CITY OF FORT WAYNE MASTER UPDATED: 2/23/16

SECTION 33 05 34.15

CONCRETE PRESSURE UTILITY PIPING

NTS: Coordinate this section with applicable requirements of Division 33 installation. Installation and jointing methods are included in the applicable piping installation section. Trenching and backfill information is in 33 00 05 Trenching and Earthwork.

1. GENERAL
   1. DESCRIPTION

NTS: Insert at (--1--) specific type(s) of concrete pipe required from the following: “reinforced concrete pressure pipe, pre-stressed concrete cylinder pressure pipe, pre-tensioned reinforced concrete pipe, concrete drainage pipe; precast reinforced concrete box sections, non-reinforced concrete pipe”. Edit to suit the project.

* + 1. Scope:
       1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install (‑‑1‑‑) and fittings.
    2. Coordination:
       1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before concrete pipe Work.
    3. Related Sections:

NTS: List below only sections covering products, construction, and equipment specifically identified in this section and specified in another section and directly referenced in this specification. Do not list administrative and procedural Division 01 sections. Insert at (--1--) the number and name of the Division 33 installation section or any other referenced sections.

* + - 1. Section 33 11 00, Water Piping Installation.
      2. Section (--1--).

Review paragraph “A.4” below and modify to suit the project.

* 1. MEASUREMENT AND PAYMENT
     1. Concrete Pipe:
        1. Work Item Number and Title

**33 05 34.15-A (--1--) Concrete Pressure Utility Piping**

* + - 1. The quantity of pipe installed shall be the number of lineal feet actually installed, backfilled, and tested, as measured from outside wall of structure to outside wall of structure, as measured along the centerline of the pipe.
      2. The payment of pipe shall be based on the unit price per linear foot as listed on the submitted Bid schedule for each pipe size successfully installed. Payment for any associated restoration shall be paid for under its respective Work item.

These Work items shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, to install the concrete pressure pipe as shown and specified. The Work includes, but is not limited to, trench excavation, dewatering, furnishing and placement of bedding, pipe, placement of required backfill, disposing of excess excavated material, required fittings, testing of materials, compaction of bedding and backfill, temporary sheeting, shoring and bracing, restoration/replacement of all disturbed items not included under other Work items, protection of existing utilities and structures, pressure testing and incidentals for performing all Work as specified unless otherwise outlined as a separate Work item.

* 1. REFERENCES

NTS: Retain applicable standards and add/delete others as required.

* + 1. Standards referenced in this Section are:
       1. AASHTO, Policy on Geometric Design of Highways and Streets.
       2. ANSI/ASTM A36/A36M, Specification for Carbon Structural Steel.
       3. ANSI/ASTM A82, Specification for Steel Wire, Plain for Concrete Reinforcement.
       4. ANSI/ASTM A185, Specification for Steel Welded Wire Reinforcement, Plain for Concrete.
       5. ANSI/ASTM A283/A283M, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
       6. ANSI/ASTM A496, Specification for Steel Wire, Deformed, for Concrete Reinforcement.
       7. ANSI/ASTM A497/A497M, Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
       8. ANSI/ASTM A615/A615M, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
       9. ANSI/ASTM A663/A663M, Specification for Steel Bars, Carbon, Merchant Quality Mechanical Properties.
       10. ANSI/ASTM A1011/1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
       11. ANSI/ASTM A1018/1018M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
       12. ANSI/ASTM C33, Specification for Concrete Aggregates.
       13. ANSI/ASTM C150, Specification for Portland Cement.
       14. ANSI/ASTM C361, Specification for Reinforced Concrete Low‑Head Pressure Pipe.
       15. ANSI/ASTM C595, Specification for Blended Hydraulic Cements.
       16. ANSI/AWWA C207, Steel Pipe Flanges for Waterworks Service-Sizes 4-inch through 144-inches.
       17. ANSI/AWWA C300, Reinforced Concrete Pressure Pipe, Steel Cylinder Type.
       18. ANSI/AWWA C301, Prestressed Concrete Pressure Pipe, Steel Cylinder Type.
       19. ANSI/AWWA C302, Reinforced Concrete Pressure Pipe, Non-Cylinder Type.
       20. ANSI/AWWA C303, Concrete Pressure Pipe, Bar-wrapped, Steel Cylinder Type.
  1. QUALITY ASSURANCE

NTS: Edit or delete Paragraph “A”, below, if project requirements prohibit including an experience clause.

* + 1. Qualifications:
       1. Manufacturer:
          1. Manufacturer shall have a minimum of 5years of experience producing concrete pipe and fittings, and shall be able to document satisfactory service in at least 5 installations.
    2. Component Supply and Compatibility:
       1. Each type of concrete pipe and associated fittings shall be products of one manufacturer.
       2. Concrete pipe Supplier shall review, approve, and prepare all Shop Drawings and submittals for all components furnished under this Section.
       3. Components shall be suitable for specified service conditions.
    3. Quality of materials, process of manufacture and finished pipe shall be subject to inspection by Engineer.
  1. SUBMITTALS
     1. Action Submittals: Submit the following:
        1. Shop Drawings:
           1. Detailed drawings and data on piping and fittings, where applicable, and appurtenances.
        2. Product Data:
           1. Detailed product data on pipe, fittings, gaskets, fastening hardware where applicable, and appurtenances.
           2. Required Calculations (i.e. structural)
           3. Detailed description for future repair, maintenance, connections, etc.
           4. Results from required quality control test.
     2. Informational Submittals: Submit the following:
        1. Certifications:
           1. Submit certificate signed by manufacturer of each product certifying that products conform to applicable referenced standards.
        2. Supplier Instructions:
           1. Pipe manufacturer instructions for handling, storing, and installing products.
  2. DELIVERY, STORAGE, AND HANDLING
     1. Comply with Section 01 65 00 Product Delivery Requirements and Section 01 66 00 Product Storage and Handling Requirements.

1. PRODUCTS
   1. MATERIALS, CONCRETEPRESSURE PIPE

NTS: Retain the appropriate version of Paragraph “A”, below, based on pipe operating pressure, and delete inapplicable versions. NOTE: AWWA C300 covers from 40 to 260 PSI; AWWA C301 covers from 250 to 350 PSI; AWWA C302 covers from zero to 55 PSI; NOTE: AWWA C302 is not typically used for water piping installation. AWWA C303 covers up to 400 PSI.

ANSI/AWWA C300 pipe is available in sizes 30-inch through 144-inch diameter, and is typically used for transmission lines and distribution mains. It is suitable for pipe jacking and microtunneling because of to its strength. Its minimum standard length is 8 feet.

* + 1. Pipe and fittings shall conform to ANSI/AWWA C300. Pipe shall have the following features: welded steel cylinder with steel joint rings welded to its ends; a reinforcing cage or cages of steel bars, wire, or welded wire fabric surrounding the steel cylinder; wall of dense concrete covering the steel cylinder and reinforcing cage or cages inside and out; and joint with a preformed watertight gasket. Fittings shall be fabricated from welded steel sheet or plate, and be lined and coated with cement mortar.

NTS: ANSI/AWWA C301 pipe is available in sizes 16-inch thru 144-inch diameter, and is typically used for transmission mains, distribution mains, pressure siphons, penstocks, and water intake lines. ANSI/AWWA C301 states that lined-cylinder pipe (LCP) “shall” be used for pipe sizes up to 20-inch diameter, and also states that embedded cylinder pipe (ECP) “shall” be used for pipes greater than 60-inch diameter. For all diameters in between, it states that either LCP or ECP “may” be used.

ANSI/AWWA C301 does not allow LCP above 60-inch diameter due to practical limitations of spinning the weight required for core placement during fabrication.

ECP cannot be produced under 24-inch diameter because of the minimal space required to expand and collapse the forms which are placed on the interior of the steel cylinder prior to encasement in concrete.

Theoretically, sizes 24 inch through 60 inch diameter can be made as either LCP or ECP—hence, the statement that these sizes “may” be either type.  However, Price Bros. Company will not manufacture 24-inch through 36-inch as ECP for reasons of worker safety and will not make pipe larger than 48-inch as LCP, due to horsepower (and safety) limitations needed to achieve the g-forces required for centrifugally placing concrete. Price Brothers Company (part of Hanson Pipe & Precast) Recommends LCP for 16-inch through 48-inch, and ECP for 54-inch diameter and larger. ECP is more expensive than LCP.

* + 1. Pipe and fittings shall conform to requirements of ANSI/AWWA C301. Pipe shall have the following features: welded steel cylinder with steel joint rings welded to its ends; steel cylinder encased in concrete, reinforcement consisting of high‑tensile wire wound around outside of the core in one or more layers at a predetermined stress and securely fastened at its ends; coating of dense mortar or concrete covering the core and wire, except surfaces of joint rings; self‑centering joint with watertight preformed rubber gasket. For embedded cylinder pipe at least one-third of total core thickness shall be outside of cylinder. Embedded cylinder pipe shall be used in sizes 54‑inches and larger. For pipe 16-inch to 48-inch diameter, lined cylinder pipe may be used, with a core of concrete lining inside of steel cylinder. Fittings shall be fabricated from welded steel sheet or plate, and be lined and coated with cement mortar.

NTS: ANSI/AWWA C303 pipe is available in sizes 10-inch through 72-inch diameter, in laying lengths of 24 feet to 36 feet, and is typically used for cross-country transmission mains, distribution mains, and water treatment plants.

* + 1. Pipe and fittings shall conform to requirements of ANSI/AWWA C303. Pipe shall have the following features: welded steel cylinder with sized steel joint rings welded to its ends; lining of concrete or cement mortar centrifugally applied within steel cylinder and spigot ring; reinforcement consisting of continuously steel rod wound helically around outside of cylinder at predetermined stress and securely fastened by welding to steel joint ring at each end of cylinder; a coating of dense mortar covering cylinder and rods, except for necessary exposed surfaces of spigot joint rings; and a self‑centering watertight preformed rubber gasket. Fittings shall be fabricated from welded steel sheet or plate, and be lined and coated with cement mortar.
    2. Pipe Materials:
       1. Cement for concrete work in accordance with ANSI/ASTM C150, Type I.
       2. Aggregates for concrete work in accordance with ANSI/ASTM C33.
       3. Steel for cylinders, joint and fittings in accordance with ANSI/ASTM A1011/1011M, ANSI/ASTM A1018/1018M or ANSI/ASTM A283/A283M.
       4. Steel for reinforcing in accordance with ANSI/ASTM A663/A663M, Grade 80; ANSI/ASTM A615/A615M, Grade 40; or ANSI/ASTM A497/A497M.
       5. Rubber for gaskets shall contain not less than 50 percent by volume of first‑grade natural crude or first‑grade synthetic rubber. Remainder of compound shall consist of pulverized fillers, free of rubber substitutes, reclaimed rubber, and other deleterious substances.
  1. PIPE CLOSURES
     1. Pipe layout submitted by Supplier shall reflect Contractor’s planned schedule for operations and the Progress Schedule. Pipe closures shall be designed by pipe manufacturer for pressure required and shall be located in straight runs of pipe. Number, design, and location of closure pieces shall be as shown or subject to approval of Engineer.
     2. Contractor may either cut closure cylinder to required length in field or, if time allows, have pipe manufacturer supply required length based on exact field measurements.
     3. Extra payment will not be made for closures. Extra compensation will not be paid for concrete required for protecting cylinder and joint rings.

NTS: Where thrust protection is to be provided by restrained joints, and pipe is steel cylinder type, include article “2.11”.

* 1. THRUST RESTRAINT
     1. Provide thrust restraint by using restrained joints.

NTS: Modify paragraph “B” below to suit project requirements. Snap ring type joints are generally the most economical type of restrained joint for concrete pipe. Where longer lengths are required than are possible by shop fabrication, welded type tie joints may be used with discretion—welded joints are the least economical due to the costs of field welding and due to concerns with quality control.

* + 1. Restrained joints shall be bell bolt type, harnessed clamp type, welded type tie joint, or snap ring type flexible joints.

NTS: Include paragraph “C” below for restraining elbows using restrained joints and thrust collars. Pipe shall be provided with anchor rings. Contact the pipe manufacturer during detailed design to obtain specific anchor ring requirements. Edit paragraph “C” to suit project if other types of fittings, such wyes, dead-ends, etc. Require anchor rings and retrained joints.

* + 1. Where restrained joints are used in conjunction with thrust collars for elbow restraint, provide pipe with anchor ring type joints with reinforced, raised coating anchors for restraint.

NTS: Delete paragraph “D” below if harnessed lengths of buried pipe are not used. If harnessed lengths of buried pipe are required for restraint, design engineer must indicate the required lengths on the drawings. In addition, steel cylinder thickness in the harnessed pipe must be determined during the design to have sufficient cross-sectional area to transmit the longitudinal thrust force. Methods for determining the required harnessed lengths and required steel cylinder thickness based on pipe laying and soil conditions are in AWWA Manual M-9; also consider consulting pipe manufacturers, including Price Bros. Thrust Restraint Design Guide. A conservative value of 0.3 is recommended for the friction factor.

* + 1. Harnessed lengths of buried pipe shall be as shown. Steel cylinder thickness of harnessed pipe shall have sufficient cross-sectional area to transmit thrust force.
  1. WALL FITTINGS
     1. Connect to structures by casting a fabricated bell wall fitting into concrete. Fabricated bell wall fitting shall consist of a bell ring suitable for connecting to steel spigot, steel pipe section, and waterstop ring, all welded together to form a complete unit, with a laying length equal to width of wall in which it is installed. For restrained joints, provide additional length to accommodate bell‑bolt, harnessed clamp, or snap ring connection. Fitting shall have a welded fabric or wire mesh reinforced mortar lining furnished to interior diameter of connecting pipeline.
     2. Connect sluice gates and flanged piping to special fabricated flange wall fittings where shown. Fabricated flange wall fitting shall consist of a steel flange, steel pipe section, waterstop ring, and a bell ring suitable for connecting steel spigot to be provided, all welded together to form a complete unit, with a laying length equal to width of wall in which it is installed. For restrained joints, provide additional length to accommodate bell‑bolt, harnessed clamp, or snap ring connection. Fitting shall have a welded fabric or wire‑mesh reinforced mortar lining finished to interior diameter of connecting pipe. Flange shall be stress-relieved after welding to steel pipe section and then machined. Drill and tap flange to receive stud bolts. Flange shall conform to AWWA C207 for steel flanges, Class D, with ANSI B16.1, Class 125 drilling. When connecting to a wall thimble such as used for sluice gates or other equipment installed with wall thimble, provide stiffener ring at connection to wall thimble. Connect to wall thimble as recommended by manufacturer of gate or equipment attached to wall thimble.
  2. MARKING FOR IDENTIFICATION
     1. General:
        1. Pipe Markings:

NTS: Delete Paragraph “a” if there is no laying schedule on the project.

* + - * 1. Factory-mark each length of pipe and each fitting with designation conforming to those on approved laying schedules.
        2. Manufacturer shall cast or paint on each length of pipe and each fitting pipe material, diameter, and pressure or thickness class.
      1. All pipeline materials shall be stamped, marked, or identified with the following information:
         1. Name or trademark of manufacturer.
         2. Pipe class and specification designation.
         3. Size and length dimensions.
         4. Date and place of manufacture.
         5. Pipe 24‑inches and larger shall also be marked on pipe interior as above.
         6. Name of Owner.
  1. SOURCE QUALITY CONTROL
     1. Shop Tests:
        1. Pipe manufacturer shall maintain continuous quality control program.
        2. Where applicable and when requested by Engineer, submit results of source quality control tests specified in reference standards.
  2. BURIED PIPING IDENTIFICATION

NTS: Coordinate project specific tracing wire requirements with Section 33 11 00, Water Piping Installation or 33 31 00, Sanitary Sewer Piping Installation. Insert at (--1--) the appropriate piping installation spec section. Delete if not required.

* + 1. Provide piping tracing wire; refer to Section (--1--).

1. EXECUTION
   1. INSPECTION
      1. Inspect pipe materials for defects in material and workmanship. Verify compatibility of pipe and fittings.
   2. INSTALLATION
      1. Buried Piping Installation
         1. Refer to the applicable Division 33 piping installation section.
      2. Bedding and Backfill
         1. Refer to Section 31 00 05 Trenching and Earthwork.

NTS: Specifier to consider known construction sequencing and procedures when determining pipe design. Heavy construction loading should be avoided for installed pipes with shallow cover.

* + 1. Contractor shall be responsible for verification of pipe loading during construction. Pipe design is based on final installation depth and required cover.
  1. BURIED PIPING IDENTIFICATION INSTALLATION

NTS: Coordinate project specific tracing wire requirements with applicable piping installation specification section. Insert at (--1--) below Section 33 11 00, Water Piping Installation, or 33 31 00, Sanitary Sewer Piping Installation. Delete if not required.

* + 1. Install piping tracing wire; refer to Section (--1--).

NTS: Coordinate article “3.4” below with project specific testing requirements listed within Section 33 11 00, Water Piping Installation. Edit the installation specification reference if a different installation (sanitary, storm) section is used. Ensure that the installation section has the applicable requirements.

* 1. FIELD QUALITY CONTROL
     1. Leakage Testing
        1. Complete pipe leakage testing; refer to Section 33 11 00, Water Piping Installation.
     2. Disinfection
        1. Complete pipe disinfection; refer to Section 33 11 00, Water Piping Installation.

+ + END OF SECTION + +