

SPECIFICATIONS FOR THE CONSTRUCTION OF WATER SYSTEMS

1.0 GENERAL

The applicant shall design and construct a water distribution system including, but not limited to, water mains, valves, hydrants, post hydrants, and all accessories capable of supplying the necessary domestic flow plus fire protection flow to the proposed project.

Water mains / systems cannot be installed until after all curbing has been completed. The Authority may perform a distribution system analysis to check the adequacy of the distribution system. The approval will be based on the successful results of said analysis.

2.0 EXCAVATIONS

Excavation shall not be carried below the required level. All excavations shall be kept free of water until the installation of the pipe has been completed and backfilling of the excavation is completed. Excess excavation below required level shall be backfilled with ¾" crushed stone as directed by the JTMUA.

Unstable soil shall be removed and replaced with ¾" crushed stone, crushed slag, or suitable fill, which shall be thoroughly tamped. The JTMUA will determine what constitutes unstable soil and will specify the amount to be removed and replaced.

All applicable OSHA Rules and Regulations shall be followed.

2.1 Trench Excavation

Width of the trench at the top of the pipe shall be 6" minimum, 8" maximum, on each side of the pipe coupling. The bottom of the trench shall be rounded so that an arc of the circumference equal to 0.5 of the outside diameter of the pipe rests on undisturbed soil. Coupling holes shall be excavated accurately to size by hand. If a trench box is used, the bottom edges of the box shall at no time be below the proposed invert elevation of the pipe.

2.2 Bracing and Shoring

The contractor shall do all bracing, sheeting, and shoring necessary to perform and protect all excavation as required for safety of the workers, public, existing utilities, structures, pavements, and public and private property. When the sheet piling is driven below the bottom of the pipe or the structure, the Authority Engineer may direct the contractor to leave the sheeting in place.

3.0 MAINTENANCE OF TRAFFIC

All work shall be performed in a manner that will ensure the least obstruction to traffic. The contractor shall at all times conduct his operation with not only the motorists' safety in mind, but also of the pedestrians and his own employees.

The requirements of the Agency having jurisdiction over the road in which the contractor is working shall govern. Emergency vehicles shall be provided access at all times.

The contractor is responsible for submitting traffic control plans and acquiring all road opening, traffic detour, and road closing permits.

4.0 BACKFILLING

Backfilling shall be done with approved materials free from large clods or stones. Any unsuitable bedding or backfill material shall be removed from the trench. Backfill materials in trenches shall be placed evenly and carefully around and over pipe in 6" maximum layers. Each layer shall be thoroughly and carefully tamped until one foot of cover exists over pipe.

The remainder of backfill materials shall be placed in one foot lifts maximum, moistened if necessary, and compacted in areas not to be paved (utility easements). No compacting shall be done when the material is too wet.

All forms, trash, and debris shall be removed and cleared away from excavation. Approved backfill material may be from excavation or borrow. It shall be free from rocks, lumber, debris and frozen material. Each layer shall be moistened and compacted with mechanical or hand tampers. In roadway or area to be paved, each layer shall be compacted to density equal to a minimum 95% standard Proctor density.

The trenches shall be backfilled at the end of each workday, except when the conditions require them to be left open overnight. When the trenches are left open overnight, temporary fencing shall be built around them.

Even though testing may indicate that the required density has been attained, the contractor will be responsible for correcting any settlement or damage to the utilities.

5.0 PAVEMENT RESTORATION

Existing pavement shall be restored in accordance with the rules and regulations of the agency having jurisdiction over the roadway. Said agency will determine if the roadway has been restored adequately.

6.0 DEWATERING

Dewatering shall be accomplished by methods, which ensure that the groundwater will be drawn down to an elevation two (2) feet below the bottom of the bedding. Upon removal of well points, deep wells or other dewatering equipment, the contractor shall backfill, compact, and pave all roads where required. Well point and deep well holes shall be compacted for the full depth to a density equal to in-situ soils.

Dewatering for the structures and pipelines shall commence when groundwater is first encountered and shall be continued as long as the trench is open.

7.0 EROSION CONTROL

Erosion control measures taken at the site shall be in full conformance with and meet all requirements of the "Standards for Soil Erosion and Sediment Control – New Jersey State Soil Conservation Committee." A compliance certificate from the Ocean County Soil Conservation District shall be submitted to the Authority.

8.0 PIPING

8.1 Handling

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

8.2 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.

8.3 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 shall be 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; all under the direction and inspection 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, 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, care being taken not to disturb the position of the pipe during this process.

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 and the remainder of the concrete shall be immediately deposited in such a manner as to avoid changing the position of the pipe.

Concrete cradle shall be allowed to cure sufficiently to prevent consolidation of backfill, and wet concrete cradle 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 bedding, and the stone shall be deposited for the full width of the trench to the height of the outside bottom of the pipe. 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.

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.

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.

8.4 Cleanup & 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.

9.0 PIPING AND ACCESSORIES

9.1 Ductile Iron Pipe & 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 or 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. .

9.2 Tapping Sleeves

Tapping sleeve 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 sleeve shall be equipped with a test plug. Contractor shall furnish gate valve, which is part of this installation, conforming in every respect with section 9.4.2 of these specifications. Tapping sleeve shall be Mueller Model H-615. Stainless steel tapping sleeves manufactured by Ford as style "FAST", Smith Blair Model No. 663, or Mueller No. H-304, are also acceptable.

9.3 Fire Hydrants

The District Board of Fire Commissioners having jurisdiction over the project and the Authority shall approve fire hydrant locations and quantity. At 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. Fire hydrants shall have a minimum 5-1/4" main valve opening, and shall be equipped with two 2-1/2" hose nozzles and one 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. Hydrants shall be furnished with a 6" gate valve. Hydrants shall be Mueller Model A-423, U.S. Pipe "Metropolitan," Clow Medallion, or Kennedy K-81A, or equal.

All hydrants shall be flow tested by the Contractor / Developer, and witnessed by the Authority prior to approval to operate the system. Hydrants shall have all rust removed, apply one coat of primer, and final painting in accordance with the fire hydrant painting schedule listed below.

- A. Fire Hydrant Painting Schedule: Cap and bonnets 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 to be painted silver.
- D. Additional flushing may be required at time of activation.

9.4 Valves

9.4.1 General

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 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 nut shall be a maximum of 4' below grade, installing valve stem adaptors on deeper valves.

9.4.2 Gate Valves

Gate valves shall be 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, U.S., Kennedy or equal.

9.4.3 Butterfly Valves

Body shall be ductile or cast iron. Disc shall be ductile iron with a resilient Nitrile rubber seat. Disc shall be self-adjusting. Butterfly valves shall be clockwise closing. Butterfly valves shall comply with AWWA C-504 Standard. Butterfly valves shall be Mueller Co. Model B-5227 or equal.

9.4.4 Automatic Air Release Valves

Automatic air release valves shall be float-actuated with heavy cast iron body, stainless steel float, and 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 nearest drain shall be installed. Air release valves shall be APCO Heavy Duty Air Release Valves No. 400 Series by the Valve & Primer Corporation.

9.4.5 Valve Boxes

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

10.0 WATER SERVICES

10.1 General

Water service laterals shall be installed to each individual lot at the time of main installation. Service lateral shall be installed from the main and terminate behind the curb with a curb valve. Contractor shall saw-cut the letter "W" on the top of curb in front of the curb box. Service laterals shall be type "K" copper tubing per AWWA C800.

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

Water services shall include the excavation and backfill for and the construction of water services for conveying 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.

10.2 Method of Construction

10.2.1 General

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

10.2.2 Excavation and Backfill

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

10.2.3 Handling

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

10.2.4 Tapping

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

Drill and tap must be sharp and clean and provide the thread for use with stop. The tapping machine used shall be Mueller or approved equal and operated strictly in accordance with manufacturers recommendations and these specifications. Unless otherwise noted taps shall be made at a forty-five degree angle to horizontal from

centerline of the main. Contractor must excavate sufficient material so as to properly operate the machine. The workmen operating machine must have not less than five (5) years experience in the operation of tapping machines. The work must be performed with the main under system pressure.

10.2.5 Laying Pipe

The copper pipe shall be thoroughly bedded and supported throughout its length and handled at all times in such a manner as to prevent indentations or "kinks". Any damaged pipe shall be removed and replaced. Copper connection at corporation stop and curb stop shall be a compression fitting. The proper tools shall be used which shall be in new condition. Pipe shall be cut at right angles to 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 conditions will the pipe be laid in water.

10.2.6 Curb Box and Curb Stop

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

10.2.7 Tests

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

10.2.8 Disinfection

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

10.3 Materials

10.3.1 Copper Pipe

Copper service line shall be minimum 1" inside diameter, type K in conformance with ASTM B88.

10.3.2 Service Saddles

Bronze service saddles shall be manufactured in accordance with ANSI/AWWA C800 Standard. Service Saddles 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.

10.3.3 Corporation Valve

Corporation valve shall be manufactured in accordance with ANSI/AWWA C800 Standard. Corporation valve shall be quarter-turn check type. Corporation valve shall be Ford Type F600, Mueller H-15000, H-15008, or equal.

10.3.4 Curb Valve

Curb valve shall be manufactured in accordance with ANSI/AWWA C800 Standard. Curb valve shall be quarter-turn check type. Curb valve shall be Mueller Model H-15209, and Ford Model Z-22, or equal.

10.3.5 Curb Box

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

10.3.6 Back Flow Preventors

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

10.4 Water Meters

All meters and related equipment shall be purchased from and installed by qualified JTMUA staff. All meters and components i.e. registers, chambers, etc, shall be completely interchangeable with meters currently in use by the Jackson Twp. MUA. All meters shall be a magnetic drive, sealed register, positive displacement type oscillating piston only conforming to American Water Works Standard C-700 as most recently revised. Meter shall read in gallons and be capable of direct visual reading both at the meter and by remote reading utilizing a visual integration device which connects through the water meter via a touch pad located external to the meter, and/or by a Meter Transceiver Unit (MXU), for a radio based Automatic Meter Reading (AMR). The register shall be secured to the main case by means of a locking device located in the interior of the meter so the register cannot be removed by non-utility personal. Meters shall be Sensus Technologies Model SR ECR or approved equal as determined by the Authority engineer.

10.5 Meter Transceiver Unit (MXU)

All Meter Transceiver Units (MXU) shall be completely compatible with Sensus SR ECR water meters currently in use by the Jackson Twp. MUA. All equipment must comply with current Federal Communications Commission (FCC) requirements including proper labeling of the MXU and operating in the non-licensed 902 – 928 MHz band utilizing the direct sequence spread spectrum. The MXU will be housed in a two-piece UV stable molded plastic enclosure secured by means of a tamper resistant locking screw and be capable of being submersed in a water filled meter box. The MXU must contain all electronics, a field replaceable date stamped battery cartridge, internal antenna, wiring diagram, and all necessary hardware for either wall or underground meter box installation. Meter transceiver units shall be SENSUS TECHNOLOGIES MODEL 500 MXU or approved equal as determined by the Authority engineer.

10.6 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. The applicant's engineer shall determine the fire service size. All fire services shall be D.I.P. Class 52 conforming to Section 9.1 Ductile Iron Pipe and Fittings of this specification. Every fire service shall include a double detector check valve to prevent 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 valve shall be Watts Series No. 709DCDA, or equal.

11.0 DISINFECTION AND TESTING

Prior to placing water mains and appurtenances into service, said mains and appurtenances 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.

11.1 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. 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 thus 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 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

11.2 Disinfection

Pipes and hydrant barrels shall be disinfected by introducing chlorine of such a strength as to produce in the filled line a solution of not less than 50 parts per million of free chlorine. 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 12-hour period, all valves in the system shall be operated to disinfect all parts of said valves. A water sample will be taken and a bacteriological analysis will be performed. The developer will perform said 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.

11.2 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.

12.0 WATER BOOSTER STATIONS AND/OR STORAGE TANKS

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