Section 02511

WATER LINES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

1. Installation of water lines.

2. Specifications identify requirements for both small diameter water lines and large diameter water lines. When specifications for large diameter water lines differ from those for small diameter water lines, large diameter specifications will govern for large diameter pipe.

1.2 MEASUREMENT AND PAYMENT

1. Unit Prices.

    1. Payment for water lines installed by open-cut, augered with or without casing, aerial crossing, pipe offset section or within limits of Potentially Petroleum Contaminated Area (PPCA) is on linear foot basis for each size of pipe installed. Separate pay items are used for each type of installation.

        1. Mains: Measure along axis of pipe and include fittings and valves.

        2. Branch Pipe: Measure from axis of water line to end of branch.

    2. Payment for interconnection is on lump sum basis for each interconnection identified on Drawings. Payment will include tapping sleeve and valves piping, connections and other related work necessary for construction as shown on Drawings or specified herein.

    3. Payment for removal of existing internal elliptical or dished head plug is on unit price basis for each internal elliptical or dished head plug removed. Payment will include deletion of plug, drainage or dewatering of water lines, repair of damaged linings, rechlorination and items incidental to operation.

    4. Payment for plug and clamp is on a unit price basis for each size of pipe.

    5. Payment for drainline connection with service manhole is on unit price basis for each drainline shown on drawings. Payment includes valve, access manhole and connection.

6. When directed by City Engineer to install extra fittings as required to avoid unforeseen obstacles, payment will be based on the following:

    1. Each extra fitting requested by City Engineer and delivered to jobsite will be paid according to unit price for "Extra Fittings in Place."

    2. Payment will include and be full compensation for items necessary for installation and operation of water line.

7. Refer to Section 01270 - Measurement and Payment for unit price procedures.

2. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

1. ANSI A 21.11/AWWA C111 - Standard for Rubber-Gasket Joints for Ductile - Iron Pressure Pipe and Fittings.

2. ANSI/NSF Standard 61 - Drinking Water System -Health Components.

3. ASTM A 36 - Standard Specification for Carbon Structural Steel

4. ASTM A 536 - Standard Specification for Ductile Iron Castings

5. ASTM A 126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

6. ASTM B 21 - Standard Specification for Naval Brass Rod, Bar, and Shapes.

7. ASTM B 98 - Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.

8. ASTM B 301 - Standard Specification for Free-Cutting Copper Rod and Bar.

9. ASTM B 584 - Standard Specification for Copper Alloy Sand Casting for General Application.

10. ASTM E 165 - Standard Test Method for Liquid Penetrant Examination

11. ASTM E 709 - Standard Guide for Magnetic Particle Examination

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12. ASTM F 1674

13. AWWA C 206 - Standard for Field Welding of Steel Water Pipe.

14. AWWA C 207 - Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 Inches through 144 Inches.

1.4 SUBMITTALS

1. Conform to requirements of Section 01330 - Submittal Procedures.

2. Conform to submittal requirements of applicable Section for type of pipe used.

3. Photographs: Submit photographs conforming to requirements of Section 01321 - Construction Photographs prior to commencement of construction.

4. Submit videotapes conforming to requirements of Section 01323 - Construction Videotapes, if applicable.

5. Submit Lone Star notification transmittal number prior to beginning excavation.

PART 2 P R O D U C T S

1.5 PIPE MATERIALS

1. Install pipe materials which conform to following:

    1. Section 02501 - Ductile Iron Pipe and Fittings.

    2. Section 02502 - Steel Pipe and Fittings. Water line piping within plant site and aerial crossings to be welded joint steel pipe with flange or approved restraint joint connections, unless otherwise shown on Drawings.

    3. Section 02506 - Polyvinyl Chloride Pipe.

    4. Section 02507 - Prestressed Concrete Cylinder Pipe.

    5. Section 02518 - Steel Pipe and Fittings for Large Diameter Water Lines.

    6. Section 02613 - Bar-Wrapped Steel Cylinder Pipe.

2. Conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and have certified by an organization accredited by ANSI.

3. Type of pipe materials used are Contractor's option unless specifically identified on Drawings.

4. Provide minimum of 3/8 inch inside joint recess between ends of pipe in straight pipe sections.

1.6 WELDED JOINT PROTECTION FITTING

1. Cylindrical Corrosion Barrier manufactured by CCB Int'1 Inc., or approved equal.

2. O-rings: Conform to National Sanitary Foundation requirements.

1.7 RESTRAINED JOINTS

1. Ductile-Iron Pipe: See Section 02501 - Ductile Iron Pipe and Fittings.

2. PVC Pipe: See Section 02506 - Polyvinyl Chloride Pipe.

3. Prestressed Concrete Cylinder Pipe, Bar-Wrapped Pipe and Steel Pipe: Welded joints (see Paragraph 3.06D).

4. Restrained Joints where required on DIP and PVC pipe:

    1. Restraint devices: Manufacture of high strength ductile iron, ASTM A 536 up to 24 inches, and ASTM A 36 for sizes greater than 30 inches. Working pressure rating twice that of design test pressure.

    2. Bolts and connecting hardware: High strength low alloy material in accordance with ANSI A21.11/AWWA C111.

1.8 COUPLINGS AND APPURTENANCES FOR LARGE DIAMETER WATERLINE

1. Flexible (Dresser-type) Couplings.

    1. Install where shown on Drawings or where allowed by City Engineer for Contractor's convenience. Use galvanized flexible couplings when installed on galvanized pipe, which is cement lined, or when underground. Provide gaskets manufactured from Neoprene or Buna-N.

    2. For steel pipe; sleeve-type flexible couplings, Dresser Style 38, Rockwell Type 411, or equal. Thickness of middle ring equal to or greater than thickness of pipe wall.

    3. Flanged adapter couplings for steel pipe; Dresser Style 128, Rockwell Type 913, or approved equal.

    4. Use Type 316 stainless steel bolts, nuts and washers where flexible couplings are installed underground. Coat entire coupling with 20-mil of T.C. Mastic as manufactured by Tape Coat Company, Inc., Bitumastic 50 as manufacturer by The Carboline Company, or approved equal.

2. Victaulic Joints. Make joint with Victaulic Style 77 coupling fitted with Grade H molded synthetic rubber gasket.

3. Flap Valves: Provide on discharge of manhole drainline as shown on Drawings.

    1. Body and Flap: ASTM A 126-B cast iron.

    2. Seats: ASTM B 21-CA482 or ASTM B 301-CA145 bronze.

    3. Resilient Seat: Buna-N.

    4. Hinge Arms: ASTM B 584-CA865 high tensile bronze.

    5. Hinge pins: ASTM B 98-CA655 silicon bronze.

    6. Provide Rodney Hunt Series FV-AC, or equal.

PART 3 E X E C U T I O N

1.9 PREPARATION

1. Conform to applicable installation specifications for types of pipe used.

2. Employ workmen who are skilled and experienced in laying pipe of type and joint configuration being furnished. Provide watertight pipe and pipe joints. Lay pipe with bell ends facing in direction of laying.

3. Lay pipe to lines and grades shown on Drawings. Use adequate surveying methods and equipment; employ personnel competent in use of this equipment. Horizontal and vertical deviations from alignment as indicated on Drawings shall not exceed 0.10 feet. Measure and record "as-built" horizontal alignment and vertical grade at maximum of every 50 feet on record drawings.

4. Confirm that nine feet minimum separation from gravity sanitary sewers and manholes or separation of four feet minimum from force mains as specified in this Section in all directions unless special design is provided on Drawings:

    1. Water line crossing above gravity sanitary sewer or force main with no leaks: Minimum 2-foot vertical clearance.

5. Where above clearances cannot be attained, and special design has not been provided on Drawings, obtain direction from City Engineer before proceeding with construction.

6. Inform City Engineer if unmetered sprinkler or fire line connections exist which are not shown on Drawings. Make transfer only after approval by City Engineer.

7. Keep pipe trenches free of water, which might impair pipe-laying operations. Prevent pipe bells from coming in contact with sub grade. Grade pipe trenches to provide uniform support along bottom of pipe. Excavate for bell holes for proper sealing of pipe joints after bottom has been graded and in advance of placing pipe. Lay not more than nominal city block length of not more than 300 feet of pipe in trench ahead of backfilling operations. Cover or backfill laid pipe if pipe laying operations are interrupted and during non-working hours. Place backfill carefully and simultaneously on each side of pipe to avoid lateral displacement of pipe and damage to joints. If adjustment of pipe is required after it has been laid, remove and re-lay as new pipe.

8. City of Tomball Utility Operations Division will handle, at no cost to Contractor, operations involving opening and closing valves for wet connections and for chlorination. Contractor is responsible for handling necessary installations and removal of chlorination and testing taps and risers.

9. If asbestos-cement (A.C.) pipe is encountered, follow safety practices outlined in Asbestos-Cement Pipe Producers Association publication, "Recommended Work Practices for A/C Pipe". Strictly adhere to "recommended practices" contained in this publication and make them "mandatory practices" for this Project.

10. For pipe diameters 36 inches and greater, clearly mark each section of pipe and fitting with unique designation on inside of pipe. Locate unique identifying mark minimum of five feet away from either end of each section of pipe. Provide one unique identifying mark in middle of each fitting. Place markings at consistent locations. Use permanent black paint and minimum letter height of 4 inches to mark designations.

11. Laying Large diameter Water Line

    1. Lay not more than 50 feet of pipe in trench ahead of backfilling operations.

    2. Dig trench proper width as shown. When Contractor's operations cause trench width below top of pipe to become 4 feet wider than specified, install higher class of pipe or improved bedding, as determined by City Engineer. No additional payment will be made for higher class of pipe or improved bedding.

    3. Prevent damage to coating when placing backfill. Use backfill material free of large rocks or stones, or other material, which could damage coatings.

    4. Before assembling couplings, lightly coat pipe ends and outside of gaskets with cup grease or liquid vegetable soap to facilitate installation. Groove pipe to manufacturer's specifications.

    5. When installing water line below existing water line provide an approved repair clamp sized for existing water line on site.

6. Prior to proceeding with critical tie-ins submit sequence of work based on findings from "critical location" effort.

12. Contractor is responsible for assuring chosen manufacturer fulfills requirements for extra fittings and, therefore, is responsible for costs due to downtime if requirements are not met.

13. Do not remove plugs or clamps during months of peak water demands; June, July and August, unless otherwise approved by City Engineer.

1.10 HANDLING, CLEANING AND INSPECTION

1. Handling:

1. Place pipe along project site where storm water or other water will not enter or pass through pipe.

2. Load, transport, unload, and otherwise handle pipe and fittings to prevent damage of any kind. Handle and transport pipe with equipment designed, constructed and arranged to prevent damage to pipe, lining and coating. Do not permit bare chains, hooks, metal bars, or narrow skids or cradles to come in contact with coatings. Where required, provide pipefittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.

3. Hoist pipe from trench side into trench by means of sling of smooth steel cable, canvas, leather, nylon or similar material.

4. For large diameter water lines, handle pipe only by means of sling of canvas, leather, nylon, or similar material. Sling shall be minimum 36 inches in width. Do not tear or wrinkle tape layers.

5. Use precautions to prevent injury to pipe, protective linings and coatings.

1. Package stacked pipe on timbers. Place protective pads under banding straps at time of packaging.

2. Pad fork trucks with carpet or other suitable material. Use nylon straps around pipe for lift when relocating pipe with crane or backhoe.

3. Do not lift pipe using hooks at each end of pipe.

4. Do not place debris, tools, clothing, or other materials on pipe.

6. Repair damage to pipe or protective lining and coating before final acceptance.

7. For cement mortar line and coated steel pipe and PCCP, permit no visible cracks longer than 6 inches, measured within 15 degrees of line parallel to pipe longitudinal axis of finished pipe, except:

    1. In surface laitance of centrifugally cast concrete.

    2. In sections of pipe with steel reinforcing collars or wrappers.

    3. Within 12 inches of pipe ends.

8. Reject pipe with visible cracks (not meeting exceptions) and remove from project site.

2. Cleaning: Thoroughly clean and dry interior of pipe and fittings of foreign matter before installation, and keep interior clean until Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing or other materials in pipe. After pipe laying and joining operations are completed, clean inside of pipe and remove debris.

3. Inspection: Before installation, inspect each pipe and fitting for defects. Reject defective, damaged or unsound pipe and fittings and remove them from site.

1.11 EARTHWORK

1. Conform to applicable provisions of Section 02317 - Excavation and Backfilling for Utilities and Section 02447 - Augering Pipe for Water Lines.

2. Bedding: Use bedding materials in conformance with Section 02320 - Utility Backfill Materials.

3. Backfill: Use bank run sand or earth or native soil as specified in Section 02320 - Utility Backfill Materials. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

4. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density. Field density tests may be made at frequency determined by City Engineer. Water tamping is not allowed.

5. Pipe Embedment: Including 6-inch pipe bedding and backfill to 12 inches above top of pipe.

1.12 PIPE CUTTING

1. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by City Engineer. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

1.13 PIPING INSTALLATION

1. Do not lay pipe unless sub grade is free of water. Make adjustments of pipe to line and grade by scraping away sub grade or filling in with granular material. Wedging or blocking up bell will not be acceptable.

2. Do not install pipe at greater depth than its design allows.

3. Protection of Pipeline: Securely place stoppers or bulkheads in openings and in end of line when construction is stopped temporarily and at end of each day's work.

4. Perform critical location to determine actual horizontal and vertical location of existing pipe and other utilities that may affect tie-in connection. For large diameter water lines, submit to City Engineer horizontal and vertical dimensions signed and sealed by Registered Professional Land Surveyor, prior to submitting portion of proposed water line lay schedule for tie-in. Refer to Section 02317 - Excavation and Backfill for Utilities for additional requirements at critical locations.

5. Perform following additional procedures when working on plant sites.

    1. Seventy-two hours prior to each plant shut down or connection, schedule coordination meeting with City Engineer and Water Production personnel. At this meeting, present proposed sequencing of Work and verification of readiness to complete Work as required and within time permitted. Do not proceed with Work until City Engineer agrees key personnel, equipment and materials are on hand to complete Work.

    2. Prior to fully excavating around existing piping, excavate as minimal as possible to confirm type and condition of existing joints. Verify size, type, and condition of pipe prior to ordering materials or fully mobilizing for Work.

    3. Do not proceed with connections to existing piping and identified critical stages of work unless approved by City Engineer and City's Water Production Division operator is present to observe.

    4. Coordinate with City's Water Production Division operators to obtain reduction in operating pressures prior to performing connections to existing piping.

    5. Make connections to existing piping only when two valves are closed off between connection and source of water pressure. Do not make connection relying solely on one valve, unless otherwise approved by City Engineer.

6. Perform critical stages of Work identified on Drawings at night or during low water demand months as specified in Section 01110 - Summary of Work.

7. Excavation equipment used on plant sites to have smooth bucket; no teeth or side cutters.

8. Submit to City Engineer Lone Star Notification transmittal number prior to beginning excavation.

9. Before each "dig" with mechanical excavator, probe ground to determine potential obstructions. Repeat procedure until existing pipe is located or excavation reaches desired elevation. Perform excavations within one foot to existing piping by hand methods.

10. Provide adequate notice to pipe manufacture's representative when connecting or modifying existing prestressed or pretension concrete cylinder pipe.

11. Provide field surveyed (horizontal and vertical elevations) "as-builts" of new construction and existing underground utilities encountered. Submit in accordance with Section 01330 - Submittal Procedures.

12. Prior to performing plant work to be done on weekend, provide list of sites and contact person with phone numbers to City Engineer by noon on Thursday of week. Contact person must be accessible during weekend, have Houston Metro Area phone number, and be authorized to make emergency decisions.

13. No night work or plant shut down will be scheduled to begin two working days before or after designated City Holidays.

6. For tie-ins to existing water lines, provide necessary material on hand to facilitate connection prior to shutting down existing water line.

1.14 JOINTS AND JOINTING

1. Rubber Gasketed Bell-and-Spigot Joints for Concrete Cylinder Pipe, Bar Wrapped Pipe PVC, Steel, and DIP:

1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.

2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.

3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.

4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage and replace if necessary before remaking joint.

5. Where preventing movement of 16-inch diameter or greater pipe is necessary due to thrust, use restrained joints.

    1. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.

    2. Do not include passive resistance of soil in thrust restraint calculations.

6. Provide means to prevent full engagement of spigot into bell as shown on Drawings. Means may consist of wedges or other types of stops as approved by City Engineer.

2. Flanged Joints where required on Concrete Cylinder Pipe, Bar Wrapped Pipe, Ductile Iron Pipe, or Steel Pipe:

    1. AWWA C 207. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Align bolt holes to straddle vertical, horizontal or north-south centerline. Do not exceed 3/64 inch per foot inclination of flange face from true alignment.

    2. Use full-face gaskets for flanged joints. Provide 1/8-inch-thick cloth inserted rubber gasket material. Cut gaskets at factory to proper dimensions.

    3. Use galvanized or black nuts and bolts to match flange material. Use cadmium-plated steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Maintain at all times approximately same distance between two flanges at points around flanges. Tighten bolts alternately (180/ apart) until all are evenly tight. Draw bolts tight to ensure proper seating of gaskets. Provide Densco petroleum based tape or approved equal for all exposed portions of nuts, bolts and pipe.

    4. For in-line flange joints 30 inches in diameter and greater and at butterfly valve flanges, provide Pyrox G-10 with nitrite seal, Type E LineBacker gasket as manufactured by Pipeline Seal and Insulator, Inc., or approved equal conforming to ANSI A 21.11 mechanical joint gaskets. For in-line flange joints sized between 12 inches in diameter and greater and 24 inches in diameter and smaller, provide Phenolic PSI with nitrite seal, Type E LineBacker gasket as manufactured by Pipeline Seal and Insulator, Inc., or approved equal conforming to ANSI A 21.11 mechanical joint gaskets.

3. Welded Joints (Concrete Cylinder Pipe, Bar Wrapped Pipe, Steel Pipe):

    1. Prior to starting work, provide certification of qualification for welders employed on project for type of work procedures and positions involved.

    2. Joints: AWWA C 206. Full-fillet, single lap-welded slip-type either inside or outside, or double butt-welded type; use automatic or hand welders; completely penetrate deposited metal with base metal; use filler metal compatible with base metal; keep inside of fittings and joints free from globules of weld metal which would restrict flow or become loose. Do not use mitered joints. For interior welded joints, complete backfilling before welding. For exterior field-welded joints, provide adequate working room under and beside pipe. Use exterior welds for 30-inch and smaller.

    3. Furnish welded joints with trimmed spigots and interior welds for 36-inch and larger pipe.

    4. Bell-and-spigot, lap-welded slip joints: Deflection may be taken at joint by pulling joint up to 3/4 inch as long as 1-1/2-inch minimum lap is maintained. Spigot end may be miter cut to take deflections up to 5 degrees as long as joint tolerances are maintained. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to 5 degrees.

    5. Align piping and equipment so that no part is offset more than 1/8 inch. Set fittings and joints square and true, and preserve alignment during welding operation. For butt welded joints, align abutting ends to minimize offset between surfaces. For pipe of same nominal wall thickness, do not exceed 1/16 inch offset. Use line-up clamps for this purpose; however, take care to avoid damage to linings and coatings.

    6. Protect coal-tar-epoxy lining during welding by draping an 18-inch-wide strip of heat resistant material over top half of pipe on each side of lining holdback to avoid damage to lining by hot splatter. Protect tape coating similarly if external welding is required.

    7. Welding rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.

    8. Deposit metal in successive layers to provide at least 2 passes or beads for automatic welding and 3 passes or beads for manual welding in completed weld.

    9. Deposit no more than 1/4 inch of metal on each pass. Thoroughly clean each individual pass with wire brush or hammer to remove dirt, slag or flux.

    10. Do not weld under weather condition that would impair strength of weld, such as wet surface, rain or snow, dust or high winds, unless work is properly protected.

11. Make tack weld of same material and by same procedure as completed weld. Otherwise, remove tack welds during welding operation.

12. Remove dirt, scale, and other foreign matter from inside piping before tying in sections, fittings, or valves.

13. Welded Joints for Large Diameter Water Lines:

    1. Furnish pipe with trimmed spigots and interior welds for 36-inch and larger pipe.

    2. Use exterior welds for 30-inch and smaller.

    3. Only one end may be miter cut. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to 2-1/2 degrees.

    4. Employ an independent certified testing laboratory, approved by City Engineer, to perform weld acceptance tests on welded joints. Include cost of such testing and associated work to accommodate testing in contract unit price bid for water line. Furnish copies of all test reports to City Engineer for review. City Engineer has final decision as to suitability of all welds tested.

        1) Weld acceptance criteria:

            1) Conduct in accordance with ASTM E165- Standard Test Method for Liquid Penetrant Examination and ASTM E709 Standard Guide for Magnetic Particle Examination. Use X-ray methods for butt welds, for 100 percent of joint welds.

            2) Examine welded surfaces for the following defects:

                1) Cracking.

                2) Lack of fusion/penetration.

                3) Slag which exceeds one-third (t) where (t) equals material thickness.

                4) Porosity/Relevant rounded indications greater than 3/16 inch; rounded indication is one of circular or elliptical shape with length equal to or less than three times its width.

5) Relevant linear indications in which length of linear indication exceeds three times its width.

6) Four or more relevant 1/16-inch rounded indications in line separated by 1/16 inch or less edge to edge.

14. After pipe is joined and prior to start of welding procedure, make spigot and bell essentially concentric by jacking, shimming or tacking to obtain clearance tolerance around periphery of joint except for deflected joints.

15. Furnish each welder employed steel stencil for marking welds, so work of each welder can be identified. Mark pipe with assigned stencil adjacent to weld. When welder leaves job, stencil must be voided and not duplicated. Welder making defective welds must discontinue work and leave project site. Welder may return to project site only after recertification.

16. Provide cylindrical corrosion barriers for epoxy lined steel pipe 24-inch diameter and smaller.

1. In addition to welding requirements contained here in Paragraph 3.06, conform to protection fitting manufacturer's installation recommendations.

2. Provide services of technical representative of manufacturer available on site at beginning of pipe laying operations. Representative to train welders and advise regarding installation and general construction methods. Welders must have 12 months prior experience installing protection fittings.

3. All steel pipe is to have cutback 3/4 inch to no greater than 1 inch of internal diameter coating from weld bevel.

4. Steel fittings shall be supplied with cylindrical corrosion barriers and will be welded to ends and be the greater of 6 inches or diameter of the pipe. Welds are to be shop applied and fittings are to be shop coated per AWWA C 210 or AWWA C 213 prior to movement to jobsite.

5. All steel pipe receiving field adjustments are to be cold cut using standard practices and equipment. No cutting using torch is to be allowed.

4. Harnessed Joints (Concrete Cylinder Pipe, Bar Wrapped Pipe):

1. Use of snap-ring type restrained joints on pipe is limited to 20-inch through 48-inch diameters.

2. Position snap-ring joint bolt on top (12 o'clock portion). Provide minimum 1/2-inch joint recess. Use joint "diapers" minimum of 12 inches wide.

3. For field adjustments with deflections beyond manufacturer's recommendations:

    1. Field trim spigot.

    2. Do not engage ring.

4. Harnessed joints are not permitted in areas defined on Drawings as potentially petroleum contaminated material, in tunnels, or at bend greater than 5 degrees.

5. Install harness type joints including snap rings at straight sections of pipe.

5. Restrained Joints

1. Installation.
    a. Install restrained joints mechanism in accordance with manufacturer=s recommendations.

    b. Examine and clean mechanism; remove dirt, debris and other foreign material.

    c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.

    d. Verify gasket is evenly seated.

    e. Do not over stab pipe into mechanism.

2. For existing water lines and water lines less than 16 inches in diameter, restrain pipe joints with concrete thrust blocks or provide restrained joints.

3. Prevent any lateral movement of thrust restraints throughout pressure testing and operation. Place 2500 psi concrete conforming to Section 03315 - Concrete for Utility Construction, for blocking at each change in direction of existing water lines, to brace pipe against undisturbed trench walls. Finish placement of concrete blocking, made from Type I cement, 4 days prior to hydrostatic testing of pipeline. Test may be made 2 days after completion of blocking if Type II cement is used.

4. Thrust restraint lengths shown on Drawings are minimum anticipated lengths. These lengths are based on deflections indicated and on use of prestressed concrete cylinder pipe. Adjustments in deflections or use of other pipe material may result in reduction or increase of thrust lengths. Perform calculations by pipe manufacturer to verify proposed thrust restraint lengths. Submit calculations for all pipe materials sealed by a registered Professional Engineer in State of Texas for review by City Engineer. Make adjustments in thrust restraint lengths at no additional cost to City.

5. Passive resistance of soil will not be permitted in calculation of thrust restraint.

6. Use minimum 16-foot length of pipe in and out of joints made up of beveled pipe where restraint joint lengths are not identified on Drawings. Otherwise, provide restraint joints for a minimum length of 16 feet on each side of beveled joints.

6. Joint Grout (Concrete Cylinder Pipe, Bar Wrapped Pipe, Steel Pipe):

1. Mix cement grout mixture by machine except when less than 1/2 cubic yard is required. When less than 1/2 cubic yard is required, grout may be hand mixed. Mix grout only in quantities for immediate use. Place grout within 20 minutes after mixing. Discard grout that has set. Retempering of grout by any means is not permitted.

2. Prepare grout in small batches to prevent stiffening before it is used. Do not use grout, which has become so stiff that proper placement cannot be assured without retempering. Use grout for filling grooves of such consistency that it will adhere to ends of pipe.

3. Surface Preparation: Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces with wire brush or hammer to sound, clean surface. Remove rust and foreign materials from metal surfaces in contact with grout.

4. Follow established procedures for hot and cold weather concrete placement.

5. Complete joint grout operations and backfilling of pipe trenches as closely as practical to pipe laying operations. Allow grouted exterior joints to cure at least 1 hour before compacting backfill.

6. Grouting exterior joint space: Hold wrapper in place on both sides of joint with minimum 5/8-inch-wide steel straps or bands. Place no additional bedding or backfill material on either side of pipe until after grout band is filled and grout has mechanically stiffened. Pull ends of wrapper together at top of pipe to form access hole. Pour grout down one side of pipe until it rises on other side. Rod or puddle grout to ensure complete filling of joint recess. Agitate for 15 minutes to allow excess water to seep through joint band. When necessary, add more grout to fill joint completely. Protect gap at top of joint band from backfill by allowing grout to stiffen or by covering with structurally protective material. Do not remove band from joint. Proceed with placement of additional bedding and backfill material.

7. Interior Joints for Pipe 24 Inches and Smaller: Circumferentially butter bell with grout prior to insertion of spigot, strike off flush surplus grout inside pipe by pulling filled burlap bag or inflated ball through pipe with rope. After joint is engaged, finish off joint grout smooth and clean. Use swab approved by City Engineer for 20-inch pipe and smaller.

8. Protect exposed interior surfaces of steel joint bands by metallizing, by other approved coatings, or by pointing with grout. Joint pointing may be omitted on potable water pipelines if joint bands are protected by zinc metallizing or other approved protective coatings.

9. Remove and replace improperly cured or otherwise defective grout.

10. Strike off grout on interior joints and make smooth with inside diameter of pipe.

11. When installed in tunnel or encasement pipe and clearance within casing does not permit outside grout to be placed in normal manner, apply flexible sealer, such as Flex Protex by Gifford-Hill America, or equal, to outside joint prior to joint engagement. Clean and prime surfaces receiving sealer in accordance with manufacturer's recommendations. Apply sufficient quantities of sealer to assure complete protection of steel in joint area. Fill interior of joint with grout in normal manner after joint closure.

12. Interior Joints for Water Lines 30 Inches and Larger: Clean joint space, wet joint surfaces, fill with stiff grout and trowel smooth and flush with inside surfaces of pipe using steel trowel so that surface is smooth. Accomplish grouting at end of each workday. Obtain written acceptance from City Engineer of inside joints before proceeding with next day's pipe laying operation. During inspection, insure no delamination of joint mortar has occurred by striking joint mortar lining with rubber mallet. Remove and replace delaminated mortar lining.

13. Work, which requires heavy equipment to be over water line, must be completed before mortar is applied to interior joints.

7. Joint Testing: In addition to testing individual joints with feeler gauge approximately 1/2 inch wide and 0.015-inch thick, use other joint testing procedure approved or recommended by pipe manufacturer which will help ensure watertight installation prior to backfilling. These tests shall be made at no additional cost to City.

8. Make curves and bends by deflecting joints or other method as recommended by manufacturer and approved by City Engineer. Submit details of other methods of providing curves and bends, which exceed manufacturer's recommended deflection prior to installation.

    1. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer, unless otherwise indicated on Drawings.

    2. If deflection exceeds that specified but is less than 5 percent, repair entire deflected pipe section such that maximum deflection allowed is not exceeded.

3. If deflection is equal to or exceeds 5 percent from that specified, remove entire portion of deflected pipe section and install new pipe.

4. Replace, repair, or reapply coatings and linings as required.

5. Assessment of deflection may be measured by City Engineer at location along pipe. Arithmetical averages of deflection or similar average measurement methods will not be deemed as meeting intent of standard.

6. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

9. Closures Sections and Approved Field Modifications to Steel, Concrete Cylinder Pipe, Bar Wrapped Pipe and Fittings:

1. Apply welded-wire fabric reinforcement to interior and exterior of exposed interior and exterior surfaces greater than 6 inches in diameter. Welded-wire fabric: minimum W1; maximum spacing 2 inches by 4 inches; 3/8 inch from surface of steel plate or middle third of lining or coating thickness for mortar thickness less than 3/4 inch.

2. Fill exposed interior and exterior surfaces with nonshrink grout.

3. For pipe diameters 36 inches and greater, perform field welds on interior and exterior of pipe.

4. For large diameter water lines, provide minimum overlap of 4 inches of butt strap over adjacent piece on butt-strap closures.

1.15 CATHODIC PROTECTION APPURTENANCES

1. Where identified on Drawings, modify pipe for cathodic protection as detailed on Drawings and specified. Unless otherwise noted, provide insulation kits at connections to existing water system or at locations to isolate one type of cathodic system from another type, between water line, access manhole piping and other major openings in water line, or as shown on Drawings.

2. Bond joints for pipe installed in tunnel or open cut, except where insulating flanges are provided. Weld strap or clip between bell and spigot of each joint or as shown on Drawings. No additional bonding required where joints are welded for thrust restraint. Repair coatings as specified by appropriate AWWA standard, as recommended by manufacturer, and as approved by City Engineer.

3. Bonding Strap or Clip: Free of foreign material that may increase contact resistance between wire and strap or clip.

1.16 SECURING, SUPPORTING AND ANCHORING

1. Support piping as shown on Drawings and as specified in this Section, to maintain line and grade and prevent transfer of stress to adjacent structures.

2. Where shown on Drawings, anchor pipe fittings and bends installed on water line by welding consecutive joints of pipe together to distance each side of fitting. Restrained length, as shown on Drawings, assumes that installation of pipe and subsequent hydrostatic testing begin upstream and proceed downstream, with respect to normal flow of water in pipe. If installation and testing differs from this assumption, submit for approval, revised method of restraining pipe joints upstream and downstream of device used to test against (block valve, blind flange or dished head plug).

3. Use adequate temporary blocking of fittings when making connections to distribution system and during hydrostatic tests. Use sufficient anchorage and blocking to resist stresses and forces encountered while tapping existing water line.

1.17 POLYETHYLENE WRAP FOR DUCTILE IRON PIPE

1. Double wrap pipe and appurtenances (except fire hydrants and fusion bond or polyurethane coated fittings) with 8-mil polyethylene film.

2. Conform to requirements of Section 02528 - Polyethylene Wrap.

1.18 CLEANUP AND RESTORATION

1. Provide cleanup and restoration crews to work closely behind pipe laying crews, and where necessary, during chlorination, testing, service transfers, abandonment of old water lines, backfill and surface restoration.

2. Upon completion of section not exceeding 4000 feet per crew, chlorinate and pressure test. Begin transfer of services no later than 7 calendar days after successful completion of chlorination and pressure testing.

3. After transfer of services, but no later than 21 calendar days after successful completion of chlorination and pressure testing, begin abandonment of old water lines, including resodding and placement of sidewalks and pavements.

4. Do not begin construction of additional sections if above conditions are not met.

5. For large diameter water lines, do not install more than 2000 feet of water line, without previous 2000 feet being cleaned up and site fully restored. Schedule paving crews so repaying work will not lag behind pipe laying work by more than 1000 feet. Failure to comply with this requirement will result in "Notice of Nonconformance".

6. Complete site restoration within 30 days from date water line is successfully disinfected and hydrostatically tested, unless extended in writing by City Engineer.

7. For projects involving multiple subdivisions or locations, limit water line installation to maximum of two project site locations.

1.19 CLEANING PIPING SYSTEMS

1. Remove construction debris or foreign material and thoroughly broom clean and flush piping systems. Provide temporary connections, equipment and labor for cleaning. City must inspect water line for cleanliness prior to filling.

1.20 DISINFECTION OF WATER LINES

1. Conform to requirements of Section 02514 - Disinfection of Water Lines.

1.21 FIELD HYDROSTATIC TESTS

1. Conform to requirements of Section 02515 - Hydrostatic Testing of Pipelines.

END OF SECTION