

**SECTION 03400****PRECAST CONCRETE UTILITY STRUCTURES****03400.01 GENERAL****A. Description**

Precast concrete utility structures shall include, but not necessarily be limited to, furnishing and installing precast concrete storm drain structures, manholes, valve and meter vaults, grade rings, and other miscellaneous structures of the configuration and to the extent indicated and in accordance with the Contract Documents.

**B. Related Work Included Elsewhere**

1. Trench excavation, backfill, and compaction; Section 02250.
2. Storm drainage structures; Section 02530.
3. Water valves and appurtenances; Section 02552.
4. Water services, meter settings, and vaults; Section 02553.
5. Sanitary sewer manholes; Section 02562.
6. Dampproofing and membrane waterproofing; Section 07100.
7. Bentonite waterproofing and sealer; Section 07130.

**C. Quality Assurance**

1. Precast concrete utility structures shall be supplied by a qualified firm with a minimum of 3 years of continuous operations and which has performed at least three representative jobs, 3 years or older, comparable to precast work required for this Contract.
2. The Engineer will inspect all materials before and/or after installation to ensure compliance with the Contract Documents. Access shall be allowed the Engineer to the casting plant at any time to inspect the fabrication of units for County projects.
3. Precast units shall be substantially free of fractures and surface roughness. The planes of the ends of sections to be joined shall be perpendicular to their longitudinal axis within 5/8 inch. Precast units shall be subject to rejection on account of failure to conform to any of the Specification requirements. In addition, individual sections may be rejected because of any of the following:

- a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
  - b. Defects that indicate imperfect proportioning, mixing, and molding.
  - c. Surface defects indicating honeycombing or open texture.
  - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
  - e. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more, regardless of position in the section or wall.
  - f. For grade rings, cracks or fractures extending for a length of 1/2 inch or more regardless of position in the ring. Dimensional tolerances shall be  $\pm$  1/4 inch.
4. Precast units shall be set so as to be vertical. The maximum allowable deviation, when measured from the top to the bottom of the completed unit, shall not exceed 1/4 inch.
  5. The manufacturer or supplier shall store completed sections off the ground with ample space between rows and enough clearance above and below to allow full view of walls and joint ends for inspection purposes.
  6. The Engineer reserves the right to require core samples of finished products.
  7. All precast units shall be marked with the manufacturer's name or trademark, date of manufacture, and the ASTM and/or AASHTO specification under which the unit was manufactured.

**D. Submittals**

1. Shop Drawings

Shop drawings shall be submitted as specified in the "General Provisions" for all precast units. The shop drawings shall be fully dimensioned and show reinforcing details, joint details, design loads, pertinent design calculations, and lifting and erection inserts. Shop drawings shall also include the precast unit manufacturer's handling, assembly, and installation directions and recommendations.

2. Certificates of Compliance

Certificates of compliance shall be submitted as specified in the "General Provisions" stating that the precast units furnished, and their components, meet the design, fabrication, and testing requirements specified in Sections 03400.02 and 03400.03.

**03400.02 MATERIALS**

**A. Materials Furnished by the County**

The County will not furnish any materials for precast concrete utility structures.

**B. Contractor's Options**

1. The Contractor may furnish aluminum or plastic-coated steel steps for use in manholes, inlets, and vaults.
2. The Contractor may furnish mechanically wedged-in-place or cast-in-place manhole-to-pipe connectors for sanitary sewer manholes.

**C. Detailed Material Requirements**

1. Portland Cement Concrete

Portland cement concrete shall meet the requirements specified in Section 03310.02 except as modified herein. Portland cement for units to be used in sanitary sewer systems shall be Type II.

2. Concrete Reinforcement

Concrete reinforcement shall meet the requirements specified in Section 03200.02.

3. Water from Other Than Potable Sources

Water shall meet the pH requirements of AASHTO T 26, Method B. Water shall not smell or be discolored. Water suspected of questionable quality shall meet limits of the comparison tests with distilled water in accordance with AASHTO T 26. The chloride concentration of water used in mixing and curing of Portland cement will be determined in accordance with ASTM D 512 and shall not have a chloride concentration exceeding 1000 ppm.

4. Joint Seals Between Sections

a. Flexible Joint Sealing Compound

Joint sealing material shall be cold-applied preformed plastic sealing compound meeting the following requirements:

Chemical Composition -	Minimum	Maximum	Test Method
Bitumen (Hydrocarbon Plastic Content) % by weight	50	70	ASTM D4
Inert Mineral Filler % by weight	30	50	AASHTO T111
Volatile Matter % by weight	-	2.0	ASTM D6

  

Physical Properties -		Test Method
Specific Gravity at 77°F	1.20 to 1.35	ASTM D71
Ductility at 77°F minimum	5.0 cm	ASTM D113
Softening Point at 77°F minimum	32°F	ASTM D36
Flash Point, C.O.C. minimum	600°F	ASTM D92-57
Penetration 77°F (150 gs.) 5 sec	50 to 120	ASTM D217

or shall be a specially formulated preformed joint sealant in rope like form which swells upon contact with water forming a compression type seal. The specially formulated preformed joint sealant shall meet the following requirements:

Chemical Composition -		Test Method
Butyl Rubber Hydrocarbon % by weight	24.9	ASTM D297
Bentonite % by weight	75.0	SS-S-210-A
Volatile Matter % by weight	below 1.0	ASTM D6

  

Physical Properties -		Test Method
Specific Gravity at 77°F	1.57	ASTM D71
Penetration	58	ASTM D217 150 GTL
	85	ASTM D217 300 GTL
Flash Point	365	ASTM D93-97
Accelerated Aging	Maintain 99% Solids	4 hrs @ 212°F
Storage Life	Indefinite	
Application Temperature Range	5° to 125°F	
Service Temperature Range	-40° to 212°F	

b. Gaskets

Rubber gaskets shall meet the requirements of ASTM C 443.

5. Sanitary Sewer Manhole Materials

a. Flexible Gaskets Between Manhole and Frame

Flexible plastic gasket between manhole and manhole frame shall be extruded rope Type B, in accordance with AASHTO M 198, butylbased, 3/4 inch diameter minimum.

b. Jointing Mastic

Jointing mastic shall be an elastic, water resistant formulation of plastic bituminous materials and inert fillers so combined when applied to a vertical metal surface and heated to 120°F, the jointing mastic will neither slump nor lose plasticity. When applied directly from the container without further mixing the jointing mastic can be applied in an even, adherent coat within the temperature range of 20° to 100°F.

c. Manhole-to-Pipeline Connectors

Manhole-to-pipeline connectors shall be either mechanically wedge-in-place or cast-in-place as specified in Section 02562.02.

d. Provide thermoplastic cast-in-place inserts with a working tensile load capacity of 1200 pounds for bolting down manhole cover frames where indicated on the Drawings. Inserts shall be 1/2 inch diameter by 2 3/4 inch minimum length.

6. Dampproofing and Waterproofing

Dampproofing and waterproofing for exterior of precast structures shall be as specified in Section 07100.

7. Steps and Ladders

Steps and ladders shall be as specified in Section 05500.02.

8. Granular Bedding

Granular bedding beneath precast units shall meet the requirements of AASHTO M 43, No. 57, as specified in Section 02621.02.

9. Non-Shrink Mortar

Quick-setting non-shrink cement mortar shall be as specified in Section 03600.02.

**03400.03 EXECUTION**

**A. Design Criteria**

1. General

a. Structural design for precast units shall be prepared by a registered Engineer for the precast concrete manufacturer. Units shall be designed for HS 20 load designation or 300 pounds per square foot live load, whichever is most critical for determining the concrete and steel stresses.

- b. Where more than one standard is referenced for any given unit, should there be a conflict, the more stringent requirement as determined by the Engineer, shall apply.
- c. Unit configuration shall be as shown on the Plans and/or Standard Details.
- d. Distribution of earth loading and live load shall be in accordance with ASTM C 857 or ASTM C 890.
- e. Walls shall be designed using an equivalent fluid pressure of 83 pounds per cubic foot and a 2 foot surcharge. The units shall also be designed to resist all stress encountered during casting, handling, and erection.

**2. Manholes**

- a. Precast concrete manholes shall meet the requirements of ASTM C 478 except that the minimum compressive strength of the concrete shall be 4000 psi.
- b. Joints shall meet the requirements of ASTM C 443, shall be self-centering, and shall form a uniform water tight joint.

**3. Inlets**

Precast inlets shall meet the requirements of AASHTO M 199.

**4. Grade Rings**

Grade rings shall meet the requirements of ASTM C 478 and shall be one-piece, 2 or 3 inches thick, with anchor bolt holes as shown in the Standard Details.

**5. Miscellaneous Water and Wastewater Structures**

Miscellaneous water and wastewater structures not otherwise covered shall meet the requirements of ASTM C 913.

**B. Fabrication**

- 1. The precast units shall be factory cast. Job site casting will not be permitted. Concrete in the precast elements shall be continuously placed to prevent formation of seams. The finished units shall be free of voids, cracks, and have beveled corners and edges. All inserts shall be securely attached or embedded in their proper location.
- 2. Concrete strength of all precast units at 28 days shall be 4000 psi minimum, unless otherwise specified. It shall be the precast unit manufacturer's responsibility to insure that the specified concrete strength is maintained throughout production of the units. Mix design shall be those previously used by

the manufacturer which have proven satisfactory for casting units similar to those specified and producing the required strength. All precast concrete shall be air entrained. Admixtures containing calcium chloride shall not be used.

3. Precast concrete units shall be manufactured in accordance with the applicable requirements of ASTM C 858, and as modified herein except that precast concrete units manufactured by the dry cast (packerhead) process are prohibited.
4. Wall sleeves or gaskets for piping, sumps, steps, access hatches, and other inserts as shown on the Plans and/or Standard Details shall be cast into the structure or inserted at the place of manufacture.

**C. Product Handling**

1. No precast unit shall be shipped in less than 15 days from date of manufacture, unless the unit has been tested and is shown to be in full compliance with the Specifications.
2. Precast sections shall be transported and handled with proper equipment to protect the elements from damage. Sections shall be handled by means of lifting inserts embedded in the concrete. Damaged sections that cannot be satisfactorily repaired shall be replaced by new sections at no additional cost to the County.
3. Precast sections shall be stored on wooden blocks to hold them off the ground to prevent dirt and debris from entering the joining surfaces.

**D. Installation**

1. Excavation, foundation preparation, backfill, and compaction shall be as specified in Section 02250.03.
2. Precast units shall be installed where and as shown on the Plans and Standard Details or as directed by the Engineer.
3. Pipe connection, penetrations, and other appurtenances shall be installed as specified in the following sections:
  - a. Storm drainage structures; Section 02530.03,
  - b. Water valves and appurtenances; Section 02552.03,
  - c. Water services, meter settings, and vaults; Section 02553.03,
  - d. Sanitary sewer manholes; Section 02562.03.
4. Field modifications of precast units, such as cutting or enlarging holes or slots, will not be permitted without the specific approval of the precast unit's

manufacturer and the Engineer. Permitted modifications shall be made in strict accordance with the manufacturer's directions and recommendations.

5. Mating surfaces shall be cleaned of all foreign materials such as dirt, mud, stones, etc., and where appropriate, joint sealing materials applied prior to assembly of the units.

**03400.04 METHOD OF MEASUREMENT**

Measurement for precast concrete utility structures will be made as specified in Sections 02530.04, 02552.04, 02553.04, and 02562.04, as appropriate, or as specified in the "Special Provisions".

**03400.05 BASIS OF PAYMENT**

Payment for precast concrete utility structures, complete and accepted in place, will be made, and will include such additional work and incidentals, as specified in Sections 02530.05, 02252.05, 02553.05, and 02562.05, as appropriate, or as specified in the "Special Provisions".