SECTION 33 11 00

PIPING AND ACCESSORIES - GENERAL PROVISIONS

PART 1: GENERAL

1.01 DRAWINGS

Dimensions shown on Drawings are approximate only. Verify all piping geometry in the field and to ensure proper alignment and fit of all piping consistent with the intent of the Drawings. Submit field layout drawings as required for approval.

PART 2: PRODUCTS

2.01 CONTRACTOR'S RESPONSIBILITY FOR MATERIAL

A. Examine all material carefully for defects. Do not install material which is known, or thought to be, defective.

B. AW reserves the right to inspect all material and to reject all defective material shipped to the job site or stored on the site. Failure of AW to detect damaged material shall not relieve the Contractor from his total responsibility for the completed work if it leaks or breaks after installation.

C. Lay all defective material aside for final inspection by AW. AW will determine if corrective repairs may be made, or if the material is rejected. AW shall determine the extent of the repairs.

D. Classify defective pipe prior to AW's inspection as follows:

1. Damage to interior and/or exterior paint seal coatings.
2. Damage to interior cement-mortar or epoxy lining.
3. Insufficient interior cement-mortar lining or epoxy thickness.
4. Excessive pitting of pipe.
5. Poor quality exterior paint seal coat.
6. Pipe out of round.
7. Pipe barrel area damaged to a point where pipe class thickness is reduced (all pipe).
8. Denting or gouges in plain end of pipe (all pipe).
9. Excessive slag on pipe affecting gasket seal (DIP).

10. Any visible cracks, holes.

11. Embedded foreign materials.

12. Non-uniform color, density and other physical properties along the length of the pipe.

E. The Contractor shall be responsible for all material, equipment, fixtures, and devices furnished. These materials, equipment, fixtures and devices shall comply with the requirements and standards of all Federal, State, and local laws, ordinances, codes, rules, and regulations governing safety and health.

F. The Contractor shall take full responsibility for the storage and handling of all material furnished until the material is incorporated in the completed project and accepted by AW. Contractor shall be solely responsible for the safe storage of all material furnished to or by him until incorporated in the completed project and accepted by AW.

G. Load and unload pipe, fittings, valves, hydrants and accessories by lifting with hoists or skidding to avoid shock or damage. Do not drop these materials. Pipe handled on skidways shall not be skidded or rolled against other pipe. Handle this material in accordance with AWWA C600, C605 or C906 whichever is applicable.

H. Drain and store fittings and valves prior to installation in such a manner as to protect them from damage due to freezing of trapped water.

2.02 REDUCTION OF LEAD IN DRINKING WATER ACT COMPLIANCE

A. The Contractor shall comply with the requirements and standards of the Reduction of Lead in Drinking Water Act.

B. Any pipe, fitting or fixture (e.g. corp stops, curb valves, gate valves less than 2 inches in diameter, backflow prevention devices, water meters, hose bibs, etc.), solder and flux installed or requiring replacement as of January 4, 2014 must be “lead free”. The Contractor shall be responsible to comply with the State, local laws, ordinances, codes, rules, and regulations governing the Reduction of Lead in Drinking Water Act that may have additional limitations or requirements."

C. The definition of 'lead free' is as follows:

1. Not containing more than 0.2 percent lead when used with respect to solder and flux; and

2. Not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

2.03 PETROLATUM TAPE COATING

A. The tape coating shall be a cold applied, saturant tape made from either petrolatum or petroleum wax with a noncellulosic synthetic fiber fabric. The fabric shall be encapsulated and coated on both sides with the petrolatum or petroleum wax. The thickness of the tape shall be no less than 40 mil. The petrolatum or petroleum wax shall be at least 50% of the product by weight.

B. The tape coating shall be supplied in sheets, pads or rolls. Pads and sheets shall be sized to fit the area that is to be covered, allowing for an overlap per AWWA Standards.

2.04 RUBBERIZED-BITUMEN BASED SPRAY-ON UNDERCOATING

Subject to approval by AW, an alternative corrosion protection for exposed buried metal is an aerosol applied rubberized coating. The material shall be rapid dry and specifically designed for corrosion protection. 3M Rubberized Underseal Undercoating 08883 or any equivalent rubberized-bitumen based spray-on undercoating may be used. Follow manufacturer's recommendations for storage and application.

2.05 PRESSURE GAUGES

A. General Use - Provide liquid filled, diaphragm-isolated pressure gauges, location of gauges as shown on drawing and range suitable for the particular service.
B. Provide 2 1/2" diameter dial white face, black lettering/markings.
C. Minimum suggested gauge shall be:
   a. Bronze isolation valve provided between the pipe and gauge
   b. Gauge to read in both feet and psi
   c. Range of gauge to be such that the design total dynamic head (tdh) of the pump should be located at about the 50% point of the gauge's range.
   d. A pressure dampener should be provided with each gauge to moderate the vibration of the gauge needle.

PART 3: EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Lay and maintain all pipe to the required lines and depths. Install fittings, valves and hydrants in strict accordance with the Specifications at the required locations with joints centered, spigots home, and all valve and hydrant stems plumb. Do not deviate from the required alignment, depth or grade without the written consent of AW.

B. Buried steel lugs, rods, brackets, and flanged joint nuts and bolts are not permitted unless specifically shown on the Drawings or approved in writing by AW. Cover any and all buried steel lugs, rods, brackets, and flanged joint nuts and bolts with approved coating in accordance with AWWA Standard C217 prior to backfilling. Encase the same in polyethylene encased if the Specifications require polyethylene encasement of the pipe, valves or fittings..

C. Lay all pipe to the depth specified. Measure the depth from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the Drawings or as specified in the Specifications.

D. Do not lay pipe in a wet trench, on subgrade containing frost, or when trench conditions are unsuitable for such work. If all efforts fail to obtain a stable dry trench bottom and AW determines that the trench bottom is unsuitable for such work, AW will order the kind of stabilization to be constructed, in writing. In all cases, water levels must be at least 6” below the bottom of the pipe.

E. Thoroughly clean the pipes and fittings before they are installed. Keep these materials clean until the acceptance of the completed Work. Lay pipe with the bell ends facing in the direction of laying, unless otherwise shown on the Drawings, or directed by AW. Exercise care to ensure that each length abuts the next in such a manner that no shoulder or unevenness of any kind occurs in the pipe line.

F. Do not wedge or block the pipe during laying unless by written order of AW.

G. Before joints are made, bed each section of pipe the full length of the barrel, at the required grade, and at the invert matching the previously laid pipe. Dig bell holes sufficiently large to permit proper joint making. Do not bring succeeding pipe into position until the preceding length is embedded and secure in place.

H. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying. Take up such in-place pipe sections found to be defective and replace them with new pipe. Take up, relaying, and replacement will be at the Contractor's expense.

I. Place enough backfill over the center sections of the pipe to prevent floating. Take all other necessary precautions to prevent the floating of the pipeline by the accumulation of water in the trench, or the collapse of the pipeline from any cause. Should floating or collapse occur, restoration will be at the Contractor's expense.

J. Contractor shall install tracer wire along all pipelines. Tracer wire shall be placed and centered on the bottom of the trench to prevent disturbance or damage to the tracer wire during repairs. Tracer wire may be installed in trench below both the pipe and pipe bedding to prevent the tracer wire from being disturbed during repairs.

K. Bedding materials and concrete work for the pipe bedding and thrust restraint shall be as specified.

L. Prevent foreign material from entering the pipe while it is being placed. Do not place debris, tools, clothing, or other materials in the pipe during laying operations. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work, or for other reasons such as rest breaks or meal periods.

M. Only cut pipe with equipment specifically designed for cutting pipe such as an abrasive wheel, a rotary wheel cutter, a guillotine pipe saw, or a milling wheel saw. Do not use

chisels or hand saws. Grind cut ends and rough edges smooth. Bevel the cut end slightly for push-on connections as per manufacturer recommendations.

N. In distributing material at the site of the Work, unload each piece opposite or near the place where it is to be laid in the trench. If the pipe is to be strung out, do so in a straight line or in a line conforming to the curvature of the street. Block each length of pipe adequately to prevent movement. Block stockpiled pipe adequately to prevent movement. Do not place pipe, material, or any other object on private property, obstructing walkways or driveways, or in any manner that interferes with the normal flow of traffic.

O. Exercise special care to avoid damage to the bells, spigots or flanged ends of pipe during handling, temporary storage, and construction. Replace damaged pipe that cannot be repaired to AW's satisfaction, at the Contractor's expense.

P. Remove all existing pipe, fittings, valves, pipe supports, blocking, and all other items necessary to provide space for making connections to existing pipe and installing all piping required under this Contract.

Q. Maintain the minimum required distance between water and sewer lines and other utility lines in strict accordance with all Federal, State, and local requirements and all right-of-way limitations.

R. Provide and install polyethylene encasement for ductile iron pipe, fittings and valves as required. See Specification Section - .Polyethylene Wrap.

S. The maximum allowable deflection at the joints for push-on joint pipe shall be the lesser of manufacturer's recommendations or as described in the DIPRA Guideline, *Ductile Iron Pipe Joints and Their Uses*, as follows:

Size of Pipe	Deflection Angle	Maximum Deflection (18-ft. Length)	(20-ft. Length)
3"-12"	5 degrees	19"	21"
14"-42"	3 degrees	11"	12"
48"-64"	3 degrees	N/A	12"

T. The maximum allowable deflection at the joints for PVC pressure pipe shall be as follows:

Size of Pipe	Deflection Angle	Maximum Deflection (20-ft. Length)
4"-12"	2 degrees	8"
14" +	1.5 degrees	6"

U. Use short lengths of pipe (minimum length 3 feet, no more than three short sections), when approved by the AW Project Manager, to make curves that cannot be made with

full length sections of pipe without exceeding the allowable deflection. Making these curves will be at no additional cost to AW.

V. Furnish air relief valve assemblies in accordance with Drawings provided or as specified in Specification Special Conditions section. AW Project Manager will provide standard detail for additional air release valve assemblies. Any deviation from the standard detail, proposed by Contractor must be approved in advance.

W. Exercise particular care so that no high points are established where air can accumulate. Install an air release valve and manhole, as extra Work to the Contract, when the AW Project Manager determines that unforeseen field conditions necessitate a change in the pipe profile that requires the installation of an air release valve and manhole. If the Contractor requests a change in the pipe profile solely for ease of construction, and the requested change requires the installation of an air release valve and manhole as determined by the AW Project Manager, the cost of furnishing and installing the air release valve and manhole will be at the expense of the Contractor.

X. All water mains 20” and greater in diameter shall be constructed using DIP only. Other construction materials, such as PVC and HDPE, are limited to water mains 16” and under in diameter. Alternate materials for larger water mains may be approved by AW on a case-by-case basis.

Y. A minimum 3” wide marking tape to be provided along all mains and service lines installed. Marking tape to be installed 12” below grade, or 12” above the pipe. Foil backing is not required on marking tape. Tape shall be colored blue for water mains and green for sewer. Marking tape along pressurized force mains shall be labeled “Pressurized Wastewater”.

3.02 CONSTRUCTION METHODS TO AVOID CONTAMINATION

A. Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of this Section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.

B. Take precautions to protect the interior of pipes, fittings, and valves against contamination. String pipe delivered for construction so as to keep foreign material out of the pipe. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Use rodent-proof plugs approved by AW, where it is determined that watertight plugs are not practical and where thorough cleaning will be performed.

C. Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the likelihood of contamination. Complete the joints of all pipe in the trench before stopping work. If water accumulates in the trench, keep the plugs in place until the trench is dry.

D. When encountering conditions on pre-existing pipe that requires packing, employ yarning or packing material made of molded or tubular rubber rings, or rope of treated paper or other approved materials. Do not use materials such as jute, asbestos, or hemp. Handle packing material in a manner that avoids contamination.

E. Do not use contaminated material or any material capable of supporting prolific growth of microorganisms for sealing joints. Handle sealing material or gaskets in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. Deliver the lubricant to the job in closed containers and keep it clean.

F. If dirt enters the pipe, and in the opinion of AW the dirt will not be removed by the flushing operation, clean the interior of the pipe by mechanical means, then swab with a 1% hypochlorite disinfecting solution. Clean using a pig, swab, or "go-devil" only when AW has specified such and has determined that such operation will not force mud or debris into pipe joint spaces.

G. If the main is flooded during construction, the flooded section must be isolated from the remainder of the installation as soon as practical. Submit a plan to AW on correcting the condition and do not proceed until authorized by AW. Replace or fully clean and disinfect the affected pipe at no additional cost to AW.

3.03 VALVE INSTALLATION

A. Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure containing bolting, cleanliness of valve ports and especially of seating surfaces, handling damage, and cracks. Correct defective valves or hold for inspection by the AW Project Manager.

B. Set and join to the pipe in the manner specified in Paragraph 3.01. Provide valves with adequate support, such as crushed stone and concrete pads, so that the pipe will not be required to support the weight of the valve. Set truly vertical. If polyethylene is applied to the pipe, the entire valve shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut, exposed and free to be operated.

C. Provide a valve box for each valve. Set the top of the valve box neatly to existing grade, unless directed otherwise by AW. Do not install in a way that allows the transfer of shock or stress to the valve. Center and plumb the box over the wrench nut of the valve. Do not use valves to bring misaligned pipe into alignment during installation. Support pipe in such manner as to prevent stress on the valve.

D. Provide extension stem for each valve, with a standard 2-inch AWWA nut. Pin the extension stem to the operating nut on the valves. Extension stem shall extend to with 12-inches of finished grade.

E. Provide valve marking posts, when authorized by AW, at locations designated by AW and in accordance with detail drawings.

3.04 THRUST RESTRAINT

A. Provide all plugs, caps, tees, and bends (both horizontal and vertical) with concrete thrust blocking and/or restrained joint pipe as represented on the Drawings, or specified in the Specification Special Conditions.

B. Place concrete thrust blocking between undisturbed solid ground and the fitting to be anchored. Install the concrete thrust blocking in accordance with Section Cast-In-Place Concrete and Standard Details provided. Locate the thrust blocking to contain the resultant thrust force while keeping the pipe and fitting joints accessible for repair, unless otherwise shown or directed.

C. Use restrained joints for fittings and valves for a minimum distance on either side as calculated using DIPRA guidance - “Thrust Restrained Design for Ductile Iron Pipe”. Refer to Table 1 at the end of this section, for minimum lengths restrained for 12” – 24” diameter pipe. If soil conditions other than those listed in the table are encountered, contractor shall provide engineering calculation performed by a local P.E for the minimum required restraining length.

D. Provide temporary thrust restraint at temporary caps and plugs. Submit details of temporary restraint to AW for approval.

E. At connections with existing water mains where there is a limit on the time the water main may be removed from service, use metal harnesses of anchor clamps, tie rods and straps; mechanical joints utilizing set-screw retainer glands; or restrained push-on joints as permitted by AW. No restraining system can be installed without the approval of AW. Submit details of the proposed installation to AW for approval. For pipe up to 12-inches in size, use a minimum of two 3/4-inch tie rods. If approved for use, install retainer glands in accordance with the manufacturer’s instructions. Material for metal harnessing and tie-rods shall be ASTM A36 or A307, as a minimum requirement.

F. Protection of Metal Harnessing: Protect ties rods, clamps and other metal components against corrosion and by encasement of the entire assembly with 8-mil thick (12 mil thick in corrosive soils) loose polyethylene film in accordance with AWWA C105. Apply tape on all exposed tie rods prior to installing polyethylene.

Table 1

Required Restrained Lengths On Each Side of Bend (ft)

Pipe Diameter	Type of Bend	Bend Angle						Soil Conditions
		5°-11.25°	11.25°-22.5°	22.5°-30°	30°-45°	45°-60°	60°-90°	
12	Horizontal Bend	4	9	12	16	25	43	Rock
12	Vertical Up Bend	4	9	12	16	25	43	Rock
12	Vertical Down Bend	15	31	41	64	89	155	Rock
16	Horizontal Bend	5	11	15	23	32	55	Rock
16	Vertical Up Bend	5	11	15	23	32	55	Rock
16	Vertical Down Bend	20	40	53	82	115	199	Rock
24	Horizontal Bend	7	15	20	31	44	76	Rock
24	Vertical Up Bend	7	15	20	31	44	76	Rock
24	Vertical Down Bend	28	56	75	117	183	281	Rock
12	Horizontal Bend	7	14	19	29	40	69	Clay
12	Vertical Up Bend	7	14	19	29	40	69	Clay
12	Vertical Down Bend	17	35	47	73	102	77	Clay
16	Horizontal Bend	9	18	24	37	52	77	Clay
16	Vertical Up Bend	9	18	24	37	52	77	Clay
16	Vertical Down Bend	23	46	62	97	135	233	Clay
24	Horizontal Bend	13	26	35	54	76	131	Clay
24	Vertical Up Bend	13	26	35	54	76	131	Clay
24	Vertical Down Bend	34	69	93	143	200	346	Clay

The following assumptions were used in calculating required restrained lengths: 42" burial depth, 250 psi, 1.5 safety factor. In areas of multiple bands where required restrained lengths overlap,

END OF SECTION 33 11 00