New Section

SECTION 33_05_39.14[AD1]

REINFORCED CONCRETE PIPE: ASTM C76

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Reinforced concrete gravity piping with plastic liner.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   2. C150 - Standard Specification for Portland Cement.
   3. C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
   4. C990 – Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.
   5. C1479 – Standard Practice for the Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.
   6. C1837 – Standard Specification for Production of Dry Cast Concrete Used for Manufacturing Pipe, Box and Precast Structures.

B. American Concrete Pipe Association (ACPA):
   1. Q-Cast Quality Control Program.

1.03 SUBMITTALS

A. Submit as specified in Section 01_33_00 - Submittal Procedures.

B. Shop drawings:
   1. Detailed layout drawings including listing of connector pipes with size and D-Load of pipe, stations where pipe joins mainline, and number of sections of pipe, length of sections, type of sections indicating straight, horizontal bevel, vertical bevel, or other type; pipe stubs; gasket shape and size; and liner details.
   2. Gasket specifications.
   3. Design calculations.

C. Provide Manufacturer's Certificate of Source Testing as specified in Section 01_75_17 - Commissioning. Include:
   1. Cement mill certificates for each load of cement delivered showing specification, type, chemical analysis, and quantity; or for stockpiled pipe, certification that cement meets Specifications.
   2. Cement content compliance with yield to cubic yard of concrete.
   3. Lack of calcium chloride or admixtures.
   4. Admixture approval.

5. Reinforcing steel mill certificates showing heat numbers, chemical analysis, and physical tests; or for stockpiled pipe, certification that steel meets or exceeds specifications.
6. Gasket test results showing physical properties.

D. Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01_75_17 - Commissioning.

1.04 QUALITY ASSURANCE

A. Manufacturer qualifications: Manufacture of proposed products for minimum 5 years with satisfactory performance record.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Maintain struts and other protective methods to prevent the formation of cracks larger than the specified tolerances.

B. Handle pipe with exterior slings or suitable forklifts.
1. Do not use interior hooks or slings when lifting pipe.

C. Store cement in weathertight, dry, well-ventilated structures.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Determine reinforcement required for adequate pipe wall thicknesses and to support anticipated loads.

2.02 MATERIALS

A. Portland cement, aggregate, water, and steel: ASTM C76, with following exceptions:
1. Cement: ASTM C150, Type II, low alkali.
2. Admixtures: Without calcium chloride.

B. Gaskets: ASTM C361; O-ring type; diameter as indicated within 1/32 inch; with synthetic rubber compound containing minimum 50 percent neoprene by volume and no deleterious substances, and having the following characteristics:
1. Tensile strength: Minimum 1,900 pounds per square inch when tested in accordance with ASTM D412.
2. Elongation at break: Minimum 425 percent when tested in accordance with ASTM D412.
3. Durometer hardness: Maximum Type A Shore of 55 within 3 when tested in accordance with ASTM D2240.
4. Compression set: Maximum 20 percent after aging by the oxygen-pressure chamber for 96 hours, at 158 within 1.8 degrees Fahrenheit, and 300 pounds per square inch within 15 pounds per square inch, and tested in accordance with ASTM D395, Method B, except with 1/2-inch long disc of gasket stock.

5. Aged tensile strength: Maximum 80 percent of pre-aged strength after aging by the oxygen-pressure chamber for 96 hours, at 158 within 1.8 degrees Fahrenheit, and 300 pounds per square inch, and tested in accordance with ASTM D395, Method B, except with 1/2-inch long disc of gasket stock.
6. Aged durometer hardness: Maximum Type A Shore of 63 within 3, after aging in an oxygen-pressure chamber for 96 hours, at 158 within 1.8 degrees Fahrenheit, and 300 pounds per square inch within 15 pounds per square inch, and tested in accordance with ASTM D2240.
7. Specific gravity: From 1.29 to 1.31 when tested in accordance with ASTM D297.

C. Curing compound: As specified in Section 03_30_00 - Cast-in-Place Concrete.

2.03 MIXES

A. Pipe concrete: Minimum 564 pounds cement per cubic yard of concrete, and water to produce a maximum 4-inch slump.

B. Reject lumpy concrete.

C. Allow concrete to cool to below 150 degrees Fahrenheit before use.

2.04 FABRICATION

A. Fabricate pipe in accordance with ASTM C76 as modified by the Contract Documents with Class and diameter indicated on the Drawings.

B. Fabricate pipe by vertical dry-cast centrifugally spun process, Tamped, or Packer Head method in accordance with ASTM C1837.

C. Form spigot of pipe consistent with the gasket material and shape selected.

2.05 SOURCE QUALITY CONTROL

A. Manufacturers of concrete pipe larger than 24-inch diameter shall have a quality control program consisting of a quality management system certified by the Q-Cast Program following the requirements of the ACPA Plant Certification Manual.

B. Test in accordance with ASTM C76.
1. Plant load-bearing tests, material tests, and inspection of pipe for defects.

C. Concrete cylinder tests:
1. In accordance with ASTM C76.
2. Allow for a reasonable number of additional cylinders for testing by Owner.

D. Edge bearing tests: Perform a minimum of two, 3-edge bearing tests and determine the load needed to produce a 0.01-inch crack for each size of pipe.

E. Cracks:
   1. Reject pipe with cracks extending through pipe walls and extending for more than 1 foot; cracks measuring 0.01-inch wide, 1/16 inch or more deep, and 1 foot or more long; hairline cracks to reinforcing steel; and cracks longer than half the length of pipe.
   2. Repair pipe with minor single continuous hairline cracks longer than 1 foot, and not extending to reinforcing steel.

F. Porous areas:
   1. Remove porous or honeycomb concrete areas 6 inches in or less in diameter or in longest dimension and repair areas.
   2. Reject pipe with larger porous or honeycomb concrete areas.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
   1. Lay pipe as specified in Section 33_05_00.01 - Common Work Results for General Piping and this Section.
   2. Curves, bends, and closures:
      a. Make long radius curves by deflecting joints of straight pipe.
         1) Limit deflections to maximum 3/4-inch joint openings for 36-inch diameter pipe and larger.
      b. Make short radius curves by using straight pipe with beveled joints.
         1) Limit bevels to 5 degrees.
      c. Make shorter radius curves and closures by using fabricated specials.
      d. Install pipe so pipe joints fall on radii indicated on the Drawings.
   3. Avoid tension and distortion of joint strips integrally molded with liner when bending back joint strips to make pipe joints.

B. Pipe repairs:
   1. Repair pipe in accordance with source quality control above.
   2. Repair or replace pipe with cracks wider than 0.01 inch.
      a. Repair pipe by injecting cracks with epoxy under pressure or chipping out V-sectors to full depth of defects and filling V-sections with patching compound.
   3. Fill remaining cracks with patching compound.
   4. Repair pipe joints with blisters involving less than 1/4 the interior surface area by removing loose material and exposing hollow areas, applying an acceptable bonding agent, placing fresh concrete, and curing repairs with curing compound.
      a. Reject pipe with blisters affecting larger areas of joints.
   5. Do not paint pipe with grout to cover defects, minor or major, until pipe has been accepted by Engineer.

END OF SECTION

[AD1] Addendum No. 1