

SECTION 33 10 00 - WATER SUPPLY SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to work of this Section.
- B. The specifications in this section are intended to supplement any requirements and specifications established by the local utility company or agency which regulates water usage at the project site.

1.2 DESCRIPTION OF WORK

- A. Extent of water supply systems work is indicated on the Drawings and schedules, and by requirements of this Section.
- B. Obtain all building permits for installation of the new water service line. Coordinate inspection of new water service piping with local Construction Official or other authority having jurisdiction.
- C. Verify the exact location of existing water services using test pits or electronic location means. Water service locations shown on the drawings were obtained by record mapping. This information is deemed to be very inaccurate and the contractor must adjust installation to suit field conditions as indicated on the drawings.
- D. Pressure-test system after installation.
- E. Sterilize new water services and obtain health department approval of same.
- F. Coordinate work with site plumbing contractor to insure continuity.
- G. Restore all pavement and other areas to original or better (new) condition after utility work.
- H. Provide trench de-watering, AS NEEDED, in accordance with Section 31 50 00 – Excavation Support.
- I. The contractor may need to provide trench shoring in some areas to keep trench widths to a minimum and to maintain the structural integrity of the existing structures.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of water supply system products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with water supply work similar to that required for this project.
- C. The contractor shall contact the appropriate utility company or agency which regulates and provides water service at the project site for installation guidelines and specifications. The specifications in this section shall be superseded by all requirements set forth by the appropriate utility company or agency for the work described on the Drawings.
- D. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of water supply system materials and products. Also comply with National Fire Prevention Association Code #24 for water supply systems for Private Fire Service.
 - 2. Environmental Compliance: Comply with applicable portions of local Environmental Agency and Health Department regulations pertaining to water supply systems.
 - 3. Safety Compliance: Comply with applicable portions of OSHA, related to trench safety.
- E. All construction of water systems shall be inspected by the authority having jurisdiction, either directly or through trained observers under his/her supervision.
- F. The applicant shall give at least 48 hours notice to water utilities, the Health Department and the Building Department prior to construction or testing of water systems at all times during construction of this project.
- G. Record Drawings
 - 1. After construction, and before final acceptance of the water system, the Contractor shall furnish as-built drawings, signed and sealed by a licensed Professional Surveyor in the State of New Jersey, showing all new water service lines and appurtenances.
 - 2. Record drawings shall be with full detail and accurate dimensions, setting forth the location of each pipe, cross, bend, and tee connection. At all times possible, dimensions shall be tied to major site features for future locating purposes.

1.4 SUBMITTALS

- A. Make submittals under provisions of Appropriate Division 01 Section.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for water supply system materials and products.

- C. Record Drawings: At project closeout submit record drawings of installed water supply piping in accordance with requirements of Appropriate Division 01 Section.

1.5 REFERENCE STANDARDS

A. ANSI

1. Ductile Iron Pipe: A21.51.
2. Bituminous Coating: A21.51.
3. Cement-mortar lining: A21.4, (AWWA C104)
4. Pipe Wall: A21.50, (AWWA C150).
5. Ductile Iron Pipe Joints: A21.11, (AWWA C111).
6. Flange: B16.1 or A21.10.
7. Ductile Iron Pipe Fittings: A21.10.
8. Underground Pipe Fittings: A21.11, (AWWA C111).

B. AWWA

1. Gate Valves: Specification C-500.
2. "Standard for Disinfecting Water Mains": Specification C-601.
4. Bacteriological Testing: Specification C-601.

- C. NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances 1995 Edition

- D. Jackson Township Municipal Utilities Authority (MUA) Rules and Regulations, April 2011 or current edition.

1.6 RELATED SECTIONS: Included in this specification section are CSI Standard Reference numbers.

- A. Section 311200 – Selective Clearing
- B. Section 315000 – Excavation Support
- C. Section 312000 – Earth Moving
- E. Section 329113 – Soil Preparations
- F. Section 329200 – Lawns and Grasses
- G. Section 331300 – Disinfecting of Water Utilities

PART 2 - PRODUCTS

2.1 PIPES AND PIPE FITTINGS

- A. The drawings identify most fittings, bends, tees, restraining measures, alignment changes, etc., however, the Contractor shall adjust installation requirements to suit actual field conditions encountered at no additional cost to the owner.
- B. The proposed service lateral shall be of a minimum diameter of four (4) inches.
- C. Ductile Iron Pipe
 - 1. Ductile Iron Pipe shall be centrifugally cast annealed and manufactured in accordance with the latest revision of:
 - a. ANSI/AWWA C110/A21.10 (fittings)
 - b. ANSI/AWWA C111/A21.11 (rubber gasket joints)
 - c. ANSI/AWWA C115/A21.15 (Flanged joints)
 - d. ANSI/AWWA C151/A21.5 (pipe)
 - 2. Pipe shall be double cement mortar lined inside and have an exterior coal-tar, epoxy type coating. The bituminous coating shall be in accordance with the requirements of the latest revision on ANSI A21.51. The cement-mortar lining shall be in accordance with the latest revisions of ANSI A21.4 (AWWA C104), and shall include a bituminous seal coat. The pipe length shall be in nominal 18-20 ft. lengths. All ductile iron pipe shall be pressure class.
 - 3. Special transition couplings and or gaskets are required for joining different types of pipe. The basis of design for such transition devices are listed on the plans and shall be approved by the local water utility. When ordering, the actual outside diameter of the pipe should be given. Push on joints and mechanical joints shall be assembled as specified in ANSI/AWWA C600, latest edition.
 - 4. Acceptable Manufacturers:
 - a. U.S. Pipe
 - b. Rockwell
 - c. Griffin Pipe Products Co.
 - d. Valley Steel Products
- D. Ductile Iron Pipe Joints
 - 1. All pipe using push on joints shall have “Field Lok 350” joints or approved equal. Where concrete reaction backings (thrust blocks) cannot be installed due to poor soils other pipes in this area, restrained joints shall also be used.
 - 2. All exposed pipe (within structures, etc..) and where noted on the plans shall have flange joints unless otherwise noted. The flange shall be faced and drilled to the Class 125 standard.
 - 3. Reference Manufacturers:
 - a. “Basis of Design” is “Field Lok 350” by US Pipe or approved equal.

E. Ductile Iron Pipe Fittings

1. All D.I. fittings shall be ductile iron class 250.
2. All buried ductile iron fittings (i.e. valves, couplers, transitions, blow-offs, backflow devices) shall have mechanical joints with retainer glands.
3. All underground pipe fittings shall be ductile iron conforming to the latest revisions of ANSI, A21.11 (AWWA C111).
4. Reference Manufacturers:
 - a. U.S. Pipe
 - b. Rockwell
 - c. Griffin Pipe Products Co.
 - d. Valley Steel Products
 - e. Geneco Co.

F. Gate Valves

1. Gate valves for water service shall conform with all applicable provisions of ANSI/AWWA C509, latest addition.
2. A new 4" gate valve shall be provided where shown on the plans.
3. Type: Double disc, parallel seat. Underground valves shall be of the non-rising stem type and exposed valves in pits or structures shall be of the open rising stems and yoke type.
4. Seals: "O-ring" unless stuffing box and gland are required. Gland, bushing, and bolts where required, shall be of bronze.
5. End Connections: Bell, mechanical joint, flange (American Standard), or "Ring-tite" to suit the type of pipe in which the valve is installed.
6. Discs and Seat Rings: Bronze mounted.
7. Lubrication and O & M instructions and parts lists shall be furnished in quadruplicate for each type of valve provided.
8. All valves shall open counterclockwise, shall be set plumb, and shall be furnished with a 2 inch square operating nut.
9. Buried resilient seat gate valves shall have iron body, inside screw, epoxy coated inside and out, resilient seat, "O" rings seals and mechanical joint ends. Valves shall be of the non-rising stem type and shall be "SUPER-SEAL RESILIENT SEAT NRS" (A-2370) and manufactured by the Mueller Company.
10. Reference Manufacturers:
 - a. Mueller Company
 - b. American Darling Company

G. Valve Boxes

1. All buried valve boxes shall be 2-piece sliding type cast iron valve boxes.
2. Where valves are deeper than 4'-0" extension stems shall be provided to within a maximum of 3'-0" from the finished grade.
3. All extension stems shall be of heavy duty construction, shall be coated with two (2) coats of asphaltum varnish, and shall be provided with a self-centering ring to maintain the stem in the center of the valve box.

4. Each valve box shall be of sufficient length to allow a vertical adjustment of approximately 8 inches in either direction.
5. All existing valve boxes and castings that are in good condition shall be reset to new grades. Contractor to replace any broken or deteriorated valve boxes as needed. Contractor to furnish and install new standard and deep valve boxes as required, to reset to new grades.
6. All valve boxes and extension stems shall be set plumb.
7. All water main valve box covers shall have the word "water" and arrow indicating the direction of valve opening cast on.
8. Concrete block shall be poured around all valve boxes not set in paved areas as shown on the detail sheet.
9. Reference Products
 - a. Geneco, Tuflite shaft buffalo-type service boxes
 - b. Joseph G. Pollard Company, Buffalo-type
 - c. Bingham & Taylor (Opelika)

2.2 TAPPING SLEEVES

- A. 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.
- B. 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 2.1 of these specifications.
- C. Tapping sleeves shall be Mueller Model H-615 or equal for all ductile iron water mains.

2.3 FIRE HYDRANTS

- A. Fire hydrants shall comply with the latest edition of AWWA Standard C-502.
- B. Hydrants shall have a minimum 5-1/4" main valve opening;
- C. Hydrants shall be equipped with two (2) 2-1/2" hose nozzles and one (1) 4-1/2" steamer nozzle;
- D. All nozzles shall be National Standard thread;
- E. The operating and nozzle cap nuts shall be 1-1/2" pentagon, open left;
- F. All hydrants shall be furnished with a 6" gate valve;
- G. Acceptable Models:
 1. Mueller Model A-423

2. U.S. Pipe “Metropolitan”.
- H. Fire Hydrant Painting Schedule: Cap and bonnets are to be painted based on flow as follows:
- Flow Color: 0-500 G.P.M Red
500-1000 G.P.M. Orange
1000-1500 G.P.M. Green
Over 1500 G.P.M. Blue
- I. Fire Hydrant barrels shall be painted silver.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

A. Laying Water Pipe

1. The laying conditions for ductile-iron pipe shall be completed in accordance with ANSI/AWWA C150/A21.50 and the approved details.
2. All pipe, fittings, valves and other appurtenances shall be inspected by the Contractor prior to installation. Defective materials shall be marked and held for inspection by the Contractor who may prescribe corrective repairs or reject the material.
3. All pipe shall be laid and maintained at required lines and grades shown on the approved plans, as called for in these specifications or as may be directed by the Engineer or Water Utility having jurisdiction. The axis of fittings shall align with the longitudinal axis of the pipe.
4. It shall be the responsibility of the Contractor to provide adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of work. When the required grade or alignment of the pipe is obstructed by existing utility structures (such as conduits, ducts, pipes, branch connections to main sewers, or main drops), the obstruction shall be permanently supported, relocated, removed, reconstructed, or bypassed by the Contractor as provided in the specifications and in cooperation with the owners of such utility structures.
5. Pipes, valves, and fittings shall be inspected for damage when received and shall be inspected prior to installation. Bolted joints shall be checked for proper torquing of bolts.
6. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign materials before the pipe is laid.
7. Foreign materials shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time. No trench water shall be allowed to enter the pipe fittings. Before lowering and while suspended, the pipe shall be inspected for defects.

8. At times when pipe-laying is not in progress, the open ends of pipe shall be closed by a watertight plug. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is completely dry. Care must be taken to prevent pipe flotation, if the trench fills with water.
 - a. Prior to removal of the plug for extending the line or for any other reason, air and/or water pressure of the line shall be released.
9. Under no circumstances shall water pipe materials be dropped or dumped. Pipe shall not be rolled or skidded against other pipe materials.
10. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work.
11. All pipe, fittings, and valves shall be lowered carefully into the trench by means of a backhoe, a crane, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall materials shall be dropped or dumped into the trench.
12. The trench should be dewatered prior to installation of the pipe.
13. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
14. Pipes shall bear throughout their full length and shall not be supported by the bell ends only or by blocks.
15. The top of the pipe shall be buried not less than 4.0 feet below final grade as specified in N.J.A.C. 7:10-11:10.
16. Except where necessary in making connections with other lines and as authorized by the Site Engineer, pipe shall be laid with the bells facing in the direction of laying and for lines on an appreciable slope, the bell shall, at the direction of the engineer, face upgrade.
17. Not less than two lengths of pipe shall be in position with packing installed and earthfill tamped alongside the pipe, ahead of each joint before it is completed, except at closures.
18. Pipelines or runs intended to be straight shall be so laid. Deflections from straight line or grade made necessary by vertical curves or horizontal curves or offsets shall not exceed ½ inch per linear foot of pipe between the centerline extended of any two connected pipes.
19. All gasketed joints shall be made in strict accordance with the recommendations of the joint manufacturer.
20. Joints shall be assembled by persons familiar with the particular materials used and in accordance with the manufacturer's instructions and specifications.
21. All bolted joint accessories shall be cleaned and thoroughly coated with asphalt or other corrosion-retarding material after installation.
22. All fittings at bends in mains shall be restrained with threaded rods and a concrete thrust block as shown on the Drawings. Care must be taken as not to cover MJ bolts, rods and nuts with concrete.
23. All exposed pipe fittings, within structures, etc., shall have flange joints. The flange shall be faced and drilled to the 125# standard in accordance with the latest revisions of ANSI b16.1 or A21.10.
24. Provide and coordinate final connection to public water main(s) with the appropriate utility company/agency.
25. Provide connections to water service line exiting the building.

27. When it is necessary to deflect pipe from a straight line in either the horizontal or vertical plane, the amount of pipe deflection shall not exceed that shown in Tables 4 or 5 of ANSI/AWWA C600, latest edition. The deflections listed are maximum deflections and should not be exceeded. Deflection should be limited to 80 percent of the values shown.
28. Cutting pipe for insertion of valves, fittings, or closure pieces shall be done in conformance with all safety recommendations of the manufacturer of the cutting equipment. Cutting shall be done in a safe, workmanlike manner without creating damage to the pipe or cement-mortar lining.
 - a. Existing gray-iron pipe may be cut using an abrasive pipe saw, rotary wheel-cutter, guillotine pipe saw, milling wheel saw, or oxyacetylene torch if recommended by the pipe manufacturer.
 - b. Ductile-iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling saw wheel, or oxyacetylene torch if recommended by the pipe manufacturer.
 - c. Cut ends and rough edges shall be ground smooth, and, for push-on joint connections, the cut end shall be beveled by methods recommended by the manufacturer.
 - d. ANSI/AWWA C151/A21.51 requires factory gauging of the spigot and to ensure that the outside diameter of each spigot and falls within the tolerances stipulated in the standard. Accordingly, pipes selected for cutting should be field-gauged. A mechanical joint (MG) gland inserted over the barrel might serve as a convenient indicator for this purpose.

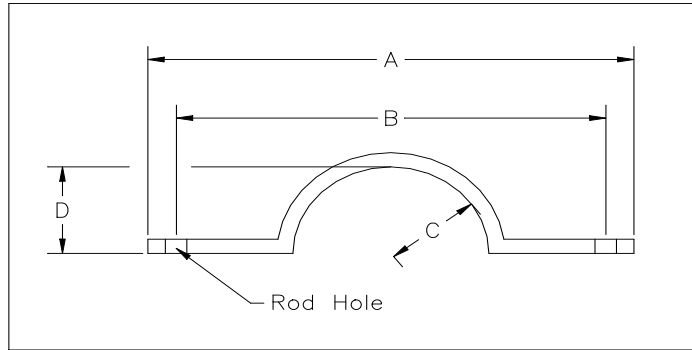
B. Restraining Water Pipes

1. All tees, plugs, caps, bends, and branches shall be restrained against movement.
2. Pipe clamps and tie-rods, thrust blocks, locked mechanical or push-on joints, mechanical joints utilizing set screw retainer glands, or other approved methods or devices shall be used. The type of pipe, soil conditions, and available space determine the method.
 - a. Clamps shall be:
 - 1/2 in. x 2 in. (12.7 mm x 50.8 mm) for pipe 4 in. to 6 in.
 - 5/8 in. x 2 1/2 in. (15.9 mm x 63.5 mm) for pipe 8 in. x 10 in.
 - 5/8 in. x 3 in. (15.9 mm x 76.2 mm) for pipe 12 in.
 - b. Bolt holes shall be 1/16 in. (1.6 mm) diameter larger than bolts.
 - c. Minimum rod size shall be 5/8 in. (15.9 mm) diameter.

Nominal Pipe Size (inches)	Number of Bolts			
	5/8 in. (15.9 mm)	3/4 in. (19.1 mm)	7/8 in. (22.2 mm)	1 in. (25.4 mm)
4	2	--	--	--
6	2	--	--	--

- d. When using bolting rods, the diameter of mechanical joint bolts limits the size of rods to 3/4 in. (19.1 mm)
 - e. When using clamps, rods shall be used in pairs, two to a clamp.
 - f. When using combinations of rods greater in number than two, the rods shall be symmetrically spaced.
 - g. Clamp bolts shall be:
5/8 in. (15.9 mm) diameter for pipe 4 in., 6 in., and 8 in.
 - h. Washers can be cast iron or steel, round or square.
Dimensions for cast iron washers shall be
5/8 in. x 3 in. (15.9 mm x 76.2 mm) for pipe 4 in., 6 in., 8 in., and 10 in.
Dimensions for steel washers shall be
1/2 in. x 3 in. (12.7 mm x 76.2 mm) for pipe 4 in., 6 in., 8 in., and 10 in.
 - i. Holes shall be 1/8 in. (3.2 mm) larger than rods.
3. Restraint Straps for Tees
- a. Straps shall be
5/8 in. (15.9 mm) thick and 2 1/2 in. (63.5 mm) wide for pipe 4 in., 6 in., 8 in., and 10 in.
 - b. Rod holes shall be 1/16 in. (1.6 mm) larger than rods.

Restraint Straps for Tees



Nominal Pipe Size	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
4	12 ½	318	10 1/8	257	2 ½	64	1 ¾	44
6	14 ½	368	12 1/8	308	3 9/16	90	2 13/16	71
8	16 ¾	425	14 3/8	365	4 21/32	118	3 29/32	99
10	19 1/16	484	16 11/16	424	5 ¾	146	5	127
12	22 5/16	567	19 3/16	487	5 7/8	171	5 7/8	149

4. Threaded sections of rods shall not be formed or bent.
5. Material used for clamps, rods, rod couplings or turnbuckles, bolts, washers, restraint straps, and plug straps shall be of material having physical and chemical characteristics such that its deterioration under stress can be predicted with reliability.
6. After installation, rods, nuts, bolts, washers, clamps, and other restraining devices, except thrust blocks, shall be cleaned and thoroughly coated with a bituminous or other acceptable corrosion-retarding material.

C. Trench Construction

1. The trench width at the ground surface may vary with the trench depth, the nature of soils encountered, existence of any pavement, and the proximity of adjacent structures.
 - a. The minimum clear width of an unsupported or supported trench measured at the centerline of the pipe shall be at least 18 inches or the pipe outside diameter plus 12 inches, whichever is greater.
 - b. Where embedment compaction is required, the trench shall be wide enough to accommodate the compaction equipment.

- c. Whenever possible, the clear width of the trench at the top of the pipe should not exceed the pipe outside diameter plus 24 inches.
 2. The trench shall be excavated to the depth that permits pipe to be laid at the elevations shown on the engineering drawings or with the required depth of cover. The depth of cover shall be measured from the finished grade or the surface of the permanent improvement to the top of the pipe barrel.
 3. The trench bottom shall be constructed to provide a firm, stable, and uniform support for the full length of the pipe. Blocking shall not be used to change pipe grade or to intermittently support pipe across excavated sections. Bell holes at each joint shall be provided to permit the joint to be assembled and pipe to be supported properly.
 4. Ledge rock, boulders, and cobbles, and large stones shall be removed to provide at least 6 inches of embedment cushion on each side of and below all pipe and appurtenances. The excavation shall be sufficiently wide to enable proper placement of the embedment specified by the Purchaser. When excavation is completed, excavation material shall be placed, leveled, and compacted to provide a proper cushion for the pipe. Such embedment shall be dense graded aggregate as specified by NJDOT.
 5. If the trench passes over sewer or other previous excavation, the trench bottom shall be compacted to provide support equal to that of the undisturbed native soil or conform to specific regulatory requirements that preclude damage to the existing installed facility.
 6. Where all unstable subgrade conditions exist that, in the opinion of the , cannot support the pipe, an alternative foundation shall be provided. At the discretion of the geotechnical engineer additional depth shall be excavated and refilled to pipe foundation grade with embedment material. Any part of the trench excavated below grade shall be backfilled to grade and compacted to the required density. Such embedment shall be dense graded aggregate as specified by NJDOT.
 7. Where running or standing water occurs in a trench bottom or where the soil in the trench bottom displays a “quick” tendency, the water shall be removed by pumps. The trench shall be kept free from water during installation operations by suitable means, such as well points or pervious underdrain bedding, until the pipe has been installed and backfill placed and compacted to a sufficient height to prevent pipe flotation.
 8. The Contractor shall dewater all excavations promptly and continuously throughout the progress of the work. The contractor shall protect uncompleted work.
- D. Backfilling: Do not backfill until trenches and pipe work have been inspected by appropriate authority, except as further defined in Section 315000.
1. Use imported granular dense graded aggregate fill in all pipe trenches. Backfill shall be tamped in layers under and around pipes (and puddled where possible) to prevent settlement or lateral movement, and shall contain no ashes, cinders, refuse, organic matter, or other corrosive materials.
 2. Rocks shall not be placed in trenches. Frozen earth shall not be used for backfilling.
 3. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, or other unsuitable material. See note 1 above.
 4. When special backfill compaction procedures are required, they shall be accomplished in accordance with project specifications or applicable federal, State, and local regulations.

5. Newly installed pipelines are normally tested after backfilling. When unusual conditions require that pressure and leakage testing be accomplished before completion of backfilling or with pipe joints accessible for examination, sufficient backfill material shall be placed over the pipe barrel between the joints to prevent movement, and due consideration shall be given to restraining thrust forces during the testing. In particular, restrained-joint systems, which derive their stability from the interaction of the pipe and soil, should be backfilled prior to testing.

E. Polyethylene Wrapping:

1. Provide 8 mil thick polyethylene tube if and where indicated on the drawings. Installation in accordance with ANSI/AWWA C105/A21.5 Method A.

F. Reddy Bolts and Duc-Lugs

1. Reference Product: Stellar Corporation or approved equal.

G. Threaded Rod

1. Reference Product: Stellar Corporation All Thread Rod or approved equal.

3.2 SAFETY

- A. Contractor shall submit certification that an experienced foreman superintendent trained in safety will be present at all times that construction activities are underway.

3.3 FLUSHING

- A. All mains shall be flushed thoroughly with water after backfilling is complete. All dirt, rubbish and debris shall be removed from the mains.
- B. The contractor shall furnish and install all temporary piping, valves, corporations, fittings, pumps, hose and appurtenances which may be necessary to properly flush the pipeline.
- C. Flushing operations shall be in strict conformance with NJDEP requirements and water shall be discharged so as not to cause any soil erosion or sedimentation problems.

3.4 STERILIZATION AND TESTING OF MAINS

- A. Sterilization – Refer to Section 33 13 00.

B. Hydrostatic Testing

1. All pipe lines shall be hydrostatically tested to a minimum of 200 psi or 2 times the working pressure of the line, whichever is greater, for 2 hours. The cost of testing the pipe lines shall be borne by the contractor, who must furnish all necessary equipment, material, and labor for the tests. All pipe shall be tested for a minimum of two hours with a leakage not to exceed 11.65 gallons per inch-diameter per mile per 24 hours, while maintaining the test pressure with an allowable tolerance of 5 psi maximum.
 - a. The above maximum leakage value takes into account any leakage across valves.
 - b. In any case, any visible leaks shall be corrected, regardless of the overall leakage rate.
 - c. Should the test indicate a leakage greater than that permitted, the contractor shall locate and repair or rebuild the defective portion of the main responsible for the leak. The test shall then be repeated until it is found that the leakage is within the allowable limit.
2. The Contractor shall install corporations within the pipeline for the purpose of air release, pressurization, and disinfection for water mains. Upon successful testing of the pipeline, the corporations will be closed and capped with a threaded brass cap.
3. The amount of leakage in buried piping shall be measured at the specific test pressure by pumping from a calibrated container. For new pipe, the amount of leakage at the joints shall not exceed two quarts per hour (1.89 L/hr) per 100 gaskets or joints irrespective of pipe diameter. No visible leakage shall be allowed in aboveground piping.
5. The amount of allowable leakage specified in item #4 shall be permitted to be increased by one fluid ounce per inch valve diameter per hour (30 ml/25 mm/h) for each metal seated valve isolating the test section.
6. Tests shall be made by the contractor in the presence of the authority having jurisdiction (plumbing inspector), and if requested, by a representative of the owner.
7. Additives, corrosive chemicals such as sodium silicate, brine, or other chemicals shall not be used while hydrostatically testing systems or for stopping leaks.
8. All control valves shall be fully closed and opened under system water pressure to ensure proper operation.

C. Bacteriological Testing shall be as specified in AWWA Designation C-601.

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

END OF SECTION 33 10 00

SECTION 33 13 00 - DISINFECTING OF WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to work of this Section.
- B. The specifications in this section are intended to supplement any requirements and specifications established by the local utility company or agency which regulates water usage at the project site.

1.2 DESCRIPTION OF WORK

- A. Sterilize new water supply piping and obtain water utility authority and health department approval of same.

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with water supply work similar to that required for this project.
- B. The contractor shall contact the appropriate utility company or agency which regulates and provides water service at the project site for installation guidelines and specifications. The specifications in this section shall be superseded by all requirements set forth by the appropriate utility company or agency for the work described on the Drawings.
- C. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of water supply system materials and products. Also comply with National Fire Prevention Association Code #24 for water supply systems for Private Fire Service.
 - 2. Environmental Compliance: Comply with applicable portions of local Environmental Agency and Health Department regulations pertaining to water supply systems.
 - 3. Safety Compliance: Comply with applicable portions of OSHA, related to trench safety.
- D. Forty eight hours notice shall be given to the water utility, the Health Department and the Building Department prior to construction or testing of water systems at all times during construction of this project.

1.4 SUBMITTALS

- A. Make submittals under provisions of Appropriate Division 01 Section.
- B. Product Data: Submit test results of sterilization.

1.5 REFERENCE STANDARDS

- A. AWWA
 - 1. "Standard for Disinfecting Water Mains": Specification C-601.
 - 2. Bacteriological Testing: Specification C-601.

1.6 RELATED SECTIONS: Included in this specification section are CSI Standard Reference numbers.

- A. Division 33 10 00 Section "Water Supply System"

PART 2 – PRODUCTS [none]

PART 3 - EXECUTION

3.1 FLUSHING

- A. All services shall be flushed thoroughly with water after backfilling is complete. All dirt, rubbish and debris shall be removed from the pipes.
- B. The contractor shall furnish and install all temporary piping, valves, corporations, fittings, pumps, hose and appurtenances which may be necessary to properly flush the pipeline.
- C. Flushing operations shall be in strict conformance with NJDEP requirements and water shall be discharged so as not to cause any soil erosion or sedimentation problems.

3.2 STERILIZATION AND TESTING OF MAINS & SERVICES

- A. Sterilization
 - 1. All finished water piping shall be thoroughly cleaned, flushed, and disinfected in accordance with the requirements of the latest edition of ANSI/AWWA C651 and the New Jersey Safe Drinking Water Act, except as herein otherwise noted. The continuous-feed methods specified in Section 5.2.3 of ANSI/AWWA C651 shall be preferred.

2. Before being placed in service, all new water lines or extensions to existing systems shall be chlorinated to the satisfaction of the Water Utility and Health Departments, local municipal inspector, and/or municipal water company engineer. Contact appropriate agencies to schedule and coordinate appropriate inspections.
3. Prior to chlorination, all dirt and foreign matter shall be removed by a thorough flushing. The minimum rate of flow shall not be less than the water demand rate of the system, which is determined by the system design, or not less than that necessary to provide a velocity of 10 ft/sec (3 m/s), whichever is greater. For all systems, the flushing operations shall be continued for a sufficient time to ensure thorough cleaning. When planning the flushing operations, consideration shall be given to disposal of the water issuing from the test outlets. The flushing shall occur after pressure testing and trench backfilling.

Flow Required to Produce a Velocity
 of 10 ft/sec (3 m/s) in Pipes

Nominal Pipe Size (in.)	Flow Rate	
	(gpm)	(L/min.)
4	390	1476
6	880	3331
8	1560	5905
10	2440	9235
12	3520	13323

4. When the flow rate as listed in this table cannot be verified or met, supply piping shall be flushed at the maximum flow rate available to the system under fire conditions.
5. A chlorine gas-water mixture of hypochlorite solution shall be applied by means of a solution-feed device, or the gas shall be fed directly from a chlorine cylinder equipped with proper devices for regulating the rate of flow and the effective diffusion of gas within the pipe.
6. Water from the existing distribution system or other source of supply shall be controlled to flow very slowly into the newly laid pipe line during the application of chlorine, in such proportion that the chlorine dose applied shall be at least 40 to 50 parts per million.
7. Treated water shall be retained in the pipe long enough to destroy all spore-forming bacteria. This period shall be at least 3 hours and preferably longer as directed by the local inspector.
8. After the chlorine treated water has been retained for the required time, the chlorine residue at the pipe extremities and at other representative points shall be at least 5 parts per million.

9. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe line at its extremities until the replacement water throughout its length shall upon testing be equal to the water quality served the public from the existing water supply system.
 10. Should the initial treatment in the opinion of the regulatory officials or Engineer prove ineffective, the chlorination procedure shall be repeated until confirmed test shows that water sampled from the newly laid pipe conforms to the requirements.
 11. All water mains shall be disinfected in accordance with AWWA C601 "Standard for Disinfecting Water Mains".
 12. Provide written certification from local health department that sterilization procedures have been accepted and the system is suitable for operation.
 13. The installation of chlorine tablets within the pipeline during construction shall not be an acceptable method for providing disinfection of the mains.
 14. The Contractor is responsible to provide all materials, equipment, and labor to perform the flushing and disinfection of the new water lines as many times as is necessary if the initial treatment is not adequate and until tests show the waterline meets the required aforementioned requirements.
 15. Heavily chlorinated waters must first be neutralized prior to discharge in accordance with federal, State, and local regulations.
 16. Following the completion of the flushing and disinfection procedures, samples shall be taken and analyzed by the Health Department. Bacteriologic testing shall be conducted at the sole convenience of the Health Department and only after 48 hours advance notice to the Department. No portion of the new system may be open to the existing system without first passing the bacteriologic testing.
- B. Hydrostatic Testing: Refer to Section 33 10 00
- C. Bacteriological Testing shall be as specified in AWWA Designation C-601.

END OF SECTION 33 13 00

SECTION 33 30 00 - SANITARY SEWAGE SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and related Specification sections, apply to work of this Section.

1.2 SUMMARY

- A. Extent of sewage system work is indicated on Drawings and schedules, and by requirements of this section.
- B. The Contractor shall install sewer lines specified in this Section on a section-by-section basis as prescribed on the drawings. Sewer construction must be witnessed by the Engineer and/or the local authority having jurisdiction. The Contractor shall furnish labor, materials, testing equipment and accessories, and air and water necessary to perform the required tests. Tests shall be made in the presence of and to the complete satisfaction of the Engineer and/or the local authority.
- C. The Contractor shall excavate test pits to uncover existing sewer mains and/or service lines to verify alignment, size, outside diameter, and slope at locations where connections or other utility crossings will occur (also see E below). Adhere to all traffic control requirements.
- D. Extent of sanitary sewage system work is indicated on Drawings and details, and by the requirements of this section.
- E. The Contractor shall excavate test pits in all areas where pipe depths and/or alignment is noted as approximate or unverified. Some of the existing utility and sewer information shown on the plans was obtained from record mapping. In many cases the exact depth and location of buried pipelines is shown schematically, and the Contractor must prepare for making appropriate field adjustments to complete the intent of the work depicted on the drawings.
- F. Stake-out of sewer system appurtenances shall be by a licensed professional Land Surveyor as specified in Division 01 Section "Field Engineering & Layout".
- G. The contractor shall provide bypass pumping when/if required to facilitate the work. Bypass pumping shall be in accordance with the local plumbing subcode official and sewage authority having jurisdiction.
- H. RELATED SECTIONS: Included in this specification section are CSI Standard Reference numbers.
 - 1. Division 31 Section "Selective Clearing"

2. Division 31 Section "Excavation Support"
3. Division 31 Section "Earth Moving"
4. Division 32 Section "Soil Preparation"
5. Division 32 Section "Turf and Grasses"
6. Division 33 Section "Testing of New Sanitary Sewer System"
7. Division 01 Section "Construction Waste Management"
8. Jackson Township Municipal Utilities Authority Rules and Regulations, April 2011 or current edition

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage systems products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience on projects with sanitary sewage work similar to that required for this project.
- C. Tester's Qualifications: Firm with at least three (3) years of experience in testing sanitary sewers with similar air testing equipment on work of similar scope to this project.
- D. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary sewage system materials and products.
- E. Contact the local authority having jurisdiction to schedule the inspection of sanitary sewer components.

1.4 SUBMITTALS

- A. Make submittals under provisions of Submittal Procedures.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for sewer system materials and products.
- C. Record Drawings: At project closeout submit record drawings of installed sewer piping in accordance with requirements of Division 01 Section "Closeout Procedures."

1.5 Referenced Standards

- A. NJ Department of Environmental Protection.
- B. ASTM American Society of Testing and Materials.
- C. Jackson Township Municipal Utilities Authority (MUA).

PART 2 - PRODUCTS

2.1 PIPES AND PIPE FITTINGS

- A. Pipe fittings and accessories shall be of same material and weight/class as pipes, with joining method as indicated.
- B. Gravity Sewer Pipe: Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D-2665, Schedule 40 (NOT SDR-35)
 - 1. Fittings: Sch 40 PVC, ASTM D-2665, solvent-cement joints complying with ASTM D2855 using solvent cement complying with ASTM D2664; or elastomeric joints complying with ASTM D3212 using elastomeric seals complying with ASTM F477.
 - 2. PVC pipes exposed to sunlight shall be chlorinated PVC.

2.2 CLEANOUTS

- A. Provide sanitary cleanouts within 5 feet of the building facade or as indicated, pipe extension to grade with ferrule and countersunk cleanout plug.
 - 1. PVC Cleanouts are not permitted in paved or concrete areas. Use heavy-duty brass clean-out cover with non-slip surface and countersunk plug in pedestrian areas, Geneco style 40 with 429 cap, or equal.
 - 2. In paved areas subject to vehicle loading use heavy duty brass clean-out cover with low hex plug recessed in a heavy duty cast iron cover, Geneco R3218-D or equal.
 - 3. In areas not subject to vehicle loading, install CPVC cleanout with screw-on cap, 5" protrusion in lawn areas to insure that low hex cap does not protrude more than 2 inches above final topsoil grade.

2.3 SANITARY SEWER MANHOLES

- A. Precast manhole sections shall be manufactured in accordance with ASTM Designation C478-61T. Manholes shall be manufactured by the "wet" process and shall be cured in the forms for several hours. The minimum compressive strength shall be 4000 lbs psi. The maximum allowable absorption of the concrete shall not exceed 8% of the dry weight. Reinforcement in flat slab top sections shall be designed for the load to be supported
- B. Height adjustment between manhole concrete and cast iron manhole frame shall be constructed of the necessary combination of grade rings and unit masonry as shown on the drawings.
 - 1. Masonry units shall conform to ASTM C32 grader MS or ASTM C139.
 - 2. Grade rings and masonry shall be set with a mortar mix using 1:2 ratio of cement to sand with equal quantities of masonry cement and portland cement.
 - 3. No more than 2 courses of masonry units shall be used.
 - 4. Masonry shall be laid in running bond on a full bed of mortar and full head joints.

5. The inside and outside of the masonry shall be rubbed with burlap and coated with a wash coat of neat cement applied with a stiff bristle brush.
 6. The outside face of the masonry shall be furnished with a minimum of two coats of bitumastic to a minimum total thickness of 24 mils.
- C. Steps: Polypropylene, integrally cast into manhole sidewalls.
- D. Manhole covers & frames:
1. Manhole frames & covers shall be of the best quality close-grained gray iron casting conforming to the requirements of latest ASTM Designation A 48, Class 30.
 2. Frames and covers shall be machined to insure a non-clattering fit. Manhole frames and covers shall be properly cleaned and cleaned and coated with a waterproof asphaltum applied by immersion, while the castings are hot.
 3. Manhole frames shall be set to grade on a full bed of mortar. The castings shall be free from faults, sponginess, cracks, blowholes, and other defects affecting their strength.
- E. Pipe Connectors: Resilient, complying with ASTM C923.
- F. Aluminum manhole rungs shall be extruded alloy of the step drop front design, equal to the Aluminum Company of America, Type 6061-T6. The rungs shall be installed in line vertically at twelve inch (12") vertical spacing.
- G. Interior and exterior of manholes shall receive a high build polyamide coal tar epoxy coating. Exterior manhole coating shall be Coal Tax Epoxy C-200 by Sherwin Williams, or approved equal. Interior manhole coating shall be Epoxide 33/34 by Sherwin Williams, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

- A. Provide as indicated, pipe materials and size depicted on the construction drawings.
- B. Inspect piping before installation to detect defects. Mark defective materials with white paint and promptly remove from site.
- C. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.
- D. Place bell ends or groove ends of piping facing upstream.
- E. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

- F All Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D2321.
- G. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
 - 3. Flush lines between manholes if required to remove collected debris.
- H. Joint Adaptors: Make joints between different types of pipe with standard manufactured adaptors and fittings intended for that purpose. Use Fernco Series 1002 -55 or model to suit actual pipe diameters.
- I. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspections after lines between manholes or manhole locations have been installed and approximately two (2) ft of backfill is in place. Inspect again at completion of project.
 - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects, and reinspect.
 - 3. Contractor shall not backfill trenches until inspected, unless inclement weather is forecast or imminent. If weather or the close of work day requires the backfilling of pipe trenches before inspection occurs, the Contractor shall re-excavate for inspection if required by local official. Backfill & compact after final pipe inspection.
- J. Final Connections:
 - 1. Make final connection of new PVC sewer to existing sewer at approximate location shown on plans (preferably @ nearest bell joint). Coordinate requirements with local authorities.
 - 2. Provide connections to sanitary sewer lines exiting the building, which are installed by the Plumbing Contractor up to five feet beyond the exterior wall or as indicated on the site utility plan.

3.2 CONSTRUCTION & RECONSTRUCTION OF SEWER MANHOLES

- A. Existing manholes shall be core-drilled for new pipe installations.
 - 1. During core-drilling process, appropriate rubber gasket shall be installed in existing manholes to accommodate new pipe installation.
- B. Invert of new connection shall be as shown on Drawings, but shall not be greater than 2.0 feet without the construction of a sanitary drop.

- C. Appropriate safety measure shall be utilized at all times when performed work on or within an active manhole.
 - 1. Whenever possible, all flow through existing manholes shall be plugged.
- D. Concrete channel within manhole shall be restored as specified for new channels.
- E. Once the new pipe has been installed, the manhole will be restored to like new condition, following the NJ DOT Standard Specifications for new sanitary manholes.
- F. Construct new manholes per the construction plans, NJ Department of Environmental Protection regulations and NJ DOT Standard Specifications.

3.3 BACKFILLING

- A. Conduct backfilling operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.
- B. Perform backfilling as described in Section 31 20 00 – Earth Moving, and Section 31 50 00 – Excavation Support.
- C. Do not backfill until trenches and pipe work have been inspected by appropriate authority, except as further defined in Section 31 50 00.

3.4 FIELD QUALITY CONTROL

- A. After the new section of sewer line has been backfilled, a "Line Acceptance Test" using low pressure air shall be performed by the Contractor's licensed testing company.
- B. Repair and Test: If any section of pipe sewer line fails to meet the test requirements, the Contractor shall determine the source or sources of leakage. The Contractor shall repair or replace defective material and/or workmanship and shall conduct such additional tests as required to demonstrate that the pipe sewer line meets the test requirements specified.
- D. Provide test reports of pipe trench back fill and compaction per applicable specification section noted herein.

END OF SECTION 333000

SECTION 33 37 00 - TESTING OF NEW SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

1.2 SUMMARY

- A. Extent of sewage system work is indicated on Drawings and schedules, and by requirements of this section.
- B. The Contractor shall schedule inspections with the local authority having jurisdiction, at least 2 weeks prior to the commencement of sanitary sewer construction. Confirm test witnessing at least 72 hours before the scheduled testing. The Contractor shall furnish labor, materials, testing equipment and accessories, and air and water necessary to perform the required tests. Tests shall be made in the presence of and to the complete satisfaction of the authority having jurisdiction.
- C. RELATED SECTIONS
 - 1. Division 33 Section "Sanitary Sewage System"
 - 2. Division 01 Section "Construction Waste Management"
 - 3. Jackson Township Municipal Utilities Authority Rules and Regulations, April 2011 or current edition.

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with sanitary sewage work similar to that required for this project.
- B. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary sewage system materials and products.

1.4 SUBMITTALS

- A. Make submittals under provisions of Submittal Procedures.
- B. Submit test reports of all testing and inspection work.

1.5 REFERENCED STANDARDS

- A. NJ Department of Environmental Protection.
- B. National Plumbing Code.
- C. Jackson Township Municipal Utilities Authority (MUA)

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. After the new section of sewer line has been backfilled, a "Line Acceptance Test" using low pressure air shall be performed by the Contractor.
- B. Testing Equipment:
 - 1. The low pressure "Line Acceptance Tests" shall be performed by air testing equipment consisting of an air-compressor and storage tank of adequate capacity; an air control panel equipped with necessary piping, valves and pressure gauges to control the rate at which the air flows to the test section and to monitor the air pressure inside the test section; and required plugs.
 - 2. In order to prevent loading the test section with the full pressure of the compressor, the test equipment shall be provided with an approved pressure relief device set to blow out at 10 psi. An extra pressure gauge of known accuracy must also be provided so that the gauges of the test equipment can be frequently checked.
 - 3. The air testing equipment shall be adequate to conduct the required "Line Acceptance Test" and shall be subject to review by the Engineer.
- C. Cleaning: Before any "Line Acceptance Test" is performed, pipe lines in the section of the pipe sewer to be tested including the main and service connection lines shall be thoroughly cleaned by propelling a snug fitting rubber ball through the pipe lines with water. In the event cemented or wedged debris, or damaged pipe shall stop the ball, the Contractor shall remove the obstruction.
- D. Test Procedures for "Line Acceptance Test" of gravity sewer:
 - 1. After the section of pipe sewer to be tested has been cleaned to the complete satisfaction of the Engineer, The Contractor shall plug all pipe outlets.
 - 2. The ends of branch fittings and service connection piping shall be plugged with plugs properly designed to withstand the test pressures to which they will be subjected. Each plug shall be securely braced after installation. Plugs must remain in place upon satisfactory completion of the test. Plugs shall be obtained from the pipe manufacturer.

3. The ends of the sewer main piping shall be plugged with pneumatic plugs at the upstream and downstream ends. The pneumatic plugs shall be inflated to twenty five (25) psig. The pneumatic plugs shall be seal tested before being used in the actual test installation. To seal test the pneumatic plugs, one length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to twenty five(25) psig. The sealed pipe shall be pressurized to five (5) psig and the plugs shall hold at this pressure without bracing and without movement of the plugs out of the pipe.
 4. Immediately after the section of pipe sewer line to be tested has been properly cleaned and sealed, low pressure air shall be slowly introduced into this sealed section of pipe sewer line until the internal air pressure reaches four (4) psig greater than the average back pressure of any ground water that may be over the pipe.
 5. After an internal pressure of 4.0 psig is obtained, allow at least two minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure.
 6. After the stabilization period (3.5 psig minimum pressure in the pipe), the air supply shall be disconnected, and then the rate of air loss shall be determined by measuring the time interval required for the internal pressure to decrease from 3.5 psig to 2.5 psig greater than the average back pressure of any ground water that may submerge the pipe.
 7. The section of pipe sewer line being tested shall be considered acceptable when tested at an average pressure of 3.0 psig greater than the average back pressure of any ground water that may submerge the pipe, if (1-) the total rate of air loss from any section tested does not exceed 2.0 cfm, or (2-) the section under test does not lose air at a rate greater than 0.0030 cfm per sq.ft. of internal pipe surface.
 8. The requirements of this Specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 psig to 2.5 psig greater than the average back pressure of any ground water that may submerge the pipe is not less than shown for the given diameters in the Air Test Tables.
- E. Safety Requirements: The following safety requirements shall be observed by the Contractor in connection with the air testing of pipe sewer lines.
1. Gauges, air piping manifolds and valves of the air testing equipment shall be located above ground at the top of the trench.
 2. The plugs used to close the ends of the sewer main piping, branch fittings and service connection piping shall be securely braced in such a way so as to prevent blow outs.
 3. No person shall be allowed in the trenches during testing.
 4. Special care shall be exercised during removal of plugs and the pressure in the piping of the test section shall be completely relieved before any plug shall be permitted to be removed.
 5. Confined space entry procedures will be needed for all sewer construction work. Contractor shall adhere to all OSHA requirements including OSHA 1910.146 (c)(s) ventilation, 1910.146 confined space programs, 1910.27 manholes and the standard 1-1.9 CFR 1910.27.

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- F. Repair and Test: If any section of pipe sewer line fails to meet these test requirements, the Contractor shall determine the source or sources of leakage. The Contractor shall repair or replace defective material and/or workmanship and shall conduct such additional tests as required to demonstrate that the pipe sewer line meets the test requirements specified.

END OF SECTION 333700

SECTION 33 40 00 - STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of storm sewage systems work is indicated on Drawings and by requirements of this section. Note division of work between base bid and alternate bid items.
- B. Contractor shall clean debris, soil, sediment and foreign materials from all roof drain piping, inlets and manholes within the scope of the construction areas and flush connecting sewer pipes and manholes clean. Also refer to site clearing specification. Dispose of waste materials in a legal manner off-site.
- C. Contractor shall repair/reconstruct existing inlets and manholes receiving new pipe connections.
- D. The contractor shall maintain on-site drainage at all times. To accomplish this, temporary bypass piping, pumping or other means may be needed. The site shall not be allowed to flood. Any soils damaged by storm water flooding open excavations shall be completely removed to the satisfaction of the engineer and replaced with controlled compacted fill to its original depth.
- E. The contractor shall verify the activity of all storm sewers, roof drains, floor drains and other pipes that are encountered during excavation work or found during other utility work. Also refer to pre-demolition work utility location requirements. Reconnect active storm sewers to new storm sewer system.
- F. The contractor shall perform flow & dye tests to determine the source of any underground sewer pipes that are discovered and not currently mapped and provide this information to the engineer for direction on how to re-connect, divert or abandon.
- G. Existing Utilities: Contractor shall be responsible for locating all existing utilities before commencing with any demolition work or new construction. Underground pipe locations, sizes & materials on drawings were obtained from existing mapping and field observation, and should not be considered accurate. If unmapped or incorrectly mapped utilities are encountered which will obstruct new construction, or affect new construction, then the contractor shall immediately contact the Engineer for direction.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturing of storm sewage system products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with storm sewage work similar to that required for this project.
- C. Codes and Standards:
 - 1. Plumbing Code Compliance: comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewage systems materials and products.
 - 2. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewage systems.
 - 3. All structures shall be H-20 highway rated.

1.4 SUBMITTALS

- A. Make submittals under provisions of appropriate Division 01 Section.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for storm sewage system materials and products.
- C. Record Documents: At project closeout, submit record drawings of installed storm sewage piping and products, in accordance with requirements of Section 017123.02.

1.5 RELATED SECTIONS

- A. Section 01 71 23.02 "Field Engineering" pertaining to layout and test pits.
- B. Section 02 41 19 "Demolition" pertaining to test pits
- C. Section 31 20 00 "Earth Moving" pertaining to backfill & compaction of excavations.

PART 2 - PRODUCTS

2.1 PIPES AND PIPE FITTINGS

- A. Provide pipes of one of the following materials, of weight/class as indicated on the construction plans. Provide pipe fittings and accessories of same material and weight/class as pipes with joining method as indicated. The construction drawings may not necessarily illustrate all required pipe fittings and connectors.

1. Polyethylene Pipe (PEP): ASTM D3350, AASHTO M294, Hancor "Hi-Q" or ADS "N-12", smooth interior liner or equal. Provide and install all required couplers, fittings, gaskets, etc... as needed.
 - a. Fittings: Pipe joints and fittings shall conform to AASHTO M252, ASTM D1056, AASHTO M294.
 - b. Flared End Sections shall be reinforced concrete pipe. Supply appropriate fittings to marry polyethylene pipe with reinforced concrete flared end sections.
2. Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D-2665, Schedule 40 (NOT SDR-35)
 - a. Fittings: Sch 40 PVC, ASTM D-2665, solvent-cement joints complying with ASTM D2855 using solvent cement complying with ASTM D2664; or elastomeric joints complying with ASTM D3212 using elastomeric seals complying with ASTM F477.
 - b. PVC pipes used for storm sewer applications shall not be SDR-35 wall thickness. Minimum Schedule 40 is required unless noted as thicker on the drawings.
 - c. PVC pipes exposed to sunlight shall be chlorinated PVC.
3. Reinforced Concrete Pipe (RCP), ASTM C507 class III unless noted otherwise.
 - a. Fittings: Reinforced concrete, same strength as adjoining pipe, bell & spigot joints complying with ASTM C443.
 - b. All lifting holes shall be mortared closed to prevent exfiltration.

2.2 CATCH BASINS

- A. Provide precast reinforced concrete or block wall structures with H-20 structural rating, type per plan and/or NJ DOT designation, sized to suit designated frame and grate, with integral floor. All structures with a NJ DOT designation shall conform to the NJ DOT Standard Specifications and Construction Details.
- B. Steps: PVC-coated Aluminum integrally cast into catch basin sidewalls on the direction of approaching traffic or as noted on the drawings. Steps are not required in trench drains.
- C. Frame and Grate: Cast-iron
 1. Reference Product: Campbell Foundry Co. casting designation per plan.
 2. All new Castings shall be equipped with bicycle safe grates in pavement areas and ADA grates within public plazas and walkways.
 3. All castings on storm inlets located within the construction area shall be changed to bicycle-safe type castings.
 4. In general castings on storm manholes shall be equipped with open grates.
- D. Pipe Connectors: Resilient, complying with ASTM C923.
- E. Connecting inlet and/or manhole walls shall be re-blocked and repaired to restore structural integrity wherever needed.
- F. Reconstruct chambers by removing existing structures down to footing depth. Pour additional footing widths as needed to accommodate new structure and re-build per detail.

2.3 STORM SEWER MANHOLES/JUNCTION CHAMBERS

- A. Provide precast reinforced concrete storm sewer manholes or masonry block manholes and junction chambers as indicated, complying with ASTM C478.
- B. Top: Precast concrete, of concentric cone, or flat slab top type, as indicated.
- C. Base: Precast concrete, with base riser section and separate base slab, or base riser section with integral floor, as indicated.
- D. Steps: PVC-coated Aluminum, integrally cast into manhole sidewalls or as noted on the drawings.
- E. Frame and Cover: Ductile-iron, 26 inches diameter cover (or as per casting designation on plan), heavy-duty, indented top design, with lettering cast into top reading "STORM SEWER". Manhole castings with open grates shall be "bicycle-safe".
- F. Pipe Connectors: Resilient, complying with ASTM C923.

2.4 FILTER FABRIC

- A. Mirafi 140N or equal.

2.5 WATER QUALITY TREATMENT DEVICES

- A. Up-Flo Filter, manufactured by Hydro-International, certified by NJCAT to treat for 80% removal of Total Suspended Solids for 0.36 cfs, and capable of bypassing 1.05 cfs.
- B. Basis of Design products are listed above, or approved equal, must be certified by the NJDEP to treat the peak water quality storm events listed above for 80% removal of total suspended solids.
- C. Submittals shall include a site-specific layout, demonstrating that the substituted water quality treatment device can function as designed with all other components of the storm sewer and storm water management systems.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
- B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

- C. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert. Core drill inlet walls as needed to make new connections to existing storm sewer chamber. Grout all pipes into the wall to restore structural stability. Proceed laying pipe from downstream end to upstream in continuous alignment.
- D. Place bell ends or grooved ends of piping facing upstream.
- E. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.
- F. All Pipe: Install in accordance with applicable provisions of the manufacturer's installation guide.
- G. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
 - 3. Flush lines between manholes of required to remove collected debris.
- H. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspection after lines between manholes or manhole locations have been installed and approximately 2 inches of backfill is in place. Inspect again at completion of project.
 - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect.
- I. Fittings: The plans depict the design layout for underground piping, including the approximate points of connection. Furnish and install all required couplers, adapters, reducers, etc.. as needed to complete the installation. Flexible double banded Fernco couplers may be used to join dissimilar pipe materials as needed to make a proper and integral connection.

3.2 CATCH BASINS

- A. Construct structures to standard types, sizes and shapes indicated on the plans.
- B. Set frames and grates to elevations indicated.

3.3 WATER QUALITY TREATMENT DEVICE

- A. Construct treatment device in the configuration shown on the construction plans, and in accordance with all manufacturer's guidelines, instructions and specifications.

- B. Maintain water quality treatment device during construction. Prevent silt and sediment from clogging device during construction.
- C. Remove all sediment and debris from device at the completion of the project.
- D. Provide the Owner with all required materials and information required to maintain the device after substantial completion.

3.4 BACKFILLING

- A. Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.
- B. Perform backfilling as described in Section 31 20 00: Earth Moving, and Section 31 50 00: Excavation Support.

END OF SECTION 33 40 00