



# WATER UTILITY

## “SPECIFICATIONS”

2007

JACOB GARABED ADMINISTRATION BUILDING  
424 HURLEY DRIVE – P.O. BOX 450  
HACKETTSTOWN, NJ 07840  
908-852-3622  
[www.hmua.com](http://www.hmua.com)



HMUA  
STANDARD WATER SPECIFICATIONS

Table of Contents

<u>Description</u>	<u>Page No.</u>
Item 1 – For Furnishing and Installing Ductile Iron Water Mains	S1-1 – S1-12
Item 2 – For Furnishing and Installing Ductile Iron Fittings – Mechanical Joint	S2-1 – S2-2
Item 3 – For Furnishing and Installing Underground Gate Valves and Valve Boxes	S3-1 – S3-2
Item 4 – For Furnishing and Installing Tapping Sleeves and Valves	S4-1
Item 5 – For Furnishing and Installing Fire Hydrants and For Removal Of Existing Hydrants, Complete	S5-1 – S5-2
Item 6 – For Furnishing and Installing Service Connections	S6-1 – S6-2
Item 7 – For Furnishing and Installing Corporation Stops	S7-1
Item 8 – For Furnishing and Placing Quarry Processed Stone	S8-1
Item 9 – For Furnishing and Placing Broken Stone or Gravel Material	S9-1
Item 10 – For Trench Backfill Compaction	S10-1

ITEM 1 - FOR FURNISHING AND INSTALLING  
DUCTILE IRON WATER MAINS

1.00 Work Included

The Contractor shall furnish, lay, joint, test and sterilize water mains of the respective diameters shown in the proposals and on the Contract Drawings. In general, water mains shall be installed at a minimum depth of four (4) feet and maximum depth of six (6) feet.

The work shall include all excavation, backfill, backfill compaction, removal and disposal of excavated material to an approved off-site location, sheeting, bracing, and dewatering required for trenches, and additional work as may be noted on the Contract Drawings or specified herein. All water main pipe, fittings and valves shall be U.S. made. Substitutes will be reviewed for compliance at the Contractor's expense.

The work shall also include sealing, capping, and abandoning of existing mains as detailed herein and shown on the Contract Drawings.

Should additional restraint be required due to field adjustments in the horizontal and/or vertical alignment of the proposed water main, restrained system of piping must be provided. Length of restraint to be determined by the Engineer, and depends upon the depth, test pressure and type of fitting. A **minimum of three (3) full lengths of pipe before and after every fitting.**

1.01 Ductile Iron Pipe

Ductile iron pipe shall be centrifugally cast cement-lined and shall conform to the latest specifications as adapted by the AWWA C151 (ANSI A21.51), Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids. Cement lining shall conform with AWWA C104 (ANSI A21.4), Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water, latest revision thereof, and shall include a bituminous seal coat. Pipe exterior shall receive a standard foundry coal tar dip coating in accordance with AWWA C151 (latest revision); manufacturer shall meet with EPA approval. Pipe may be furnished in 18 or 20-foot nominal laying lengths.

Where restrained joints are not required, joints shall be of the push-on type with a rubber gasket conforming with USAS A21.11 (AWWA C-111) (latest revision), Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings, latest revision thereof. Pipe plain ends shall be suitably beveled to permit easy entry into the bell. Pipe joints shall be "Tyton" as manufactured by United States Pipe and Foundry Company, "Fastite" as manufactured by American Cast Iron Pipe Company, "Super Bell-Tite" as manufactured by Clow Cast Iron Pipe and Foundry Company, "Tyton Joint" as manufactured by Griffin Pipe Products Company, or approved equal.

In areas where the Contract Drawings call for restrained joints, joints shall be ductile iron mechanical joints utilizing MegaLug retainer glands, as manufactured by EBAA Iron. Field Lok Gaskets, as manufactured by U.S. Pipe, or approved equal, may be utilized to restrain joints on mechanical joint piping runs where approved by the Engineer. All gate valves and fittings shall be restrained utilizing MegaLug retainer glands. **The assembly of all piping and fittings shall be inspected prior to backfill.**

In areas where the mechanical joint set screw retainer glands are required, joints shall be ductile iron mechanical joints utilizing MegaLug retainer glands. Mechanical joint restraint shall be incorporated into the design of the follower gland. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be made of grade 60-42-10 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges. They shall have rated working pressures of 350 psi in sizes sixteen (16) inch and smaller and 250 psi in sizes eighteen (18) inch through forty-eight (48) inch. The devices shall be Listed by Underwriters Laboratories up through the twenty-four (24) inch size and Approved by Factory Mutual up through the twelve (12) inch size. The restraint shall be the Series 1100 MEGALUG® restraint as produced by EBBAA Iron, Inc. or approved equal.

Additional restraint will be provided if thrust conditions are created due to horizontal and/or vertical adjustment to the pipeline due to field conditions. Mechanical joints shall conform with AWWA C111, latest revision thereof.

The use of Field Lok Gaskets, as manufactured by US-Pipe, may be used in straight runs of push-on joint pipe where restraint is required. The use of FieldLok Gaskets shall be approved by the Engineer prior to installation. **FieldLok Gaskets must be visually inspected by HMUA prior to the pipes being put together.**

b) Pipe Thickness

Pipe thickness classes for 12-inch diameter and smaller pipe shall be Class 52 unless otherwise noted on the drawings. Grooved piping shall be Class 56.

### c) Marking Pipe

Each pipe delivered to the job shall have clearly marked, the weight, class designation and sampling period. In addition, each pipe shall have cast on the face of the bell the manufacturer's name and trade mark and the year the pipe was produced and, on bends the angle turned by.

### 1.02 Pipe Laying

All pipe shall be carefully examined for defects, and no pipe known to be defective shall be laid. If any pipe is found to be broken or defective after being laid, it shall be removed and replaced by sound pipe without any further payment than is included in the prices bid.

Joint surfaces shall be protected from damage, and shall be carefully examined before jointing. No damaged joints shall be used in the work.

Pipe shall be thoroughly cleaned and ample precautions shall be taken to prevent entrance of dirt and debris into the pipe after laying. Exposed ends of all uncompleted lines shall be provided with plugs or covers at all times when pipe laying is not actually in progress.

All pipe shall be carefully laid to true alignment and grade with bell ends up grade.

The trench bottom shall be carefully graded to the proper elevation. Unless otherwise specified pipe shall be laid on 6-inches of compacted thickness 3/4-inch clean stone beneath pipe and up to the springline of pipe so that the pipe will have a firm bearing for its full length.

Care shall be taken not to excavate below grade. Material excavated below adopted grade shall be replaced by material which will meet with the approval of the Inspector. No cribbing or blocking shall be left under the water main or fittings.

Immediately after the pipe is brought to final position, it shall be thoroughly secured and properly bedded, and ample support shall be provided to prevent settlement or disturbances.

Pipe shall be protected during construction against possible flotation due to pouring of concrete or in case the trench becomes flooded prior to placing the backfill, either with water, or a wet mud mixture.

Jointing and laying shall be in strict accordance with recommendations of pipe manufacturer.

### 1.03 Jointing

Jointing shall be done in strict conformance with manufacturer's recommendations. Pipe shall be handled with care to avoid damage to the lining and coating.

Cutting of pipe where required shall be done in a neat and workmanlike manner using an abrasive cutting wheel or other means which will produce a smooth end normal to the pipe axis with the lining undamaged. Cut ends shall be beveled to avoid damage to the gasket. Pipe ends shall be thoroughly cleaned prior to jointing and only approved lubricants shall be used. The use of pressure snap cutters is strictly prohibited.

Jointing of valves and fittings shall be with mechanical joints with MegaLug retainer glands. Materials and methods for jointing valves and fittings shall conform to the jointing specification for fittings (Item 2).

### 1.04 Inspection of Pipe

All pipe and fittings used in the work may be factory inspected by a recognized inspection agency engaged by the Owner. The Contractor shall inform the Owner and the inspection agency of the name and address of the foundry or other sources of materials to be used in the work and shall coordinate with the manufacturer to assure that the inspection agency has access at the manufacturer's plant and adequate assistance and notice so that each item may be examined. All reports will be made to the Owner and the cost of the services of the inspection agency will be borne by the Owner. On site, the Inspector will visually inspect the pipe for proper class markings and obvious defects. Any pipe not meeting the required specifications will be rejected.

### 1.05 Testing

When a reach of pipe deemed adequate by the Inspector is ready for testing, the line shall be completely filled with water, all air expelled and a pressure and leakage test made. Contractor shall be responsible for expelling all air from high points in the lines by installing corporations. Location of the corporations shall be as directed by the Inspector. Piping shall be tested prior to connection with the existing system unless other wise approved by the Inspector. The Contractor shall furnish all labor, materials and equipment for performing these tests in the presence of the Inspector, including calibrated pressure gauges, test bulkheads, filling, draining, and air release connections and valves, calibrated drum and test pump.

All portions of the new water main will be pressure tested at a minimum pressure of 1 ½ times the working pressure, minimum of 150 psi. These pressures are to be obtained in the highest portion of the main to be pressure tested and the maximum allowable leakage will be based on the following equation:

L=	$(S)(D)(P)^{0.5}$
	133,200

Where L = allowable leakage in gallons per hour  
S = length in feet of pipeline tested  
D = nominal diameter of pipe in inches  
P = test pressure in pounds per square inch gauge

The duration of the pressure test shall be at least one (1) hour. In the event that the section under test fails to meet the allowable leakage, the Contractor shall make all necessary repairs and repeat the test. The test shall be repeated as many times as is necessary to meet the allowable leakage specified above.

The HMUA personnel shall fill the pipeline with water from the Hackettstown Municipal Utilities Authority water system and the Contractor shall then conduct the pressure test.

1.06 Flushing and Sterilization

All new water lines shall be flushed and sterilized upon completion of pressure testing in accordance with the recommendation of Standard for Disinfecting Water Mains (AWWA C651 (latest revision) of the American Water Works Association, except as may be modified herein. **Flushing shall be performed by the contractor under the guidance and direction of HMUA personnel.** The Contractor shall not operate any valves without prior authorization by HMUA.

Following chlorination and after the entire length of line is ready for operation, all treated water shall be flushed thoroughly from the newly laid pipeline, at its extremities, until the replacement water throughout its length will upon test, both chemical and bacteriological, be proved equal to the quality introduced at the permanent source of supply. During the application of chlorine, valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 20 mg/l free chlorine. Samples for laboratory analysis shall be taken after water has stood in the main at least 24 hours following flushing. Should the initial treatment prove ineffective, the flushing and chlorination

procedure shall be repeated as directed until confirmed tests show the water from the newly laid pipe conforms to the requirements of the preceding section.

**All work of flushing and sterilizing shall be the responsibility of the contractor and shall be done under the guidance and supervision of the HMUA.** Following completion of sterilization and flushing, samples shall be taken, analyzed, and reported upon by a recognized testing laboratory. The costs of the services of the testing by QC Laboratories will be borne by the HMUA.

The Contractor shall be responsible for furnishing and installing sufficient quantity of corporations for the addition of chlorine. Due to the toxicity of chlorine fumes, men performing work under this Section shall be equipped with all safety equipment and shall be attended by other personnel who are in the vicinity where work it to be performed. The forward of AWWA Standard B300 latest revision, contains information and additional reference material regarding the safe handling of hypochlorites. The CONTRACTOR shall familiarize himself with this information prior to performing and disinfection work.

Following disinfection, all chlorinated water shall be flushed from the facilities at their extremities and replaced with potable water. All water flushed from the facilities shall be chemically dechlorinated and shall be performed under the supervision of the HMUA. Untreated discharge of chlorinated water to any sewer or natural water course will not be allowed.

After the applicable retention period, heavily chlorinated water should not remain in contact with pipe for more than 48 hours. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use.

Heavily chlorinated water (greater than 0.5 mg/l residual) must be disposed of in a manner which conforms to all local, State and Federal regulations. Disposal may be to the sanitary sewer system, storm sewer system, or trucked offsite.

If the CONTRACTOR elects to direct the heavily chlorinated water to the sanitary sewer system, the CONTRACTOR shall contact HMUA to ascertain any requirements for discharge. Any fees associated with discharge to the sanitary sewer system shall be included in the lump sum prices bid.



If the CONTRACTOR elects to direct the heavily chlorinated water to a storm sewer system, the chlorine residual of water being disposed shall be neutralized by treating with one of the reducing agents listed in Table 2. The amount of reducing agent applied shall be sufficient to lower the chlorine residual of the water disposed to 0.0 mg/l. If the CONTRACTOR elects to utilize a chemical for dechlorination, the water shall be aerated prior to discharge to the storm sewer system.

TABLE 2

Pounds of chemicals required to neutralize various residual chlorine concentrations in 100,000 gallons of water.

Residual Chlorine Concentration <u>mg/l</u>	Sulfur Dioxide <u>(SO<sub>2</sub>)</u>	Sodium Bisulfite <u>(NaHSO<sub>3</sub>)</u>	Sodium Sulfite <u>(NaSO<sub>3</sub>)</u>	Sodium Thiosulfate <u>Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.5H<sub>2</sub>O</u>
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

The proposed disposal site shall be approved by the HMUA.

No newly laid water main may be placed into service until written approval is given by the **HMUA Board**.

1.07 Excavation and Backfill

The Contractor shall do all excavation and backfill for the construction of the pipelines, as shown on the Contract Drawings, or as required by the Inspector.

The work shall include storage in temporary spoil banks, all back filling, selection and placing of all suitable material in backfill around the pipelines and the disposal of surplus material at approved locations.

The work shall also include the immediate disposal and trucking of all excavated materials where excavated material is either unsuitable for backfill purposes or select backfill is specified.

Select backfill material shall be quarry processed stone as noted on the Contract Drawings, placed and compacted in 12-inch layers.

The work shall also include furnishing and placing of any sheeting required, the draining and pumping of all excavations, the protection of existing utilities and structures, and the cleaning up of the site. Details of sheeting and bracing shall be submitted to the HMUA, prior to installation, for approval.

The work shall also include stripping, storage, and replacement of topsoil, any clearing, tree removal, burning and removal of debris, and cutting pavements neatly, prior to excavation.

#### 1.08 Character of Material

The Contractor shall, by inspection, by test pits or borings made by him or by other adequate methods, satisfy himself regarding the character and amount of the various classes of material to be encountered in the work to be performed.

#### 1.09 Excavation, Clearances and Trimming

Excavations shall be of sufficient width to permit work to be done competently, in the manner of the size specified and shown, and limits shall be such as to permit the use of outside forms, unless permission for alternate procedure is specifically granted. In no case shall excavations be carried below grade by machine and backfill be used to bring foundations to the grade of bottom slabs, footings or pipelines.

In all excavations for pipe, boulders, rock, masonry, or other similar materials shall be excavated to a level at least six (6) inches below the invert of the pipe, and carefully refilled with broken stone or gravel material. Rock or boulders shall be removed from sides of trenches to a plane twelve (12) inches outside the inside wall of the pipe, unless permission to do otherwise is expressly given.

Trenches shall be excavated to straight lines and shall have a width ample for jointing operations. The trench width at the top of the pipe shall be maintained as narrow as possible while allowing for proper bedding and backfill, and shall not exceed the outside diameter of the pipe plus two (2) feet unless specifically permitted by the Inspector. Where soft material is encountered and sheeting and bracing is not required, side slopes of the excavation shall not exceed the maximum commensurate with the stability of the various materials.

If required by the type of joint used, the trench shall be widened at the joints as required to provide clearance for proper jointing. Open trench shall never exceed 200 feet in advance of pipe laying and shall be reduced to as little as 50 feet if required.

#### 1.10 Unauthorized Excavation

If any excavation is caused by the Contractor's error, or wherever the excavation is carried beyond or below the lines and grade given by the Inspector, the Contractor shall, at his own expense, refill all such excavated space with such material and in such manner as may be directed, in order to insure the stability of the various structures. Beneath all structures, space excavated without authority shall be refilled with 3000 psi concrete or other material approved by the Inspector. The expense for this work shall be borne by the Contractor.

### 1.11 Sheeting and Bracing

Where necessary, particularly to prevent disturbance, damage or settlement of adjacent structures, pipelines, utilities, improvements or paving excavation shall be adequately sheeted and braced. In areas where specifically designed sheeting is not designated, the Contractor shall submit to the HMUA a sketch showing details and installation procedures of all sheeting and bracing for excavations exceeding five (5) feet in depth. Said plan, details, and procedures shall be submitted well in advance of the start of excavation. This sketch shall be accompanied by a signed and sealed certificate from a currently licensed New Jersey Professional Engineer, stating that the sheeting and bracing design shown on the sketch meets all the latest requirements of the New Jersey Construction Safety Code and the Federal Occupational Safety and Health Act.

Sheeting and bracing shall remain in place until the pipe has been laid, visually inspected for defects and repaired, if necessary, and the earth around the pipe compacted to a depth of two (2) feet over the top of the pipe.

Sheeting and bracing of all excavation shall comply with the latest statutes of the State of New Jersey governing Safety of Workers in the Construction Industry.

Any damage to new or existing structures occurring through settlement, water or earth pressure, or other causes due to inadequate bracing or through negligence or fault of the Contractor in any other manner, shall be repaired by the Contractor at his own expense.

### 1.12 Removal of Water and Protection from Flooding

The Contractor shall remove all water from the excavation promptly and continuously throughout the progress of the work and shall keep the excavation dry at all times by approved methods such as sumps, underdrains, or well points until the items to be placed therein are completed. Pumping shall be continuous where ordered by the Inspector to protect the work and/or maintain satisfactory progress.

The Contractor shall be solely responsible for the type and size of dewatering equipment necessary for maintaining a dry excavation. The Contractor shall be solely responsible for interpreting this data, and for verifying the data as necessary prior to development of his dewatering plan. The Contractor shall also be required to adhere to all general, specific, or other requirements as detailed by the NJDEP whether or not a dewatering permit has been issued. If a dewatering permit has been issued it shall be maintained at the office of the Engineer for inspection.

Precautions shall be taken to protect uncompleted work from flooding during storms or from other causes. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected.

All necessary precautions shall be taken to prevent disturbance of and to properly drain the areas upon which concrete is to be poured, and upon which pipe is to be laid.

Contractor's plant and equipment shall be adequate to keep all concrete work dry until properly set.

All discharges from dewatering activities to surface waters, wetlands or storm sewers shall be free of sediment. Care shall be taken not to damage or kill vegetation by excessive watering or by damaging silt accumulation in the discharge area. If discharges are sediment laden, techniques shall be employed to remove sediment prior to discharge. A sedimentation basin shall be constructed and used as specified, where necessary, to protect vegetation and to achieve environmental objectives. All such soil erosion and sediment control measures are governed by the local Soil Conservation District.

### 1.13 Compacting Foundations

Wherever the development of suitable foundation conditions requires it, the Contractor shall take the proper means of compacting such foundation material. After excavation to grade, the surface shall be tamped, or otherwise consolidated to adequately prepare the bottom for the loads to come upon it, the method depending upon the quality and condition of the material. Where so required, screened gravel or quarry-processed road stone shall be placed on the surface and shall be compacted into the subgrade in such thickness as may be required by the Engineer.

### 1.14 Additional Excavation

Wherever, in the opinion of the Inspector, the material found at the bottom of excavations for the slabs, wall footings, or pipe inverts, is not satisfactory, the Contractor shall make any additional excavations as directed by the Inspector, and shall refill the same with selected material, which shall be tamped, and hand graded to the required grade as specified above.

### 1.15 Backfilling

As soon as practicable, after the pipe has been placed and visually inspected **and** the concrete has acquired a suitable degree of hardness, the backfilling shall begin and shall thereafter be prosecuted expeditiously.

All lumber, rubbish and braces shall be carefully removed from the excavation and from behind walls or other structures, unless ordered left in place by the Engineer. Backfill around the pipe, and up to a cover of at least 18-inches over the top of the pipe shall be Quarry Processed stone, unless otherwise approved by Inspector. Backfill under pipe haunches, around pipe and up to a cover of at least 18 inches over the top of the pipe shall be placed by hand in 6-inch layers, each layer to be thoroughly compacted by mechanical tampers of an approved type.

Compaction and tamping shall be as directed to the end that the pipe shall be securely bedded and protected at the end of each day's operation. Unless otherwise specified, all trenches or excavations shall then be backfilled up to the original surface of the ground or up to such grades as shall be directed. The backfilling shall be done as completely as possible in such manner as to prevent after-settlement around all structures and pipelines. No heavy stones or boulders shall be

allowed to drop into the trench. The trenches and excavations shall be wet down as required to obtain optimum density while the backfilling is being carried out.

In all trenches, backfill between a plane 18-inches above the top of the pipe and the finished surface grade shall be placed in successive layers and thoroughly compacted using mechanical tampers, hydro-tampers, or high speed vibro tampers, or if the material is suitable, compaction may be by puddling.

Backfill material shall be either bank run sand and gravel, quarry processed stone, or suitable excavated material, as directed by the Inspector. The Contractor shall refer to the Contract Drawings for the specific type of backfill required under the various phases of the project.

The backfill shall be compacted near optimum moisture content by means of vibratory compactors to not less than **95%** of the maximum density determined in accordance with ASTM Standard D1557(latest revision). The Engineer reserves the right to check the obtained in-place density of the compacted fill using the method of ASTM Standard D1556 (latest revision) for In-Place Density Tests. Should the obtained density of the compacted fill be less than specified, the Contractor shall recompact on the area until the required maximum density is reached. Only hand held compaction equipment shall be used within 4 feet of retaining type foundation walls and structures.

All boulders, rock, and other excavated material shall be disposed of at approved locations.

#### 1.16 Disposal of Material

All unsuitable excavated material shall be trucked off the site and disposed of at an approved location. The Contractor shall abide by all State, County and local laws and ordinances, shall secure all permits and disposal fees as necessary.

##### 1.16a Solid Waste Disposal

The bidder is directed to Public Law NJAC 7:26-1 et seq. Rules of the Bureau of Solid Waste Management, 1974. In general, this law requires that all solid wastes (concrete, black top, demolition or construction debris, etc.) must be disposed in an approved, licensed landfill site. Also, any truck hauling this type of material to a landfill must have a permit issued by the Bureau of Solid Waste Management.

#### 1.17 Temporary Bridges and Crossings

The Contractor shall, where required to expedite the work, or where required to maintain traffic, or where otherwise ordered by the Inspector, construct temporary bridges or walkways, of adequate sized members to safely carry the loads which may reasonably be anticipated and the sizes of the members used shall meet with the approval of the Inspector.

### 1.18 Protection of Existing Structures, Pipelines, Drain and Conduits and Restoration

The Contractor shall be responsible for locating all existing utilities by calling N.J. One-Call, the appropriate utility company directly or by digging test pits.

The Contractor shall carefully protect all existing structures, both above and underground, including poles, curbs, driveways, parking areas, privately owned pavements, signs, sumps, pits, catch basins, manholes, underground tanks, and building foundations; pipelines, including gas mains, water mains, hydrants, drain lines, storm sewer, sanitary sewers, service connections, electric and telephone conduits, and miscellaneous under ground pipelines; and shall restore same to a condition equivalent to conditions existing prior to his operation.

The Contractor is specifically directed to the requirements of protecting all trees along the route of the work in an approved manner.

The work of protecting and restoring existing utilities and facilities and including trees where no definite physical interference exists, or where the interference is avoidable, shall be borne by the Contractor. **All damages to existing utilities or other improvements caused by the Contractor's operations shall be repaired prior to resuming work at the expense of the Contractor.**

The lines have been located as to avoid interference to the greatest degree practicable, based upon data available as to depth and location of existing utilities and other facilities.

The Contractor shall insofar as possible, determine in advance of excavation by trenching machines, the location of all utilities and other subsurface structures, and shall accurately mark same, so that they may be avoided by the machine.

Where definite interference is unavoidable in the final work and necessitates the removal, alteration, replacement, or extension of utilities, the Contractor shall make all excavations for such work and shall cooperate with other forces engaged in the work.

The labor, pipe, and other materials necessary for removing, altering, replacing, or extending such utilities, other than for excavation, will, unless otherwise ordered, be done by the respective utility companies.

Prior to the start of any work in the vicinity of existing utilities or other subsurface facilities, the Contractor shall notify N.J. One-Call at least three days in advance of the start of his work.

\* \* \* \* \*

## ITEM 2 - FOR FURNISHING AND INSTALLING DUCTILE IRON FITTINGS - MECHANICAL JOINT

### 2.00 Work Included

Under this Item, the Contractor shall furnish and install all ductile iron fittings and sleeves as shown on the Contract Drawings or ordered by the Inspector. Work shall include all necessary excavation, backfill and concrete thrust blocking, bracing, and anchorage, as shown on the Contract Drawings or as required by field conditions.

### 2.01 Materials

Ductile iron fittings shall be cement lined, mechanical joint, meeting the American National Standard for Ductile Iron Compact Fittings for Water Service, ANSI/AWWA C153 latest revision. Mechanical joints shall conform with latest revision for ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings. Hydrant tees shall be mechanical joint tees. Cement lining shall conform to ANSI/AWWA C104, latest revision Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water and shall include a bituminous seal coat. The exterior surface of fittings shall receive a standard foundry coal tar dip coating, product to meet with EPA approval. Fittings up to and including 24-inch size shall be 350 psi pressure rating and fittings over 24-inch shall be Ductile Iron with a pressure rating class of 250 psi. All mechanical joint fittings shall be supplied with ductile MegaLug retainer glands conforming with the applicable requirements of Item 1, including pipe restraint.

Solid sleeve mechanical joint couplings shall be used where joining pipes of the same outside diameter and material. Pipe couplings shall be **Tyler/Union Ductile Iron C-110 Full body Mechanical Joint fitting or C-152 Compact Ductile Iron fitting** or approved equal and shall be utilized where joining pipes of different outside diameters. Pipe couplings shall consist of steel middle ring, two steel follower rings, resilient gaskets and bolts. Single panel repair clamps are not suitable alternates.

Standard body fittings conforming to the latest revision of ANSI/AWWA C110, Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch for Water and Other Liquids may be used where approved by the Engineer.

All fittings shall be U.S. made. Substitutions will be reviewed for conformance with all pertinent specifications at the Contractor's expense.

### 2.02 Jointing

The last 8-inches of the outside of the spigot piece and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, tar (other than the standard coating) and other foreign materials from the pipe and joint, and then painted with a soap solution. **The inside of the pipe shall be clean of any mud, dirt or other debris.** The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

The entire section of the pipe shall be pushed forward to seat the spigot end into the bell. The gasket shall then be pressed into place within the bell being careful to have the gasket evenly located around the entire joint. The MegaLug retainer gland shall be moved along the pipe into position for bolting, all of the bolts inserted and the nuts screwed up "finger-tight". All nuts shall be tightened with a suitable torque-limiting wrench. The torque for various sizes of bolts shall be in accordance with the manufacturer's recommendations. **The torque retaining nuts shall be snapped off in accordance with manufacturer's recommendations.**

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. Suitable torque gauges shall be furnished the Engineer for use in checking the job.

If effective sealing is not attained, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation practice will not be permitted.

### 2.03 Anchorage of Fittings

All fittings shall be securely anchored by concrete thrust blocks, refer to the appropriate schedule shown on the Contract Drawings.

Reaction or thrust blocking shall be 3000 psi concrete. Blocking shall be placed between virgin or undisturbed ground and the fitting with adequate bearing area on the pipe and the ground. Blocking, clamps, and methods of anchorage shall be such as to permit accessibility for joint repair. Plastic sheeting shall be placed around fittings before concrete blocking is poured.

Where fittings are anchored by the use of restrained joints, the type of joint must be as specified or approved by the Engineer and **a minimum of three (3) full lengths of straight pipe both sides of the fittings must be furnished with restrained joints** designed to withstand the thrust due to the internal test pressure. Deflection of the joints shall be in accordance with the manufacturer's recommendations. All mechanical joint fittings shall be supplied with MegaLug retainer glands unless otherwise directed by the Inspector.

MegaLug retainer glands shall be ductile iron and be Underwriters Laboratory approved, as manufactured by EBAA Iron, Inc., or approved equal.

\* \* \* \* \*



ITEM 3 - FOR FURNISHING AND INSTALLING  
UNDERGROUND GATE VALVES AND VALVE BOXES  
(Including Excavation, Backfill and Restrained Joints)

3.00 Work Included

The Contractor shall furnish and install underground gate valves and valve boxes complete where shown on the Plans or where ordered by the Engineer. The work shall also include all necessary excavation, backfill, and appurtenant work.

3.01 Gate Valves

Gate valves shall be iron body, inside screw, fully bronze mounted, conforming with the applicable requirements of AWWA Standard for Resilient Seated Gate Valves, for Water Service of the American Water Works Associations (AWWA C509, latest revision). Valve interior and exterior shall be coated with a 10 mil thickness epoxy coating which meets or exceeds all applicable requirements of AWWA C550 and is certified to ANSI/NSF 61. Disc shall be symmetrical iron wedge, fully encapsulated with molded rubber, no exposed iron.

Valves in sizes 3-inch to 12-inch shall be suitable for water working pressures to 250 psi and test pressures to 500 psi.

The operating nut shall be square, measuring 1 15/16-inch at the top, 2-inch at the base and shall be 1 3/4-inch high. An arrow showing the direction of opening and the word "OPEN" shall be cast on the flange of the operating nut. Valves shall open counter-clockwise.

Valves in sizes 3-inch to 12-inch shall be vertical and shall be provided with mechanical joint ends and MegaLug retainer glands.

MegaLug retainer glands shall be ductile iron, Underwriters Laboratory approved and conform with the applicable requirements of Item 1, as manufactured by EBAA Iron, Inc., or approved equal.

Lubrication instructions and parts lists shall be furnished in triplicate for each type and manufacture.

Valves shall be Resilient Wedge Gate Valves Model A-2360 as manufactured by the Mueller Company.

3.02 Valve Boxes

Each buried valve shall be provided with a **Tyler/Union Series 6855 Part # 564-A** cast iron, two piece, slide type valve box. Valve boxes shall be 5-1/4-inch shaft with a round base and shall be provided with extra deep cast iron covers with the word "WATER" cast on.

Length of valve boxes and size of base shall be to suit each particular installation and shall have about 8-inches of adjustment up and down available after setting to grade.

Valve boxes shall be as manufactured by **Tyler/Union** or approved equal.

All valves and valve boxes shall be U.S.A. made. Substitutions will be reviewed for conformance with all pertinent specifications at the Contractor's expense.

### 3.03 Installation

Valves shall be set truly plumb with valve boxes directly over the valves. After being correctly positioned for line and grade, earth fill shall be carefully tamped around the valve box. Top of box shall be flush with pavement in paved areas and shall be one-inch above ground surface in grassed or earth areas. In grassed or earth areas, valve box shall be set in concrete with minimum dimensions of 20"x20"x4". Support pipe in such a manner as to prevent stress on the valve. Valve boxes shall be installed in a manner that allows for proper operation of the valve. For valves deeper than 5 feet steel valve extensions shall be provided. Jointing of pipe to valve shall conform with Specification Item 2.

\* \* \* \* \*

ITEM 4 - FOR FURNISHING AND  
INSTALLING TAPPING SLEEVES AND VALVES  
(Including Excavation, Backfill, and Blocking)

4.00 Work Included

The Contractor shall furnish and install tapping sleeves, valves, and valve boxes complete where shown on the Plans and where ordered by the Engineer. The work shall include all necessary excavation, backfill, and appurtenant work as described under Item 1. The work shall also include all support and blocking as shown on the Drawings. Shop drawings for tapping sleeves and valves shall be submitted for approval to the Engineer.

4.01 Materials

Tapping sleeves shall be of the mechanical joint end type suitable for 200 psi working pressure for sizes 4-inch through 12-inch, 150 psi working pressure for sizes 14-inch through 24-inch. Tapping sleeves employing a compression type seal will not be acceptable alternates.

Valves and valve boxes shall comply with the pertinent provisions of Item 3 with the exception that tapping valves shall be provided with flanged inlet-mechanical joint outlet ends. Valves 2-inch through 12-inch shall be Mueller No. T-2360 Resilient Wedge Tapping Valve and valves 14-inches through 36-inch shall be Mueller No. T-2361.

Tapping valves and sleeves shall be as manufactured by the Mueller Company. Tapping sleeves for use with existing cast iron pipe, Mueller No. H-615. Tapping sleeves shall be equipped with 3/4-inch NPT test plug.

4.02 Methods

Work shall be carried out by personnel thoroughly experienced in the construction of wet taps, using approved methods and equipment. The tapping sleeves and valves shall be set with the face level and securely supported and blocked by poured 3000 psi concrete against undisturbed ground. The HMUA shall be notified 48 hours in advance of the tapping operation. The sleeve shall be tested in accordance with the requirements of Item 1 prior to performing the tap.

Before ordering tapping sleeves, the Contractor shall excavate by test pit and determine the exact outside diameter of the existing pipe.

\* \* \* \* \*

**ITEM 5 - FOR FURNISHING AND INSTALLING FIRE HYDRANTS  
AND FOR REMOVAL OF EXISTING HYDRANTS, COMPLETE**

**5.00 Work Included**

The Contractor shall furnish and install new fire hydrants in locations shown on the Contract Drawings or where ordered by the Inspector. Work shall include all necessary excavation, backfill, blocking, bracing and broken stone for hydrant drainage and installation of hydrant runout pipe, valves, valve boxes and fittings. The work shall also include the removal and disposal of existing hydrants designated for abandonment on the Drawings.

**5.01 Description of Hydrants**

Hydrants shall be of 5-1/4-inch size, conforming to the standards of the American Water Works Association, AWWA Standard for Dry-Barrel Fire Hydrants for Ordinary Water Works Service, AWWA C502, latest revision, relating to fire hydrants.

Hydrants shall be of a two piece design with a breakaway flange located at the ground line. Hydrants shall be provided with a 6-inch diameter mechanical joint connection with MegaLug restraint and shall be set with the breakaway flange as shown on the Contract Drawings. Extensions, as required, shall be furnished and installed by the Contractor.

Hydrants shall be of the safety flange type with 6-inch mechanical joint connection, 5-1/4-inch main valve opening, two (2) 2-1/2-inch hose connections with National Standard threads and one (1) 4 1/2-inch steamer nozzle to fit the Owner's standard dye. Hydrants shall have O-Ring seals and the main valve shall close clockwise. All hydrants shall be painted with two (2) coats of red paint.

All parts of hydrants shall be interchangeable with similar parts of hydrants of the same size and type. All bolt holes shall be accurately drilled from templates. All joints shall be faced smooth, so as to make a perfectly watertight joint.

Hydrants shall be provided with O-ring seals. Each hydrant shall be shop tested under 300 psi applied above and below the compression valve. Any hydrant showing sweating of metal or leaking or other defect shall be rejected. All tests shall be made at the expense of the supplier.

Hydrants shall be "Centurian Model A-423" as manufactured by the Mueller Company.

**5.02 Installation of Hydrants**

Hydrants shall be placed at locations **as shown on the approved plans** or as directed by the Inspector. Steamer nozzle shall face the road. Hydrants shall be set plumb and any required hydrant extensions shall be set properly.

Each fire hydrant shall be placed on a slab of concrete not less than 4-inches thick and 15-inches square. Hydrants shall be set 18 inches from the face of the curb with the valve as close to the main as possible. Refer to the HMUA Standard Details for hydrant installation detail.

Clean broken stone shall be placed around the base of each fire hydrant to within one (1) foot of finish grade. Polyethylene sheeting shall be placed over the broken stone prior to completing the backfill operation to insure the complete drainage of the hydrant when closed. All backfill around hydrants and valves shall be thoroughly and carefully compacted after correct positioning and visual inspection.

Before installing any hydrant, care shall be taken to see that all foreign material is removed from the interior of the barrel.

All hydrants not in service shall be covered and secured by a burlap sack or other means approved by the **Inspector**. When hydrant is ready for service, the hydrant and valve shall be opened and closed to see that all parts are in working condition. After closing the main valve, a nozzle cap shall be removed and the standpipe interior inspected to make sure of proper drainage.

### 5.03 TESTING

After installation test the hydrant as follows, **Testing must also be done after any hydrant extensions are installed:**

#### A. Pressure Test

1. Open the hydrant fully and fill with water; close all outlets.
2. To prevent caps from being blown off dry-barrel hydrants and to prevent other possible damage, vent air from the hydrant by leaving one of the caps slightly loose as the hydrant is being filled. After all air has escaped, tighten the cap before proceeding.
3. Apply line pressure.
4. Check for leakage at flanges, nozzles and operating stem.
5. If leakage is noted, repair or replace components or complete hydrant unit no leaks are evident.

#### B. Drainage Test for Dry-Barrel Hydrants

1. Following the pressure test, close hydrant.
2. Remove one nozzle cap and place pylon or hand over nozzle opening.
3. Drainage rate should be sufficient rapid to create a noticeable suction.
4. After backfilling, operate the hydrant to flush out any foreign material.
5. Tighten nozzle caps, then back them off slightly so that they will not be excessively tight; leave tight enough to prevent removal by hand.

### 5.03 Related Materials

Ductile iron runout pipe, fittings, restraint, valves and valve boxes shall conform with the requirements of other sections of these Specifications.

\* \* \* \* \*

## ITEM 6 - FOR FURNISHING AND INSTALLING SERVICE CONNECTIONS

### 6.00 Work Included

The Contractor shall do all excavation, backfill, bracing, and dewatering as required for the service connection trenches, and shall furnish, lay, and test the service connections from the new corporation stops to the point of interconnection with existing services to be reconnected to the newly installed water main.

All new services installed shall be single length of copper tubing without joints between the corporation stop and the curb **valve and then from the curb valve to the meter pit**. Copper tubing shall be free of kinks, dings or other defects.

The Contractor shall furnish and install new curb valves and valve boxes with stainless steel rods and **Meter Pits** located in a grass area within 3 feet of the edge of curb or pavement and within the public road of right-of-way or at locations designated by the Inspector.

The work shall include all labor, tools, materials and equipment to complete the installation. All work shall be inspected by the HMUA. The Contractor shall take every precaution to avoid the contamination of the copper tubing prior to and during its installation.

The Contractor shall notify the HMUA and the effected residents at least 48 hours prior to the interruption of the water services.

The work shall include the protection and maintenance of traffic.

### 6.01 Materials

The copper tubing shall be ¾" or larger Type K and conform with ASTM Designation B-88, latest revision.

Curb valves and boxes shall be provided on all service connections at the right-of-way line. Curb valves shall be bronze body, stem and key with resilient o-rings. Curb valves shall be rated for a 150 psi working pressure and shall be Mueller No. B-25209 Ball Valves without drains. Valve boxes shall be cast iron extension type with **1-inch** inside diameter upper section, stationary rod extensions and arch pattern base for fitting over the curb valve. For service lines larger than 1-inch the contractor shall install a Tyler/Union Series 6855 part # 564-A main line valve box. The top of the valve box shall be set flush with finish grade. Valve boxes shall not be installed in sidewalk or curb areas. Valve boxes shall be **Model # H-10314** as manufactured by the Mueller Company, with Model 88033 stainless steel rod.

**On all new construction and on existing service lines where a repair has been made and the line is no longer one continuous piece of copper a meter pit is required,** A Mueller #SV-1848, shall be installed three (3) feet from the edge of pavement in accordance with the HMUA standard details, including all appurtenances shown. Where water services are installed for condominium units or where there is a homeowner's association, each unit shall have a separate water service line with an individual meter pit. Meter pits for multiple units shall each be located within 3 feet of the public road right-of-way before the water service line enters the developed site. All meter pit lids shall be accessible to HMUA personnel.

#### 6.02 Testing

Upon completion of the new service connection installation, the Contractor shall test each connection for any visible leakage at the working pressure of the water system. The trench area will remain open until the testing is completed at the discretion of the **Inspector**. All leaks shall be repaired prior to backfilling the trench.

\* \* \* \* \*



ITEM 7 - FOR FURNISHING AND INSTALLING  
CORPORATION STOPS

7.00 Work Included

The Contractor shall furnish and install corporation stops at locations designated by the **approved plans**. The work shall include all necessary excavation and backfill in accordance with the applicable sections of the specifications.

7.01 Connection to Ductile Iron Pipe

Tapping of the main shall be carried out by personnel experienced in this work using equipment designed for use with the corporation stops specified. Stops shall be installed so as to insure a watertight connection, and be at a **22 1/2°** angle to the spring line of the water main.

Tapping of the main shall not be conducted until the new water mains installed under this Contract have been completed, pressure tested, sterilized and flushed, and are fully pressurized.

7.02 Materials

Corporations shall be bronze body, key and stem with resilient o-ring seals conforming with AWWA C800-84, latest revision Underground Service Line Valves and Fittings. Corporations shall have threaded inlets and compression fitting outlets suitable for use with Type K copper tubing. Corporations shall be Model B-25008 as manufactured by the Mueller Company or approved equal.

Sizes of corporation stops shall be as required to reconnect existing service connections from the existing water mains to the proposed mains.

Multiple taps at a single location shall be at least 18” apart and staggered as far as angle to the spring line on water main to avoid pipe damage (to prevent weakening pipe).

\* \* \* \* \*

## ITEM 8 - FOR FURNISHING AND PLACING QUARRY-PROCESSED STONE

### 8.00 Work Included

The Contractor shall furnish, place, grade and compact quarry-processed stone for pipe bedding and backfill as noted on the Drawings or as directed by the Engineer.

### 8.01 Materials and Placing

Quarry-processed stone, Type 5A, N.J.D.O.T., shall be equivalent to Dense Graded Aggregate (DGA) material as outlined in the New Jersey State Department of Transportation Standard Specifications, Section 901.08 dated 1996, or latest revision thereof. Dense Graded Aggregate material shall be broken stone or crushed gravel conforming to the gradation and moisture requirements set forth by the NJDOT. A 30 pound sample shall be submitted to the Engineer for approval before any material is trucked onto the site. The Engineer reserves the right to have a certified testing laboratory perform sieve analyses on the material. The material shall be leveled to the required grades and compacted by approved methods in 6-inch layers. Recycled Concrete Aggregate (RCA) shall not be allowed as select backfill in trenches.

\* \* \* \* \*

ITEM 9 - FOR FURNISHING AND PLACING BROKEN STONE  
OR GRAVEL MATERIAL

9.00 Work Included

The Contractor shall furnish, place, grade, and compact all broken stone or screened gravel for foundations or drainage, where required by the Drawings and Specifications and when ordered by the Engineer. Excavation for stone or gravel base and disposal of excess material will be included under this Item.

Broken stone or gravel foundation shall be required under all sewer/water mains as shown on the standard trench detail included in the Contract Documents.

9.01 Materials and Placing

Broken stone or screened gravel shall be clean, hard, durable, strong, washed gravel or crushed stone conforming to the requirements of N.J.D.O.T. Standard Specifications for Coarse Aggregate, Size No. 57 (¾" Gravel or Broken Stone). Gravel or stone shall be used where shown on the Contract Documents, or where required by field conditions or as ordered by the Engineer. The gradation of the gravel or stone shall be approved by the Engineer. The material shall be accurately leveled to required grades, and where required shall be compacted by tamping or other approved means

\* \* \* \* \*

## ITEM 10- FOR TRENCH BACKFILL COMPACTION

### 10.00 Work Included

The Contractor shall furnish all necessary labor, materials and equipment required to compact all trench backfill material within roadways, driveways and sidewalks. It is the purpose of this item to insure that all trench backfill material used will be compacted in such a manner so as to attain maximum compaction in accordance with Sections 203 and 207 of the NJDOT Standard Specifications for Road and Bridge Construction, latest revision. The work includes backfill compaction of all **water mains, service lines**, sanitary sewers, manholes and house connection run-outs complete, as well as the compaction of backfill in test pits within roadway areas.

Following pipe laying, backfill under the pipe haunches, around the pipe and up to cover of at least 18-inches over the top of the pipe shall be placed by hand in 6-inch layers, each layer to be thoroughly compacted by mechanical or vibro-tampers of an approved type. Compaction and tamping shall be as directed such that the pipe shall be securely bedded and protected at the end of each day's operation.

All trenches or excavations shall then be backfilled in mechanically compacted 12-inch lifts to the original surface of the ground or up to such grades as shall be directed, to obtain **95%** of relative density. No heavy stones or boulders shall be allowed to drop into the trench. The trenches and excavations shall be wet down as required to obtain optimum density while the backfilling is being carried out.

The Contractor shall employ mechanical tampers, or high speed vibro-tampers to consolidate the backfill during trench backfilling. Note: Hydro-hammers are not to be used 3 feet or less from the top of the pipe.

If in the Contractor's opinion he can obtain a density of backfill equal to or greater than that which is obtained by backfilling and compacting in 12 inch layers, he may submit his scheme to the Engineer for consideration. Adequate proof of such a method will be required before any decision is made. Jetting of trenches will not be permitted under any circumstances.

\* \* \* \* \*