

STANDARD SPECIFICATIONS  
SECTION 03400  
PRECAST CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

- A. Section includes requirements for providing precast concrete structures, manholes, valve vaults, and other specified miscellaneous structures.

1.2 REQUIREMENTS FOR MANUFACTURERS AND SUPPLIERS BEFORE DELIVERY

- A. Testing and Inspection.
1. Engineer may inspect and test all precast structures, fittings, lining and joint material after delivery to site or at factory.
  2. Manufacturer or Supplier: Furnish materials for tests and labor to assist Engineer with tests.
  3. Engineer may continually perform plant certification and process inspections.
  4. Concrete design mix for precast manhole sections by manufacturer showing sieve analysis for aggregates, suppliers of materials, and thirty 28-day compressive strength test results performed within 1 year of submittal.
  5. Notify Engineer following Section 01450.
- B. Factory or Site Inspected Material: See Section 01450.
- C. Storage and Handling.
1. Manufacturer or Supplier:
    - a. Store reinforcing steel off ground in well drained area to prevent deformation.
    - b. Aggregates and sand: Store on concrete slab and handle to maintain separation and to prevent infiltration of deleterious materials.
    - c. Completed structures: Store off ground using wood blocks, pallets, or other appropriate means to give ample space between rows and individual pieces, and with enough clearance above and below to allow full view of walls and joint ends for inspection purposes.
    - d. Joint ends: Keep clean and off ground.
  2. Manufacturer's Batching Plant, Casting Equipment, and Curing Facilities: Complete, operating properly, and of proper size and range.
  3. Manufacturer's Records: Show evidence of continual maintenance and quality control over casting forms and joint forming rings.
- D. Shipment Identification: Before inspection of precast structures for an order, manufacturer or supplier shall furnish to Engineer:
1. Commission's Contract Number.

2. Contractor's name.
  3. Section sizes.
  4. Footage or number of pieces required to fill order.
  5. Evidence that concrete has cured to minimum 80 percent of design strength.
- E. Ship only Commission approved precast concrete structures to Contract site.
- F. Repairs: Follow manufacturer's procedures filed with Engineer.
- G. Manufacturer or Supplier: Follow standard cold weather concreting practices of ACI 306R "Cold Weather Concreting."
1. Engineer may make special requirements to ensure quality.

### 1.3 SUBMITTALS

- A. Submit following Section 01330.
1. Shop Drawings: Show complete details, pertinent calculations, design loads, materials, strengths, sizes, and thicknesses, joint and connection design and details for precast structures.
    - a. Reinforcing steel following ACI 315, including bar lists and bending diagrams, placement drawings, and special details.
    - b. Location, types, and details of joints.
    - c. Sequence of pours.
    - d. Calculations showing concrete strength to be attained at proposed time of removal of formwork, falsework, and centering.
  2. Waivers.
    - a. Shop drawing submittal waived when:
      - 1) Standard Details allow use of precast structures.
      - 2) Approved design drawings and calculations for precast structures are on file with Engineer.
    - b. To obtain waiver submit letter citing:
      - 1) Commission's Contract Number.
      - 2) Precast structure manufacturer.
      - 3) Approved design drawing number.
    - c. Installation Methods for Precast Sections when manufacturer's recommended methods are on file with Engineer.
    - d. If Standard Details or specifications change, new submittals will be required.
  3. Coating manufacturer's catalog data for lining interior surfaces of precast concrete manholes, including recommendations for surface preparation, application, curing, handling, and repair procedures for coated manhole sections.
- B. Submit following Section 01450.
1. Certificate of Compliance:
    - a. Precast Manhole Manufacturer or Supplier: Flexible connector assembly, including seals and metallic or non-metallic mechanical devices used therein.

- b. Manhole lining material meets physical property requirements of lining manufacturer and passes in-plant tests, as recommended by lining manufacturer.
  - c. Engineer may require manufacturer or supplier to furnish test results substantiating certificate of compliance, or in case of failure, may elect to witness testing to his or her satisfaction.
2. Certified Test Reports:
- a. Aggregates, cement, admixtures, and steel reinforcement used in production of vaults, manhole sections, and grade rings following ASTM.
  - b. Initial reports with above referenced concrete design mixes.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Suitability of Precast Structures for Transport to Contract Site: When concrete has cured to minimum of 80 percent of design strength.
- B. Storage.
  - 1. Store off ground on wood blocks, pallets, or other appropriate means away from brush, and in area accessible for inspection.
  - 2. Do not place excavated or other material over or against stored precast structures.
- C. Handling of Precast Structures and Appurtenances: Unload and handle with crane, backhoe, or equipment of adequate capacity, equipped with appropriate slings and lifting devices to protect material from damage.
- D. Repair or Replacement.
  - 1. When Engineer deems repairable: Repair as directed by Engineer.
  - 2. When Engineer deems not repairable: Remove and replace as directed by Engineer before initiating work.
  - 3. Repair or replacement of defective or damaged material and equipment will be at no cost to Commission.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. Reinforced Concrete Materials: Follow Section 03300, and modification herein, except slump requirement shall not apply to manholes.
- B. Precast Concrete Manholes: ASTM C478 except:
  - 1. Compressive Design Strength of Concrete:
    - a. Minimum 5000 psi using Type II cement.
    - b. Minimum compression cylinder test of 4000 psi at time of shipment.
  - 2. Configurations: Follow Drawings and Standard Details.
  - 3. Joints: ASTM C443.

4. Sizes: Furnish in lengths of 1 foot minimum, except do not use more than one, 1 foot section in each manhole.
5. Appurtenances.
  - a. Steps: Manufactured and of style specified in Section 02530.
  - b. Bolt inserts: Follow Standard Details.
    - 1) Embed one of following minimum of 3 inches, to accommodate 3/4 inch diameter bolts.
      - a) Heckman Building Products Corporation, No. 444 Star Threaded Inserts.
      - b) Pennsylvania Insert Corporation, the Liberator.
      - c) Atlantic Concrete Products Co., Bolt Slot Insert System.
      - d) Strut Service Company inserts.
    - 2) Provide with plugs for transport to Contract site.
6. Flexible Gasket Connectors: ASTM C923.
  - a. Stainless steel, Type 304 may be used when not in contact with sewage or sewage gas.
  - b. Identification: Permanent markings of date and production runs.
  - c. Approved manufacturers for connectors connecting with diameter dimension of ductile iron pipes, polyvinyl chloride (PVC) ASTM D3034, and PVC ASTM F679 to sewer manholes:
    - 1) A-LOK Products Inc., A-LOK or A-LOK X-CEL.
    - 2) Chardon Rubber Company, Lock Joint Flexible Manhole Sleeve.
    - 3) Hail Mary Rubber Co., Star Seal.
    - 4) Press Seal Gasket Corporation, Press Boot, PSX Series, Econoseal, CAST-A-SEAL® 12-08 Cast In Boot, or equal.
    - 5) NPC Incorporated, KOR-N-SEAL I Toggle Korband with Series 106 or 406 rubber boot.
    - 6) International Precast Supply, Cobra Style, Toggle Style, and Adjustment Style.
  - d. Approved manufacturers for connectors for inserting pressure sewer piping through manhole walls:
    - 1) A-LOK Products, Inc., Z-LOK.
    - 2) Press Seal Gasket Corporation, 8QRS-PSX Positive Seal System.
    - 3) Or equal.
  - e. Approved connector manufacturers for closed profile PVC pipe for ASTM F1803 Pipe "Manhole Pipe":
    - 1) Press Seal Gasket Corporation.
    - 2) A-LOK X-CEL.
    - 3) Or Equal.
  - f. For connectors for profile PVC pipe for ASTM F794, use special adapter meeting profile dimensions approved by the pipe manufacturer.
  - g. Approved connector manufacturers for PVC pipe with AWWA C900/C905:
    - 1) Pipe on slopes greater than 10 percent but no greater than 20 percent:
      - a) Atlantic Concrete Products Z-LOK.
      - b) Press-Seal Gasket Corporation.

<u>Pipe Size</u>	<u>Manufacturer's Gasket</u>	<u>Opening</u>
<u>Diameter</u>	<u>Designation Manhole</u>	
4 inch	8QRS	8 inch
6 inch	12Y	12 inch
8 inch	12M	12 inch
10 inch	16Y	16 inch
12 inch	16M	16 inch

- 2) Pipe on slopes greater than 20 percent but no greater than 35 percent:
  - a) Atlantic Concrete Products Z-LOK.
  - b) Or equal.
- h. Other pipe connectors: Recommended by pipe manufacturer and approved by Engineer.
7. Precast Channels/Benches:
  - a. Compressive design strength of concrete:
    - 1) Minimum 28 day compressive strength of 4000 psi using Type II cement.
    - 2) Compressive strength of 3200 psi at time of shipment.
  - b. Construction and finish:
    - 1) Furnish access for jointing pipes to flexible manhole connectors.
    - 2) Once channel/bench has been poured and initial concrete set has taken place, add no additional concrete to modify shape or repair defects.
    - 3) Top surface of bench: Brush or light broom finish.
    - 4) Channels: Troweled smooth surface.
  - c. Sizes:
    - 1) Lining: Minimum following Standard Details.
    - 2) Slopes.
      - a) Bench: Slope toward channel with maximum 1 inch vertical drop for each foot horizontal.
      - b) Channels: Slope smoothly and uniformly from incoming pipes to outlet pipe.
    - 3) Width and height.
      - a) Match inside diameters of incoming and outgoing pipes and blend channel to smooth contour.
      - b) Deviations to channel width above spring line of pipe and at flexible connectors; Permitted for this purpose with Engineer's approval.
8. Manhole Identification: Clearly marked on inside near top where applicable.
  - a. ASTM Specification designation.
  - b. Manhole setting number (bases only) and WSSC Contract number.
  - c. Date of manufacture.
  - d. Production control number for tracking manufacture phases of item and name or trademark of manufacturer.
  - e. Manhole sections with flexible connectors:
    - 1) Marked above connector openings with type and size, and type of pipe for which connector is designed.

- 2) Engraved or stenciled markings with waterproof paint or ink in minimum 1 inch high letters.
- f. Lined manholes: Stenciled with waterproof paint or ink markings as noted herein that cannot be easily removed from lining or epoxy coated surfaces.
- 9. Precast Manhole Sections.
  - a. Approved Manufacturers:
    - 1) Americast, Martinsburg, WV plant only.
    - 2) Atlantic Concrete Products Company, Cockeysville, MD plant only.
    - 3) Hanson Concrete Products, Jessup, MD plant only.
    - 4) Frederick Precast Concrete, Inc., for 48 inch through 72 inch manholes.
    - 5) Contractors Precast Corporation, Davidsonville, MD plant only.
- 10. Lined Manholes: Concrete Protective Liner or Epoxy Resin Mortar.
  - a. Concrete Protective Liner.
    - 1) Cover interior surfaces except at penetrations and channels.
    - 2) After installation, seal penetrations and other non-lined interior concrete surfaces following manufacturer's recommendation.
    - 3) Approved manufacturers:
      - a) Dura Plate 100 PVC liner, A-LOK Products, Incorporated, Tullytown, Pennsylvania.
      - b) T-Lok PVC liner, Ameron Protective Linings.
      - c) AGRU Sure-Grip HDPE liner, Americast AgruAmerica.
  - b. Epoxy Resin Mortar.
    - 1) Coat interior concrete surfaces, except channels, with .125 inch thick cementitious corrosion and abrasion resistant epoxy resin mortar.
    - 2) Approved supplier and product:
      - a) Nitomortar EL, FOSROC Incorporated.
      - b) Or equal.
- 11. Precast Concrete Grade Rings: ASTM C478, except:
  - a. Compressive Design Strength of Concrete: Minimum 5000 psi using Type II cement.
  - b. Configurations: Follow Standard Details.
  - c. Rings: Drilled with holes 1-1/2 to 2-inch diameter to accommodate frame anchor bolts.
    - 1) Grade rings with cracks or fractures passing through height of ring and any continuous crack extending for length of 3 inches or more will be rejected.
    - 2) Rings with damaged edges which will prevent making satisfactory joint will be rejected.
    - 3) Planes of ring surfaces: Within limits of plus or minus 1/4 inch of horizontal and vertical, except for sloped adjusting grade ring to be within 1/4 inch of Standard Detail.
    - 4) Protection:
      - a) On lined manholes: Follow manufacturer's recommendations.
  - d. Approved manufacturers:
    - 1) Atlantic Concrete Products Company.
    - 2) Americast.
    - 3) Contractors Precast Corporation.

- 4) Hanson Concrete Products
- 5) Dal-Col Products, Inc.
- 6) Prism Precast Products, Inc.
- 7) Frederick Precast Concrete, Inc.

C. Precast Concrete Vaults: ASTM C858.

1. Configurations: Follow Drawings.
2. Identification: Clearly mark inside of each precast concrete vault section.
  - a. ASTM Designation.
  - b. Vault size.
  - c. Date of manufacture.
  - d. Contract station location and WSSC Contract number.
  - e. Name or trademark of manufacturer.
  - f. Mark slabs on top and bottom surfaces.
3. Design Mixes:
  - a. 5000 psi at 28 days using Type II cement.
  - b. Mix proportion: ACI 318.
4. Approved Manufacturers:
  - a. A. C. Miller, Spring City, PA plant only.
  - b. Smith Midland Corp., Midland, VA plant only.
  - c. Rotondo Precast Products, Inc., Fredericksburg, VA plant only.

D. Miscellaneous Materials.

1. Granular Bedding: ASTM C33 coarse aggregate size number 4.
2. Weepholes: Service weight cast iron covered with non-erodible filter on earth side.

## 2.2 SOURCE QUALITY CONTROL

A. Test Equipment: Instruments, gages, and other testing and measuring equipment of proper range, type, and accuracy to verify conformance with specification requirements.

1. Ensure equipment is calibrated and certified at annual intervals.
2. Calibrate against measurement standards with known relationship to existing national standards.
3. Calibrate and certify gages on equipment to which they belong, and keep them on equipment following certification.
4. Do not use instruments, gages, testing, and measuring equipment found to be out of calibration or adjustment until applicable requirements have been met.
5. Calibration by agency regularly engaged in this type of activity.

B. Precast Manhole Testing.

1. Joint and Barrel Testing: ASTM C443.
  - a. Plant vacuum testing: ASTM C1244.
2. Pipe to Manhole Connection Testing: Flexible gasket connectors following ASTM C923, except modified herein.
  - a. During every 90 day period, test at least 1 connector.

- b. Perform hydrostatic testing of connectors following ASTM C923.
  - 1) If manufacturer chooses to perform vacuum test following ASTM C1244, test connector with pipe in straight alignment, 7 degrees minimum axially deflected alignment, and loaded in shear following ASTM C923.
  - 2) Use test pipe of same size, class, design and type as pipe to be provided under Contract.
  - 3) Measure pressure at horizontal centerline of connector using calibrated pressure gage, minimum 4-1/2 inch diameter, calibrated from 0 to 30 psi with 1/2 pound subdivisions.
  - 4) Manufacturer may use standpipe calibrated in 1/2 foot increments with permanent markings instead of calibrated pressure gage.
    - a) Use standpipe high enough to develop specified water pressure and equipped with overflow line adjusted to height for developing specified pressure.
    - b) Ensure that continuous stream of water flows from overflow line during test and is visible from test site.
- c. Hydrostatic test at or above 40 degrees F and in environment free from effects of wind, inclement weather, and conditions that would interfere with conducting tests and observing their results.
  - 1) Adjust test medium and specimens to, and maintain at, 40 degrees F or above prior to commencing and for duration of test.
  - 2) Faulty performance or failure of test equipment during test phase will necessitate rerunning phase using properly performing test equipment.
- d. Retesting: If connector fails to meet requirements herein and in referenced ASTM document, Engineer will randomly select and test 2 additional connectors of same diameter and from bases originally manufactured on same day as failed connector.
  - 1) If either of 2 additional connectors fails, Engineer will reject all bases manufactured that day with connectors of same size as those tested, as well as bases with other connector sizes mixed with original size tested.
  - 2) Perform retest of next day's production until compliance with requirements is proven.
- e. Repairs.
  - 1) Failure of seal between connector and manhole wall due to occasional imperfections in manufacture or accidental injury during test may be repaired using methods recommended by manufacturer and on file with the Commission, and will be acceptable if Engineer finds repairs are sound, properly finished, and cured.
  - 2) Demonstrate to Engineer that repairs will result in seal conforming to requirements of this specification.
- f. Post test failures: If previously tested and complying connectors resubjected to prescribed hydrostatic or vacuum pressure during testing of other sizes fail, and/or seal between them and manhole wall fails watertightness or vacuum tightness requirements, Engineer will reject base.
  - 1) Engineer will randomly select and test 2 additional bases fitted with same size connectors originally manufactured on same date as failed base.



- 2) If previously tested connector sizes fail retest, all bases with same size connectors manufactured on that date will be rejected.
  - 3) Perform retest of next day's production until compliance with requirements is proven.
  - 4) Perform retest of connectors that fail to meet requirements herein and in referenced ASTM document as specified in above.
  - 5) During retesting of flexible connectors on manhole parts or joints between manhole parts, leakage of water as described in this section in any area constitutes failure requiring retest.
  - 6) Leakage consisting of a small run adjacent to lifting inserts on manhole sections shall not be cause for rejection.
- C. Acceptance Procedure for Concrete Strength of Precast Manhole Sections: Procedure applies to acceptance and approval of precast manhole bases, riser and cone sections, flat top slabs, and grade rings.
1. Concrete Design Mix Approval: Based on submittal specified above herein.
    - a. The Commission will issue approval for 3 years, provided design mix materials and sources are not changed and in-plant concrete testing of manhole sections continues to be accepted without rejection of more than 2 days' production in a row.
      - 1) Every 3 years thereafter, and under failure conditions stated above resubmit concrete design mix for approval.
      - 2) Production from mixes other than those approved will be rejected.
    - b. Compressive strength test: ACI 301 and ACI 318.
- D. Vaults and Other Precast Concrete Structures.
1. Determination of concrete compressive strength: From compressive tests made on concrete cylinders.
  2. Unless otherwise specified, retain independent testing facility approved by Engineer for molding, capping, and testing concrete cylinders following appropriate ASTM requirements or, at Engineer's option, make cylinders and use own equipment to test.
    - a. Furnish test results to Engineer.
    - b. Engineer may require core samples of finished products.
    - c. When requested by Engineer, furnish compressive test specimens for testing in addition to requirements above, and continue to monitor quality of concrete.
  3. Notify Engineer at least 10 working days prior to pouring any structure.
  4. The Commission may perform random or full inspections of manufacture of boxes, vaults, and precast structures to inspect:
    - a. Steel placement and size.
    - b. Overall fabrication.
    - c. Workmanship.
    - d. Other general or specific aspects of production and specification compliance.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Execution: Follow Sections 03300, 02530, 02510, and supplemented herein.
  - 1. Provide granular bedding following Drawings.
  - 2. Provide weepholes on base of impervious material following Drawings.
  - 3. Provide bituminous membrane waterproofing following Drawings.

### 3.2 FIELD QUALITY ASSURANCE

- A. Perform field testing of precast concrete structures required under other sections of these specifications.

## PART 4 MEASUREMENT AND PAYMENT

- 4.1 Precast manholes, vaults, and other precast structures will be measured and paid for under other Sections of these Specifications.

**\*\*WSSC\*\***