemblies shall be a two and one-quarter (2-1/4") inch M & H (Style 33) Post Type Hydrant, unless noted otherwise, and shall be constructed in accordance with the Standard Detail Drawing.

## 2.9 METERS

Meters 2 inches and smaller shall be magnetically coupled displacement type, with lavender registers equipped with remote read radio transmitters, provided and owned by MWSD. Setters used for repurified water meters shall be equipped with integral check valves.

## 2.10 HOSE BIBB CONNECTIONS

Hose bibb connections are allowed for hand watering and other limited outdoor activities provided the hose bibb is located in a locked box below ground level.

The lock box shall bear a permanent and clear label, "**REPURIFIED WATER**" "**DO NOT DRINK □ NO BEBER**"

## 2.11 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.

## 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:

1. Permit is secured from appropriate State, County, or Municipal authorities having jurisdiction.
2. All emergency agencies are notified before road is closed.
3. 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 repurified water lines 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 repurified water lines are to be constructed near sewer lines or water lines, horizontal and vertical separation shall be maintained as described below:

A. Separation of Repurified Water Lines and Sanitary Sewer Lines

1. Wherever practical for parallel installations, line separation is to be at least 10 feet edge to edge. If this cannot be obtained, the bottom of the repurified waterline shall be at least 18 inches above the top of the sewer. If this condition is also unobtainable, the sewer line is to be constructed of materials and have a joint design equivalent to repurified water main standards as approved by the Water Management Department and shall be pressure tested to 50 psi to assure watertightness.
2. Where the repurified water line crosses house sewers, storm sewers, or sanitary sewers, a separation of at least 18 inches shall be provided between the bottom of the repurified water line and the top of the sewer. If this separation cannot be obtained, sewers within 10 feet of the repurified waterline shall be constructed of materials and have a joint design equivalent to repurified water main standards as approved by the Water Management Department. Such sewer lines shall be pressure tested to 50 psi to assure watertightness. Repurified water mains passing under sewers shall be protected (in addition to the above sewer line construction) by providing: at least 18 inches between the bottom of the sewer and the top of the repurified water line; adequate structural support of the sewer to prevent excessive joint deflection or damage to the repurified waterline; centering of the repurified water line section to result in the repurified waterline joints being removed from the sewer line to the maximum possible extent.
3. No repurified water line shall pass through or come into contact with any part of a sewer or sewer manhole.

B. Separation of Repurified Water Lines and Potable Water Lines

1. Horizontal Separation – Wherever practical, a minimum horizontal separation of ten feet between parallel buried, repurified water and potable water lines shall be maintained. If construction conditions dictate that the parallel repurified water line must be installed within 10 feet of a potable water line, then the top of the repurified water line shall be 18 inches below the bottom of the potable water line or shall be restrained joint or installed in a sleeve. At no time shall the separation be less than four feet.
2. Vertical Separation of Crossings - Where a repurified water line crosses a buried potable water line, the repurified water line must be located a minimum of 18 inches below the potable water line. Repurified water lines may pass over a potable water line

with a minimum of 18 inches vertical separation is maintained if a full standard pipe length is centered over the crossing or the repurified water line is installed in a pipe sleeve, which extends a minimum of 10 feet on either side of the potable water line. There will be no additional compensation for installation of the pipe sleeve. Cost shall be included in other unit prices.

### **3.2 EXCAVATION AND BEDDING**

The trench excavation for repurified water lines 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 repurified water line, 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 repurified water lines 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**

Repurified water lines 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.

Pipe line 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 pipe line 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 REPURIFIED WATER MAINS**

#### **A. GENERAL**

The Contractor shall make connections to existing repurified 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. No connections to an existing repurified water line shall be made until all lines have been tested and approved for service.

#### **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 repurified 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. VALVES

Where valves are deeper than 36 inches an extension is required to bring the operating nut to within 24 inches of the finished grade.

Repurified water transmission mains shall be equipped with blow off valves at appropriate locations, as determined by MWSD.

All valves shall be left exposed until visually inspected and approved by a MWSD inspector

#### E. 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 repurified water lines and other appurtenances shall be done in accordance with Section 02221W, Trenching, Bedding and Backfilling Water Lines, Sewage Force Mains and Repurified Water Lines.

### **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 repurified 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 pipe line 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 repurified 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

All pipe and fittings connected to or forming a part of a repurified water supply shall be sterilized by the Owner in accordance with AWWA Standard C651 with assistance from the Contractor. The following method, or others acceptable to the State Department of Environment and Conservation, Division of Water Supply, and the Engineer, shall be used.

Flush out the new pipe lines until the water runs clear. This shall be done after the pressure test. Each valved section of the newly laid pipe shall be flushed separately with repurified water from the public supply.

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

The point of application of the chlorinating agent shall be at the beginning of the pipe line extensions, or any valved sections thereof, and through a corporation cock inserted in the top of the newly laid pipe. Water from the existing repurified water distribution system shall be controlled so as to flow slowly into the newly installed pipe line during the application of chlorine. The rate of chlorine mixture flow shall be in such proportion to the repurified water entering the newly installed pipe that the chlorine dose applied to the new pipe shall be not less than fifty (50) ppm and shall produce at least twenty-five (25) ppm after twenty-four (24) hours standing. 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 repurified water is present.

Samples of repurified water shall be taken by methods and personnel approved by the Engineer 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.

## 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 pipe line 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 pipe line, 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 water lines, namely:

1. In easements

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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. Other special areas, less frequently encountered, but applicable to the project for which these specifications apply, are discussed in the Special Conditions Section of these specifications.

#### B. WORK IN EASEMENTS

The Contractor shall take care in working on private property where easements have been obtained in order to install the water line. 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 repurified water lines 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 repurified water lines 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. 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 pipe line 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

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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 will submit the appropriate permit applications and details to 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 requirements from the Corps of Engineers permit for the repurified water line crossing of the stream.

END OF SECTION

## SECTION \_\_\_\_\_

**POLYETHYLENE ENCASUREMENT FOR DUCTILE IRON PIPE****PART 1 - GENERAL****1.1 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required for installing polyethylene encasement of ductile iron pipe and associated appurtenances, where shown on the Plans or otherwise required by the ENGINEER.

**PART 2 – PRODUCTS****2.1 POLYETHYLENE TUBES AND SHEETS**

- A. Polyethylene tubes and sheets used for encasement shall conform to AWWA C105 standard in underground installations of ductile iron piping for water and other liquids (e.g., repurified water mains).
- B. Polyethylene wrap in tube or sheet form for piping encasement shall be manufactured of virgin polyethylene material conforming to the requirements of ANSI/ASTM Standard Specification D1248. The specified nominal thickness for low-density polyethylene film is 0.008 in. (8 mils). The specified nominal thickness for high-density cross-laminated polyethylene film is 0.004 in. (4 mils). The minus thickness tolerance shall not exceed 10 percent of the nominal thickness on both material types.
- C. The polyethylene tubes and sheets for use in encasing repurified water mains shall be color Pantone 522, or approved equal.

**PART 3 - EXECUTION****3.1 INSTALLATION OF POLYETHYLENE ENCASUREMENT:**

- A. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely air and watertight enclosure. Overlaps shall be secured by the use of polyethylene adhesive tape, plastic string or other nondegradable material approved by the ENGINEER and capable of holding the

encasement in place until backfilling operations are completed. Pipe and fittings shall be wrapped with polyethylene prior to pouring concrete thrust blocks.

1. Method A - For use with Polyethylene Tubes:

- a. Cut polyethylene tube to a length approximately two feet (2') longer than the pipe section.
- b. Slip the tube around the pipe, centering it to provide a one foot (1') overlap on each adjacent pipe section, and bunching it accordion-fashion lengthwise until it clears the pipe ends.
- c. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.
- d. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points.
- e. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Paragraph 4.

2. Method B - For use with Polyethylene Tubes:

- a. Cut polyethylene tube to a length approximately one foot (1') shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide six inches (6") of bare pipe at each end. Take up the slack at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points; secure the ends as described herein under Method A.
- b. Before making a joint, slip a three foot (3') length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. After completing the joint, pull the three foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot (1').
- c. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Paragraph 4.

### 3. Method C - For use with Polyethylene Sheets:

- a. Cut polyethylene sheet to a length approximately two feet (2') longer than that of the pipe section. Center the cut length to provide a one foot (1') overlap on each adjacent pipe section, bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe so that it circumferentially overlaps the top quadrant of the pipe. Secure the cut edge of polyethylene sheet at intervals of approximately three feet (3').
- b. Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene. After completing the joint, make the overlap and secure the ends as described herein under Method A.
- c. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Paragraph 4.

### 3. Appurtenances:

#### Pipe-Shaped Appurtenances:

- a. Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.

#### Odd-Shaped Appurtenances:

- a. When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up around the body. Make seams by bringing the edges together, folding over twice, and taping down.
  - b. Tape polyethylene securely in place at valve stem and other penetrations.
4. Repair any cuts, tears, punctures, or damage to polyethylene with polyethylene adhesive tape or with a short length of polyethylene sheet or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.
  5. Openings in the encasement shall provide for branches, blowoffs, air valves, and similar appurtenances by making an X-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut with tape. Service taps and other taps without tapping sleeves should be made directly through the polyethylene after wrapping the pipe with 2-3 layers of polyethylene tape, with any resulting damaged areas being repaired as described herein.

6. Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least three feet (3'). Secure the end with circumferential turns of tape. Service lines and other attached lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a minimum clear distance of three feet (3') away from the ductile-iron pipe.
7. Backfilling for Polyethylene-Wrapped Pipe
  - a. Use the same backfill material as specified for pipe without polyethylene wrap, exercising care to prevent damage to the polyethylene wrapping when placing backfill material.
  - b. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage the polyethylene. Backfill shall be as specified for the pipe without polyethylene encasement.

END OF SECTION