

**BELFAST WATER DISTRICT  
BELFAST, MAINE  
(207-338-1200)**

**WATER MAIN AND SERVICE SPECIFICATIONS**

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**1. GENERAL**

Water mains, services and appurtenances shall be of the design, type, kind, size and class as shown on the plans and as specified herein. The pipe and appurtenances shall be laid on a firm foundation with tight joints and properly protected in a trench excavated and backfilled in accordance with these specifications and accompanying plans and as may be required by the Water District.

**2. DESIGN CRITERIA**

- a. Service Pressure: Water system improvements shall be designed to provide a normal working pressure of not less than approximately twenty-five (25) psi nor more than one hundred (100) psi.
- b. Main Size: The minimum size of all new water mains for providing fire protection and serving fire hydrants shall be eight (8") inch diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow or peak demand while maintaining a minimum residual pressure of twenty (20) psi.

The minimum size of all hydrant branch mains shall be six (6") inch diameter.

- c. Hydrants: Unless otherwise required by the fire department the maximum spacing for fire hydrant intended to supply a fire flow requirement of five hundred (500) gallons per minute or less shall be one thousand (1000') feet and for fire flow requirements in excess of five hundred (500) gpm the maximum spacing shall be five hundred (500') feet. Closer spacing may be required in order to locate hydrant at street intersections or other points convenient to the fire department, or as required by the City.

A private fire hydrant may be accepted by the Belfast Water District as a public hydrant providing four (4) conditions are met;

1) the hydrant is built and installed according to the District's specifications, 2) the customer provides the District with an easement to access the hydrant and main on the customer's property, 3) complete a waiting period of two (2) years after the hydrant has passed the pressure test, 4) the private road or street it is on is accepted as a public road or street by the City of Belfast.

- d. Gate Valves: Gate valves shall be required at all main intersections and along the water main at intervals of one thousand (1000') feet. A gate valve or shut off is required on each hydrant branch and on all service mains. The District shall decide on the final number and location of all valves.
- e. Dead Ends: To maintain water quality and fire flows, dead ends shall be minimized by looping all new mains whenever practical as determined by the District. The additional required pipe to loop the system shall not be over 1000 ft.
- e. Air Relief Valves: Air relief valves shall be installed at all high points of the new main as determined by the District. The size and design of the valve and piping shall be determined by the District.
- f. Blow-offs: Blow-offs or hydrants shall be installed at the ends of all dead end lines and at low points in mains as determined by the District. The size and design of the blow-off valve and piping shall be determined by the District.
- g. Separation of Water Mains and Sewers:
  - 1. Parallel Installation:
    - a. Normal conditions: Water mains shall be laid at least ten (10') feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge-to-edge.
    - b. Unusual conditions: When local conditions (such as ledge, bridges, etc.) prevent a horizontal separation of ten (10') feet, a water main may be laid closer to a storm or sanitary sewer provided that:
      - i. The bottom of the water main is at least eighteen (18") inches above the top of the sewer and a minimum of five (5') feet edge-to-edge horizontally is provided.
      - ii. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to

water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

- iii. The Maine Department of Human Services agrees that local conditions warrant less than ten (10') feet horizontal separation and approves the plans and specifications of the work.

## 2. Crossings:

- a. Normal conditions: Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least eighteen (18") inches between the bottom of the water main and the top of the sewer, whenever possible.
- b. Unusual conditions: When local conditions prevent a vertical separation as described in 2.a. the following construction shall be used:

- i. Sewers passing over or under water mains should be constructed of the materials described with joints that are equivalent to the water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.
- ii. Water mains passing under sewers shall, in addition, be protected by providing a vertical separation of at least eighteen (18") inches between the bottom of the sewer and the top of the water main; adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains; and that one full length of water pipe be centered at the point of crossing so that the joints will be equal distance as far as possible from the sewer.

- h. Services: No more than one customer shall be served from a service pipe under the control of a single curb stop or shut off. A separate meter shall be provided for each customer. Where the length of the service pipe is greater than two hundred (200') feet between the District's main and the premises to be serviced, the water meter shall be placed in a meter pit at the edge of the traveled way. The District shall establish the size and type of construction of the meter pit. The Water District shall determine, based on the information provided by the customer, the size of the service pipe. No water services shall be installed in a

common trench with other underground utilities; separation from sewers shall be as outlined in paragraph g, above.

- i. Backflow Devices: All water services including fire lines shall be equipped with an approved backflow device in accordance with the District's Cross Connection Program approved on January 6, 2006. The backflow device shall be installed at the meter location or where the fire line enters the building.
- j. Fire Services: A separate service shall be provided to serve a building sprinkler system and/or private fire protection system and be equipped with nothing less than a testable double check valve.

### 3. MATERIALS - SERVICES:

**All materials must meet NSF/ANSI Standard 61-2007 (Standard 61) for low lead content. All materials must be submitted to the District and approved by the District before they can be installed.**

- a. Service Pipe: Water service pipe shall be Type K, annealed seamless copper water tube meeting the requirements of ASTM B88. Joints shall be packed or compression type as required by the corporation stop and curb stop. Minimum allowable size for service pipe shall be one (1") inch. Where service pipes larger than two (2") inches are required, ductile iron pipe shall be used. The minimum allowable size of ductile iron pipe service shall be four (4") inches. That portion of the service pipe from the curb stop to the building may be 200 psi CTS plastic pipe, that meets AWWA C-901 specifications, with compression fittings only.
- b. Corporation Stops: Ball type corporation stops two (2) inches and smaller shall be constructed of virgin water works brass (85-5-5-5), shall have compression type outlet and CC type threaded inlet, and shall be Mueller 110, Catalog Numbers H-15008 or H-15013, or equivalent.
- c. Curb Stops: Ball type curb stops or shut offs two (2") inches and smaller shall be constructed of virgin water works brass (85-5-5-5), shall have inlet and outlet compression type joints and shall be Mueller 110, Catalog Number H-1504-2 or H-15172, or equivalent. Must open left. Stop and waste valves shall not be used.
- d. Service Saddles: Service saddles shall be double strap type with ductile iron body (ASTM A536); Buna-N gasket and low alloy steel straps, nuts and washers. Inlet thread shall be compatible with the corporation stop.

#### 4. MATERIALS – MAINS

**All materials must meet NSF/ANSI Standard 61-2007 (Standard 61) for low lead content. All materials must be submitted to the District and approved by the District before they can be installed.**

- a. Ductile Iron Pipe: Ductile iron pipe shall conform to the latest edition of AWWA C151 (American Water Works Association) standard. Pipe shall be double cement lined with seal coat. The minimum thickness shall be class 52 or higher. Factory applied bituminous coating shall be furnished on all underground piping. The cement lining shall conform to the latest revision of AWWA C104.

“Seal lock gaskets or restrained joint” ductile iron water main shall be used in the following, but not limited to, wetlands, deep fill areas, slopes 10% or more and areas of where the soil has been previously excavated.

Unless otherwise required for joint restraint, pipe joints shall be “push-on” type and shall meet the requirements of AWWA C111, or the latest revision thereof.

- b. H.D.P.E. Pipe: H.D.P.E pipe must meet AWWA C-906 specifications. May also be considered, but need prior approval from District.
- c. Fittings: Fittings for ductile iron water pipe shall be ductile iron and shall meet the requirements of AWWA C110. The fittings shall be cement lined in accordance with AWWA C104. The minimum pressure rating for all fittings shall be two hundred fifty (250) psi unless a higher pressure class is required for the specific installation. Unless otherwise required for joint restraint, joints on fittings shall be mechanical joint in accordance with AWWA C111.
- d. Mechanical Joint Follower Gland Pipe Restrainer: Mechanical joint follower gland pipe restrainer shall be a ductile iron follower gland with multiple gripping action restrainer wedges. Gasket shall be standard MJ gasket meeting ANSI/AWWA-C111/A21.11. Working pressure shall be 350 psi up to pipe sizes of 12-inches. Pipe restrainer shall be Megalug. EBBA Iron Sales, or approved equivalent
- e. Valves:
  1. Gate Valves: Gate Valves shall be iron body bronze mounted, resilient seat, mechanical joint, for underground use, wrench operated, non-rising stem, “O-ring” seal in accordance with AWWA C509. All valves shall open LEFT, and shall have the

maker's initial, pressure rating and the year of manufacture cast on the body, and shall be Mueller A2370-20 or equal. Valves twelve (12") inches and smaller shall be designed for a water working pressure of two hundred (200) pounds per square inch and valves sixteen (16") inches and larger shall have a working pressure of one hundred fifty (150) psi. Valves sixteen (16") inches and larger shall be designed for horizontal installation and shall be equipped with a bypass. Gate valves shall have a two (2") inch nut for wrench operation and the operating nut shall have an arrow cast in metal indicating the direction of opening. Valves shall "OPEN LEFT". Valves shall have maker's initial, pressure rating and a year of manufacture cast on the body.

2. Butterfly Valves: Butterfly valves shall have a cast of ductile iron body with bronze, cast iron, ductile iron, or Ni-resist disc with a rubber or elastomer seat and shall meet or exceed the requirements of AWWA C504. Valves shall be Class 150B unless specified otherwise. Operators shall be suitable for direct burial, hermetically sealed and permanently lubricated. The valve shall have mechanical joint ends and shall "OPEN LEFT". The two (2") inch square operating nut shall have an arrow cast in the metal indicating the direction of opening. Butterfly valves shall not be used in mains twelve (12") inches and smaller.
- f. Valve Boxes: Valve Boxes shall be heavy pattern cast or ductile iron, cast in two or three telescoping sections of sliding construction and of such lengths as will provide, without full extension, the required cover. The lower section shall be five and one-quarter (5 1/4") inch minimum inside diameter and shall be belled or domed at the bottom to fit over the valve nut. The upper section shall fit over the lower section. Covers shall be at least six (6") inches in diameter, shall fit flush with the top, shall have the word "WATER" cast thereon in raised letters, and shall be slotted for easy removal. Valve boxes shall be of good quality cast or ductile iron, free from all defects in material and workmanship, and shall be coated with coal-tar pitch enamel or other approved coating. Valve boxes shall be suitable for the size valve on which they are used.
- g. Curb Boxes: Curb boxes shall conform to the specifications for Valve Boxes except that for curb boxes for curb stops two (2") inches and smaller shall have a one-piece cast or ductile iron arch base, a steel pipe extension upper section, cast iron lid and thread bronze plug with pentagon nut (rope thread). A stationary five eighths (5/8") inch minimum diameter by twenty four (24") inches minimum long stainless steel rod shall be installed in each curb box.
- h. Tapping Sleeves: Mechanical joint tapping sleeve: shall be ductile iron and have ductile iron mechanical joint end seals conforming to AWWA C111, with outlet

flange conforming to AWWA C207, class D with ANSI 150 lb. drilling recessed for tapping valve. Tapping sleeve shall fit AWWA standard of 1908, Class AB-CD cast iron pipe. Manufactured by Clow, Mueller, or approved equal. Acceptable for cast iron and ductile iron pipe. Stainless steel tapping sleeve: shall be 304 stainless steel or ductile iron outlet flange conforming to AWWA C207 Class D, ANSI 150 lb. drilling recessed for tapping valve. Bolts shall be high strength 18-8 stainless steel with heavy hexagon nuts conforming to ANSI/AWWA C111 / A21.11. Gasket material shall be grade 30 or approved equal and shall have a smooth inside taper for uniform seating. Acceptable for ductile iron pipe. Note 1: All size on size taps require full body Ductile Iron MJ tapping sleeves.

- i. Tapping Valves: Tapping valves shall be epoxy coated with 200 psi working pressure, non-rising stem, “O” ring, open left, flanged end conforming to AWWA C207, Class D, ANSI 150 lb. drilling, mechanical joint end conforming to AWWA C111, two-inch ductile iron operating nut with 304 stainless steel bolt, resilient seated gate valve conforming to ANSI/AWWA C509, manufactured by Waterous Series 500, American Darling CRS 80, Mueller A2360, AVK series 25, or approved equal. Tapping valves shall be supplied with standard mechanical joint accessories, high strength low alloy steel bolts, and heavy hexagon nuts conforming to ANSI/AWWA C111/A21.11. Tapping valve seal plates and bonnets shall have either all silicone bronze or 304 stainless steel bolts and nuts.
- j. Hydrants: Hydrants shall be breakaway type meeting or exceeding AWWA C502. Hydrants shall have six (6”) inch mechanical joint inlet, a five and one-quarter (5 ¼”) inch minimum valve opening and shall open by turning counter clockwise (OPEN LEFT). Hydrants shall have two (2) two and one-half (2 ½”) inch and one (1) four and one-half (4 ½”) inch hose outlets with National Standard Fire Hose Threads. Minimum depth of bury shall be six (6’) feet. Hydrants shall be shop painted as per AWWA C502 and field painted after installation with two (2) coats of alkyd enamel paint as per color requirements of the Water District. HYDRANT DRAINS SHALL BE CLOSED FROM THE FACTORY (OPTION 009). Hydrants shall be Mueller or Waterous.
- k. Coupling and Connectors: For joining new pipe to new pipe, couplings shall be solid sleeve type, ductile iron with mechanical joints conforming to AWWA C110. For joining new pipe to old pipe, couplings shall have a ductile iron middle ring, two ductile iron follower rings, high strength low alloy steel nuts and bolts and virgin compounded rubber gaskets.
- l. Thrust Blocks: Thrust blocks shall be cast-in-place or pre-cast concrete with a minimum compressive strength of three thousand (3000) psi at twenty-eight (28) days.
- m. Miscellaneous Metal Work: Bends, hydrants, valves, and appurtenances shall be strapped and clamped where required and/or as directed. Steel bars, rods and plates shall be of structural steel. Straps, bridle rods, clamps, anchors, and such

other parts shall be provided as directed and as approved. After installation, all parts of the strapping and clamping devices shall be given two heavy coats of an approved bituminous protective coating.

n. Backfill:

1. Common Fill: Mineral soil substantially free from organic materials, loam, wood, trash, and other objectionable materials which may be compressible or which cannot be properly compacted. Common fill shall contain no stones larger than six (6") inches in diameter. Common fill shall have properties such that it can be readily spread and compacted. Snow, ice and frozen material shall not be permitted.
  
2. Screened Gravel or Crushed Stone: Screened gravel shall be well graded in size from one-quarter (1/4") inch to three-quarter (3/4") inch and shall consist of clean, hard, and durable particles or fragments. It shall be free from dirt, vegetable, or other objectionable matter, and excess of soft, thin elongated, laminated or disintegrated pieces. The grading shall conform to the following requirements:

<u>Sieve Designation</u>	<u>% Passing by Weight Square Opening</u>
1"	100
3/4"	96-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

3. Granular fill: shall consist of hard, durable stone and coarse sand, free from frost, frozen lumps, loam and clay, well graded, and containing no stone having any dimension greater than one and one-half (1 1/2") inches. The grading of sizes and material shall be



such that the gravel may be thoroughly consolidated. The grading shall conform to the following requirements:

<u>Sieve Designation</u>	<u>% Passing by Weight Square Opening</u>
3/4"	95-100
No. 4	50-95
No. 40	5-50
No. 200	0-10

- o. Pavement: Provide all materials in accordance with the applicable sections of the Standard Specification for Highways and Bridges of the Maine Department of Transportation (D.O.T.).
  1. Aggregate Sub-base and Base: Division 700 – Material Details, Section 703 – Aggregates, Subsection 703.06 – Type A and Type B for Aggregate Base.
  2. Bituminous Tack Coat – Provide AE-90 Asphalt Emulsion Material, Division 700 – Material Details, Section 702 Bituminous Material, Subsection 702.04 – Emulsified Asphalts.
  3. Bituminous Concrete Binder and Surface Courses – Division 700 – Materials Details, Section 702 – Bituminous Material and Section 703 – Aggregates Subsection 703.09, Grading B and Grading C for roadways; Grading C and D for sidewalks, islands and drives.
  4. Sidewalks (When Applicable): Division 700 – Material Details and (When Applicable) Section 608 – Sidewalks.
  5. Pavement Markings – Section 708.03 – Pavement Marking Paint.

## **5. CONSTRUCTION METHODS**

- a. General: In unloading, storing, stacking and handling of pipe, fittings, valves or appurtenances, the contractor shall take special care to insure that his methods are consistent with methods employed by the manufacturer in the manufacture and shipping of the product. Insofar as possible, all heavy materials shall be carefully handled by the use of hoists or skidways to avoid shock or damage. Pipe handled

on skidways shall not be skidded or rolled against pipe already on the ground. It shall be the contractor's responsibility to inspect all shipments, and to replace or repair at his own expense any materials which have been damaged through his own negligence. Whenever possible, pipe shall be strung along the routes with the bell ends facing in the direction in which the work is to proceed.

- b. Trench Excavation: The contractor shall excavate the trench to the lines and grades as shown on the plans and as required by the District. Special care shall be taken to protect existing underground utilities and support the sides of the trench to prevent movement, to include the use of sheeting, shoring and bracing. The contractor shall also be required to do all dewatering of the trench which may be necessary to insure that the trench bottom is firm and dry. If, in the opinion of the District, unsatisfactory soil conditions exist at the required trench grade, the contractor may be required to excavate below normal trench grade until suitable foundation material is encountered. The excavation shall then be backfilled with screened gravel in twelve (12") inch layers. Each layer shall be properly tamped and compacted until normal trench grade is obtained. The contractor shall make such additional excavations as may be necessary to provide for proper placement of concrete thrust blocks, valves, hydrants, services and other appurtenances as shown on the plans or as required by the Water District. All water mains trenches shall be such that a minimum cover of six (6') feet is provided over the pipe, except at gate valves where a minimum of three (3') feet of cover shall be provided at the top of the valve bonnet. The maximum depth of cover shall be seven (7') feet unless approved otherwise by the District.
- c. Bedding the Pipe and Fittings: All pipe and fittings shall be placed on a layer of bedding material consisting of compacted screened gravel or granular fill. The depth of the bedding shall be six (6") inches minimum or equal to one-half (1/2) the diameter of the pipe whichever is greater. Any voids under the pipe shall be filled and thoroughly tamped.
- d. Laying the Pipe and Fittings: The pipe shall be placed in the trench in accordance with the manufacturer's recommendations or by an approved method in such a manner as to insure that the pipe is not damaged. All pipe shall be thoroughly sound, dry and clean, before laying and the utmost of care shall be taken to insure that its condition is not altered when it is placed on the bed. A water tight plug shall be installed once the pipe is in place to keep out groundwater and dirt. All work associated with laying the pipe shall conform to AWWA Standard Specification C600 wherever applicable and not in conflict with the provisions contained in these specifications. When the pipe is in place, screened gravel or granular fill, whichever is applicable, shall be placed in the trench and thoroughly compacted in twelve (12") inches above the top of the pipe.
- e. Installation of Valves and Hydrants:
  1. Valves: The contractor shall install all valves and tapping sleeves and valves together with valve boxes, at the locations shown on the

plans or as directed by the Water District. In general valves shall be installed as close as possible to plumb and in accordance with the applicable subsections 4(c) and 4(d) of this article, and in accordance with the manufacturer's recommendations. Valve boxes shall be installed at every valve location and shall be adjusted to the proper finish grade and set plumb and centered over the operating nut of the valve. The contractor shall exercise special care that the valve box is free of dirt and other obstructions and that the base does not rest on the valve bonnet. An earth cushion shall be provided between the bonnet and the base. After installation is completed, all valves shall be operated and then left in the closed position.

2. Tapping Sleeves and Valves: Tapping sleeves and valves shall be installed with the outlet flange set vertically and the sleeve squarely centered on the main. Concrete or granite blocking shall be placed beneath the sleeve and valve to provide support. Concrete thrust blocking shall be placed behind and under the sleeve and valve after the top is completed. The valve shall be flushed after completing the taps to ensure the valve seat is clean. Bituminous coating shall be applied to the bolts and nuts holding the sleeve together.
  
3. Hydrants: The hydrant shall be set plumb and at the proper elevation with respect to final finished grade. The break away flange shall be set two (2") inches above finish grade. The hydrant base shall be set on firm material. The hydrant branch valve, and mechanical joint tee shall be adequately anchored together by mechanical means (Megalugs or tie rods) and by concrete thrust blocks. Hydrant locations shall be such that no part of the hydrant is within one (1') foot of the curb line and no less than twenty feet from an intersecting street. Prior to any hydrant being tested under pressure, all hydrant laterals and mains shall be flushed to remove dirt, rocks, and foreign matter. Each nozzle and pumper outlet shall be at least eighteen (18") inches above grade on the installed hydrant.
  
- f. Concrete Thrust Blocks: Concrete thrust blocks shall be installed at all bends, fittings, dead ends and hydrants as shown on the plans or as directed by the Water District. The bearing area of the thrust blocks shall be determined for each installation based on soil type and system design pressure. The thrust block shall be formed in such a way that as much of the undisturbed earth on the trench wall and bottom will be incorporated into the forming as is possible. In making both the forms and the pour, special care shall be taken to insure that concrete is not poured in and around the joints of the pipes and fittings. In the event that other

utilities or local conditions prohibit the use of thrust blocks, the contractor shall furnish and install mechanical thrust resisting devices, upon the approval of such devices by the Water District. Mechanical thrust resisting devices may be substituted for concrete thrust blocks and incorporated into the work if it is deemed to be more expeditious to do so; provided however, the device shall be at least equal in resistance to the thrust block and of a satisfactory design and receive prior approval from the District for its use.

g. Service Connections:

1. Corporation Stops: The contractor shall furnish and install all corporation stops at the locations as shown on the plans or as directed by the Water District. A tapping machine shall be used which will permit tapping of water mains under pressure. The tapping machine shall be rigidly fastened to the pipe and the tap shall be made in the upper one-half (1/2) of the pipe. The length of the travel of the tap shall be so established that when the stop is inserted and tightened with a fourteen (14") inch wrench, not more than one to three threads will be exposed on the outside. When a wet tap is made, the corporation shall be inserted with the machine still in place.
2. Copper Tubing: The contractor shall furnish and install copper tubing at the locations as shown on the plans or as directed by the Water District. Excavation for services shall be to a minimum depth of six (6') feet and the contractor shall exercise special care to insure that the bottom is free from sharp rocks or ledge outcroppings. In placing the service in the trench, the contractor shall be careful that the copper tubing has no kinks or sharp bends and that the screened gravel (or granular fill) placed to a depth of six (6") inches over and around the service is free from large or sharp stones which may come in contact with the service.
3. Curb Cocks and Boxes: Curb cocks and boxes shall be furnished and installed by the contractor where noted on the plans or as directed by the Water District. The contractor shall place compacted gravel around and below the curb cock. The curb box shall be set flush with the finish grade and at or near the property line.

- h. Pressure and Leakage Testing: The contractor or customer shall be responsible for the cost to carry out a pressure test and leakage test, as specified in AWWA C600, on the completed pipes. The testing firm will be designated by the Water District. The Water District's field representative will be present for inspection.

The pressure and leakage test shall be conducted concurrently. The hydrostatic pressure shall be maintained for at least two (2) hours.

The amount of leakage permitted shall be in accordance with AWWA C600, current edition. If any leaks occur they shall be repaired by the contractor or customer and tested again until the AWWA C600 standard is met.

Prior to conducting the test the mains shall be flushed to remove all materials that may have entered the mains during construction. Flushing velocities shall be equal to or greater than two and one-half (2 ½') feet per second.

i. Chlorination of Pipelines:

1. Before being placed in service, all new water pipelines shall be chlorinated in accordance with AWWA C601.
2. The contractor or customer shall be responsible for the cost of disinfecting the pipeline. At the Water District's discretion, the chlorination can be conducted by the contractor, customer or a private firm designated by the Water District. If the contractor performs this work, the method must first be approved by the Water District. The tablet method of chlorination shall not be employed.
3. The location of the chlorination and sampling points shall be determined by the Water District in the field. Taps for chlorination and sampling shall be installed by the contractor. The contractor shall uncover and backfill the taps as required.
4. The general procedure for chlorination shall be first to flush all dirty or discolored water from the lines, and then to introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for twenty-four (24) hours and the chlorine residual after twenty-four (24) hours shall be at least fifty (50) mg/l, unless the slug method of chlorination is used.
5. Following the chlorination period, all treated water shall be flushed from the lines at their extremities, and replaced with water from the distribution system. Bacteriological sampling and analysis of the replacement water shall then be made by a State of Maine certified laboratory. The number of samples and the test location shall be determined by the Water District. The contractor shall be required to re-chlorinate, if necessary, and the line shall not be placed in service until satisfactorily disinfected.

6. Special disinfecting procedures shall be used in connections to existing mains, and where the method outlined above is not practical.

- j. Backfilling the Trench: Upon installation of the pipe, the trench shall be backfilled and final restoration of the surface made. Screened gravel or granular fill shall be placed to a point twelve (12”) inches over the top of the pipe, shall be placed in twelve (12”) inch layers and thoroughly compacted. Special care shall be taken to insure that backfill around the pipe is adequately tamped. The remainder of the backfill between the pipe and the pavement base gravel shall be common fill or granular fill and shall be placed in twelve (12”) inch layers and thoroughly compacted.

Compaction for that portion of the trench twelve (12”) inches above the top of the pipe shall be 95% of maximum density, as determined in accordance with Method D of ASTM specification D1557. The use of jetting or flooding to obtain a necessary compaction for bedding of the pipe will not be permitted.

Whenever a loam or gravel surface exists prior to cross-country excavations, it shall be removed, conserved, and replaced to the full original depth. In some areas, it may be necessary to remove excess material during the cleanup process, so that the ground may be restored to its original level and condition. If the contractor prefers not to store loam or topsoil, he shall replace it with loam or topsoil of equal quality and in equal quantity.

In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day’s operations. Fill shall not be placed on snow, ice or frozen uncompacted soil, nor shall snow, ice or frozen soil be incorporated in any fill. At the close of each day’s operations, the surface of the compacted fill shall be rolled or otherwise smoothed to eliminate any ridges or mounds.

- k. Compaction Control:

1. The contractor will make compaction tests as directed by the District in accordance with ASTM D1556 as the work progresses to determine the degree of compaction being attained. Corrections for oversize stones larger than three-quarter (3/4”) inch in size shall be made in accordance with ASTM “Procedure for Testing Soils”:, suggested method for correcting maximum density and optimum moisture content of compacted soils for oversize particles.
2. Any corrective work required as a result of such tests, such as additional compaction or a decrease in the thickness of layers, shall be performed by the contractor.

3. Compaction control tests will be made at no expense to the District, and by a testing laboratory approved by the District.

1. Restoring Trench Surface:

1. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, the contractor shall thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, he shall immediately deposit additional fill to restore the level of the ground. In and adjacent to streets and highways, if the top twenty-four (24") inch layer is unsuitable for use as sub-grade or shoulder material, the contractor shall remove this layer and provide granular fill for the sub-grade.
2. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved highway shall be restored by the contractor to a condition at least equal to that existing before work began.
3. In sections where the water main passes through grassed areas, the contractor shall, at his own expense, remove and replace the soil, or shall satisfactorily loam and seed the surface. The depth of the loam replaced shall be at least equal to that removed by the contractor in his trenching operations, but in no event shall it be placed less than six (6") inches in depth.

m. Pavement Replacement:

1. The contractor shall furnish all labor, material, equipment and incidentals necessary to replace all paved areas damaged by his operations.
2. The contractor shall, after pipe laying and backfilling operations are completed, and after a twelve (12") inch gravel sub-base is shaped and compacted, place the pavement.
3. The contractor shall be required to clean all road surfaces after backfilling and before any surfacing.

4. The contractor shall maintain pavement during the guarantee period of one (1) year and shall promptly refill and repave areas which have settled or are otherwise unsatisfactory for traffic.
5. The contractor shall furnish and spread calcium chloride on disturbed surfaces to allay dust conditions. Calcium chloride shall conform to AASHO M-144.
6. No permanent pavement shall be placed within ninety (90) days after completion of backfilling, unless permitted to do so in writing by the authority having jurisdiction. Repaving may be delayed for a longer time if the said authority so directs.
7. Temporary pavement shall be one and one-half (1 ½") inch thick bituminous concrete. Temporary pavement shall be maintained until replaced by permanent pavement.
8. If points of settlement or holes appear in the temporary pavement, the contractor shall repair the same within one (1) day of notification by the District or authority having jurisdiction.
9. Permanent pavement to be placed over the width of the trench shall be four (4") inches of bituminous concrete, laid in two (2) courses, a two (2") inch binder course, and a two (2") inch wearing course. Temporary pavement shall be removed and the sub-base shall be prepared by thoroughly compacting and shaping the sub-base to the required grade and cross section, and the edge of the old pavement shall be trimmed to a smooth straight line and tack coated.

Immediately prior to laying the binder course, the trimmed edges shall be stable and unyielding, free of loose or broken pieces, and all edges shall be thoroughly broomed and coated with an approved asphalt tack coat. Prior to placing wearing course, the binder course shall be broomed and tack coated.

If directed by the authority having jurisdiction, permanent pavement of a thickness greater than three (3") inches shall be placed. Material and placement shall conform to the above specifications, and thickness shall be as specified by the authority.

10. Prior to construction the contractor shall obtain the necessary road opening permits from authority having jurisdiction. Depending on the conditions of the permit the contractor may be required to place only temporary pavement, the authority having jurisdiction may be responsible for placing permanent pavement.



## 6. MISCELLANEOUS

- a. Notification: The Water District shall be notified by the contractor or customer at least five working days prior to commencement of work on a new service or main extension.
- b. Cross Connections: No cross connection shall be installed by a water customer until after an application for a cross connection permit and a permit to install such cross connections has been approved for issuance by the Maine Department of Human Services.
- c. As-built Information: During construction the contractor shall maintain detailed records of the main and appurtenances installation. Location of all fittings, valves, coupling, corporation stops, curb valves, dead ends, etc. shall be recorded with accurate swing ties. The District shall approve the method of taking the ties. In addition, all underground utilities and ledge area encountered during construction shall be located (horizontal and depth) and shown on the plans. A copy of the as-built shall be furnished to the District within ninety (90) days of completion of the project.