

CONSTRUCTION OF WATER SYSTEMS

1.0 PIPING

1.1 HANDLING

Pipe, fittings and accessories shall be handled with care and shall not be dropped or bumped against pipe or appurtenances already or against any other object on the ground.

The contractor's methods for installation and handling of pipe, fittings and accessories shall conform to the pipe manufacturer's recommendations and AWWA C-600 Standard.

1.2 CLEANING

The interior of all pipe, fittings and accessories shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the jointing is completed.

Every precaution shall be taken to prevent foreign material from entering the pipe during installation.

Groundwater shall not be allowed to rise around the pipe until the trench is backfilled and the grading is completed. Dewatering operations must be continuous for as long as the trench is open.

Whenever pipe laying is stopped, the open end of the pipe shall be closed with a snug-fitting plug.

1.3 BEDDING AND PIPE INSTALLATION

Bedding material shall be broken stone, free from silt, clay or organic material and shall conform to the requirements of the New Jersey State Department of Transportation Standards for No. 57 coarse aggregate.

Pipe shall be bedded true to line and grade, and no blocking shall be used to bring the pipe to grade.

Class "C" bedding shall be used for all pipes unless otherwise specified or directed by the JTMUA as warranted by field conditions. Class C bedding is defined as that method of bedding water mains in approved granular material with a shaped bottom in undisturbed earth so as to fit the lower part of the pipe, for a width of at least 50% of the pipe diameter; and, in which the remainder of the pipe is surrounded to a height of at least 0.5 feet above its top with approved granular materials, shovel placed and tamped to completely fill all spaces under and adjacent to the pipe. This shall be done under the inspection and approval of the Authority.

Where the water main is to be laid without a special foundation, the earth forming the bed shall be free of large stones. The pipe shall then be evenly bedded in the earth with great care being taken to remove only enough of the earth to leave a uniform bed for the entire length of the pipe, except the bell, under which a recess shall be excavated to a sufficient depth to relieve it of any load and to allow ample space for making the joint. In case the bed shaped in the bottom of the trench is too low, earth must be thrown into the bottom and thoroughly compacted and new bed shaped for the pipe. It is unacceptable to raise the grade of the pipe by ramming earth beneath it. When the pipe has been bedded satisfactorily and the joint made, the recess around the bell shall be refilled with soil and enough soil shall be refilled and tamped on

each side of the pipe to hold it securely in place with care being taken not to disturb the position of the pipe during this process.

A concrete cradle, where required, shall be constructed as directed. The concrete for the full width of the foundation shall be deposited continuously to the height of the outside bottom of the pipe. Before this concrete is set, the pipe shall be evenly bedded therein, so as to have a uniform support for its entire length. The remainder of the concrete shall be immediately deposited in such a manner as to avoid changing the position of the pipe.

A concrete cradle shall be allowed to cure sufficiently to prevent consolidation of backfill. Wet concrete cradles shall be allowed to cure 24 hours before vehicle loads can be applied to that area of the trench. Steel plates may be used to cover the trench to protect the cradle from vehicle loads if the 24-hour undisturbed cure period cannot be provided.

Where the water main is to be laid below groundwater level, it shall be laid on ¾" crushed stone foundation and the stone shall be deposited for the full width of the trench to the height of the outside bottom of the pipe. The pipe shall then be bedded on this material and the remainder of the stone deposited and carefully tamped so as to avoid disturbing the pipe but giving a uniform support to its entire length. A 4-foot long/full trench width clay barrier shall be placed at 60 ft. intervals to prevent groundwater from following the pipe for future dewatering applications.

Chlorine tablets shall be placed in the pipe during installation in accordance with the section on disinfection.

The developer is required to perform a soils analysis of the project area to determine the corrosiveness of the soils and the need for external corrosion protection of the metal piping system shall be evaluated. If required, polyethylene encasement or other approved corrosion control methods shall be employed.

1.4 CLEANUP AND RESTORATION

All excess material, trash, wood forms, and other debris will be cleaned up and disposed of properly. All areas shall be restored to their original condition or as required by the Ocean County Soil Conservation District.

2.0 PIPING AND ACCESSORIES

2.1 DUCTILE IRON PIPE AND FITTINGS

The minimum allowable pipe diameter shall be 6". Where directed by the Authority Engineer, sewer pipes shall be encased in concrete at the crossings. Water mains and services shall be constructed with a minimum of 4' earth cover.

Concrete and meg-a-lugs (as manufactured by EBAA iron or equal) or two adequately sized tie rods (in accordance with ASTM A-36 of A307) or Field Lock (or equal) restraints shall be installed at all points where change in flow direction (vertical or horizontal) or thrust may occur.

All rods and bolts shall be protected against corrosion by hand application of bituminous coating or 8-mil thickness of polyethylene encasement in accordance with AWWA C105. All concrete used as thrust backings shall have a compressive strength of not less than 4,000 psi. Backing shall be placed between

virgin/solid ground and the fitting to be anchored. The backing shall be so placed that the pipe and fitting joints will be accessible for repair.

Ductile iron pipe shall be manufactured in accordance with ANSI A21.51-96/AWWA C151 and shall be thickness Class 52, except where otherwise specified. Mechanical joints or push-on type joints shall conform to ANSI A21.11-95/AWWA C111.

All fittings shall be compact mechanical joint type and shall conform to ANSI A21.53-94/AWWA C153. All fittings shall conform to a minimum pressure rating of 250 psi.

All mechanical joints shall be installed with meg-a-lugs (or equal) or thrust rods where required. The pipe shall be furnished with the necessary rubber gaskets.

All ductile iron pipe and fittings shall be double thickness cement lined inside in conformance to AWWA C104/ANSI A21.4-95 Section 4.7.2. The lining shall be double thickness (1/8 inch) at the ends of the pipe and shall be provided with a bituminous seal coat. Pipe shall receive a standard coal-tar foundry dip on the outside. The manufacturer on the outside of the pipe shall conspicuously indicate the weight and class.

2.2 TAPPING SLEEVES

Tapping sleeves shall be bolted type of cast iron construction with molded rubber gaskets to provide a permanently tight, flexible, leak-proof joint. No caulked or poured joints will be permitted. Tapping sleeves shall be equipped with a test plug. The contractor shall furnish gate valves, which are a part of this installation, conforming in every respect with section 2.4.1 of these specifications.

- Tapping sleeves shall be Mueller Model H-615 or equal for all ductile iron water mains.
- Acceptable stainless steel tapping sleeves to be used on ACP, C-900 or pipes other than ductile iron are:
 - Ford style "FAST";
 - Smith Blair Model No. 663; or
 - Mueller No. H-304.

2.3 FIRE HYDRANTS

The District Board of Fire Commissioners having jurisdiction over the project and the Authority shall approve fire hydrant locations and quantities. At a minimum, hydrants shall be spaced so that the traveled distance between hydrants does not exceed 500 linear feet.

Fire hydrants shall comply with the latest edition of AWWA Standard C-502 and:

- Shall have a minimum 5-1/4" main valve opening;
- Be equipped with two (2) 2-1/2" hose nozzles and one (1) 4-1/2" steamer nozzle;
- All nozzles shall be National Standard thread;
- The operating and nozzle cap nuts shall be 1-1/2" pentagon, open left;
- They shall be furnished with a 6" gate valve; and
- Shall be:
 - Mueller Model A-423, or
 - U.S. Pipe "Metropolitan".

All hydrants shall be flow tested by the Contractor/Developer and witnessed by the Authority prior to approval to operate the system.

- ❖ Additional flushing may be required at the time of activation.

Hydrants shall:

- ❑ Have all rust removed;
- ❑ One coat of primer applied;
- ❑ Be final painted in accordance with the fire hydrant painting schedule listed below; and
- ❑ Have markers attached to them.

A. Fire Hydrant Painting Schedule: Cap and bonnets are to be painted based on flow as follows:

<u>Flow</u>	<u>Color</u>
0-500 G.P.M	Red
500-1000 G.P.M.	Orange
1000-1500 G.P.M.	Green
Over 1500 G.P.M.	Blue

B. Fire hydrants located on 'dry water' systems shall be painted black.

C. Fire Hydrant barrels are to be painted silver.

2.4 VALVES

As per the New Jersey Department of Environmental Protection, system valves shall be installed with a minimum of N-1 value where N = number of nodes in the intersection. For every run of pipe without an intersection, a valve shall be placed every 800 LF. Valves 12" diameter and smaller shall be gate valves. Valves larger than 12" diameter shall be butterfly valves. Automatic air release valves shall be installed at the high point in the mains.

- ❑ All valves shall be equipped with a valve box allowing access to the valve nut.
- ❑ Operating nuts shall be a maximum of 4' below grade, installing valve stem adaptors on deeper valves.

2.4.1 GATE VALVES

Gate valves shall be of the single iron disc type with resilient rubber seat. The body shall be ductile or cast iron. Interior surfaces shall be epoxy coated. Gate valves shall be clockwise closing. Gate valves shall comply with ANSI/AWWA C509 Standard.

Gate valves shall be Mueller Co. Model A-2360 or equal.

2.4.2 BUTTERFLY VALVES

The body of the butterfly valve shall be ductile or cast iron. The disc shall be ductile iron with a resilient Nitrile rubber seat. Disc shall be self-adjusting and shall be clockwise closing. Butterfly valves shall comply with AWWA C-504 Standard.

Butterfly valves shall be Mueller Co. Model B-5227 or equal.

2.4.3 AUTOMATIC AIR RELEASE VALVES

Automatic air release valves shall be float-actuated with heavy cast iron body, stainless steel float with bronze or stainless steel working parts. Air release valves shall be fitted with blow-off valves, isolation valve, quick disconnect couplings and a minimum of 6' of hose for backflushing. Piping required to pipe air release valve discharge to the nearest drain shall be installed.

Air release valves shall be APCO Heavy Duty Air Release Valves No. 400 Series by the Valve & Primer Corporation.

2.5 VALVE BOXES

All gate and butterfly valves shall be equipped with an adjustable valve box. Valve boxes shall be cast iron and shall be Bingham & Taylor Model 4908 or equal.

3.0 WATER SERVICES

Water service laterals shall be installed to each individual lot at the time of main installation. Service laterals shall be installed from the main and shall terminate behind the curb with a curb valve and shall be type "K" copper tubing per AWWA C800.

Water service laterals shall be constructed after the preliminary pressure test and before the final pressure testing.

Water services shall include:

- ❑ The excavation and backfill, for the construction of water services to convey potable water from the water main;
- ❑ To and including the curb stop, behind the curb or curb line; and
- ❑ Restoration, in accordance with the drawings and specification or as directed by the Engineer.

❖ The contractor shall saw-cut the letter "W" on the top of the curb, in front of the curb box.

3.1 METHOD OF CONSTRUCTION

All materials installed shall be new and have at no time been previously used for any other purpose.

3.1.1 EXCAVATION AND BACKFILL

The depth of water services shall be 4'0", measured from the top of the pipe to the surface or ground, previous to excavation or to the proposed finished grade, except where additional depth is required due to interference by an existing surface, subsurface, utility, structures or by connection to existing facilities.

3.1.2 HANDLING

All pipe and fittings shall be handled in such a manner as to ensure undamaged delivery and installation.

3.1.3 TAPPING

The contractor shall tap all mains and install the corporation stop. Tapping machines shall be in excellent condition utilizing a combined drill and tap.

A Mueller or approved equal tapping machine shall be used and operated strictly in accordance with the manufacturer's recommendations and these specifications. The drill and tap must be sharp and clean and provide the thread for use with the stop.

Unless otherwise noted, taps shall be made at a forty-five degree angle to horizontal from the centerline of the main. The contractor must excavate sufficient material as to properly operate the machine. The workmen operating the machine must have more than five (5) years experience in the operation of tapping machines. The work must be performed with the main under system pressure.

3.1.4 LAYING PIPE

Copper pipe shall be thoroughly bedded and supported throughout its length and handled at all times in such a manner as to prevent any indentations or "kinks". Any damaged piping shall be removed and replaced. Copper connection at the corporation stop and curb stop shall have a compression fitting.

The proper tools shall be used and shall be in new condition. Pipe shall be cut at right angles to the axis, with all rough edges removed and with proper lubrication joined in a watertight and permanent manner by experienced workmen.

The interior of all pipe and fittings shall be kept clean at all times and protected against the entrance of any foreign materials.

- ❖ Under no circumstances shall pipe be laid under water.

3.1.5 CURB BOX AND CURB STOP

Curb boxes and curb stops shall be set level and plumb. The curb stop shall be properly bedded on a sound foundation to prevent turning or movement by contractor's operations and shall be undisturbed upon completion. They shall be set plumb and adjusted to the proper level, flush with the ground surface. The base shall be set so as to protect the valve and not bear on piping.

3.1.6 TESTS

The entire installation must remain uncovered and be tested under pressure. When, in presence of an inspector, the installation is found to be tight, backfilling may commence. The pressure applied shall be static pressure on the main. Any defective material shall be removed and replaced.

3.1.7 DISINFECTION

The services shall be disinfected as specified for mains with a method approved by the State Department of Environmental Protection.

3.1.8 FIRE SERVICES

All fire services shall have a separate main connection, unless otherwise approved by the Authority Engineer.

The pipe size shall be of an adequate size to provide sufficient water to the applicant's fire suppression system and shall be determined by the applicant's engineer.

All fire services shall be D.I.P. Class 52 conforming to Section 2.1 Ductile Iron Pipe and Fittings of this specification.

Every fire service shall include a double detector check valve to prevent the backflow of polluted water from the fire protection system into the potable water system and to detect unauthorized water use and leaks in the fire protection system.

Double detector check valves shall be Watts Series No. 709DCDA or equal.

3.2 MATERIALS

3.2.1 COPPER PIPE

Copper service lines shall have a minimum 1" inside diameter and shall be type K, in conformance with ASTM B88.

3.2.2 SERVICE SADDLES

Bronze service saddles shall be manufactured in accordance with ANSI/AWWA C800 Standard and shall be Mueller H-13000 for PVC Pipe.

Service Saddles on A.C.P. and 2" D.I.P. taps shall be BR2B Series, Service Saddles as manufactured by Mueller.

3.2.3 CORPORATION VALVE

Corporation valves shall be manufactured in accordance with ANSI/AWWA C800 Standard and shall be of the quarter-turn check type.

Corporation valves shall be:

- Ford Type F600;
- Mueller H-15000; or
- Mueller H-15008.

3.2.4 CURB VALVE

Curb valves shall be manufactured in accordance with ANSI/AWWA C800 Standard and shall be of the quarter-turn check type.

Curb valves shall be Mueller Model H-15209, Ford Model Z-22 or equal.

3.2.5 CURB BOX

Curb boxes shall be constructed of cast iron and be furnished complete with cast iron lid and shut-off rod and shall be Mueller Model H-10314 or equal.

3.2.6 BACK FLOW PREVENTORS

Backflow preventors shall be installed as per New Jersey Safe Drinking Water Act (N.J.A.C. 7:10-10).

3.3 DISINFECTION AND TESTING

Prior to placing water mains and appurtenances into service, they shall be pressure and leakage tested and disinfected in accordance with the provisions of this Section.

The contractor shall provide all labor, materials, equipment, gauges, air, water and all else necessary to test and disinfect all piping systems and appurtenances installed.

3.3.1 PRESSURE AND LEAKAGE TESTING

A preliminary hydrostatic test pressure of 150 psi shall be maintained in the water main for a period of thirty minutes and a final hydrostatic test pressure of 150 psi shall be maintained in the water main once water services are installed for a minimum period of two (2) hours. At the end of the test period, if the test pressure has remained constant, the pipeline shall have passed the test.

If the pressure has dropped, it shall be brought back to the test pressure by pumping a known volume of water (by pumping from a graduated container or by metering) back into the pipeline. The volume of water used, representing leakage from the pipeline, shall be recorded. If the leakage is less than the allowable leakage specified below, the pipeline shall have passed the test.

If the leakage exceeds the allowable as specified, the contractor shall:

- ❑ Locate the leaks;
- ❑ Permanently repair the sections of piping where the leaks are occurring to the satisfaction of the Authority; and
- ❑ Retest the pipeline as specified above.

This process shall be repeated until the pipeline has successfully passed the pressure test.

All air shall be expelled from a pipeline before it is tested. All caps, plugs and fittings shall be adequately braced and anchored to withstand the test pressures. The test pressure specified by the Authority shall be obtained and measured at the lowest elevation in the pipeline under test.

Flanged, welded, threaded, and solvent welded pipelines shall show no leakage at the test pressure. The leakage for mechanical joint and push-on joint pipe lines shall not exceed the allowable leakage per 1000 LF of pipe as shown in the following Table:

Allowable Leakage Per 1000 L.F. at 150 psi

Pipe Diameter:	4"	6"	8"	10"	12"	16"	20"
Gallons/Hour:	0.35	0.53	0.71	0.89	1.06	1.42	1.77

*Per AWWA C600-87

3.3.2 DISINFECTION

Pipes and hydrant barrels shall be disinfected by introducing chlorine of such a strength as to produce a solution of not less than 50 parts per million of free chlorine in the filled line. During construction, chlorine tablets shall be placed in each length of pipe in quantities sufficient to produce the proper chlorine solution once water is introduced to the main.

The solution shall remain in the lines for a period of no less than 12 hours. During this period:

- ❑ All valves in the system shall be operated to disinfect all parts of the valves;
- ❑ A water sample will be taken; and
- ❑ A bacteriological analysis will be performed.

The developer will perform the sampling and analysis. Should the bacteriological test fail, the contractor, at his expense, shall be responsible for rechlorinating and flushing the main as many additional times as may be necessary to make the main free of bacteria.

3.3.3 FLUSHING

After disinfection and testing, the main shall be thoroughly flushed. A representative of the Authority will be present during any flushing of the mains.

4.0 WATER BOOSTER STATIONS AND/OR STORAGE TANKS

Should the need for a water booster station and/or storage tank present itself, the Authority will make a determination as to the acceptance of such, on a case-by-case basis.