

## SECTION 03 40 00

### PRECAST CONCRETE

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Reinforcing Steel
- B. Portland Cement Concrete
- C. Anchors, Lift Devices, and Accessories
- D. Stair Nosing
- E. Dielectric Insulation at Platform Edge
- F. Noise Abatement Seal

##### 1.02 RELATED SECTIONS

- A. Precast concrete structures for utilities are specified in Section 33 05 16 - Utility Structures.
- B. Concrete formwork is specified in Section 03 11 00 - Concrete Forming.
- C. Reinforcing steel for concrete is specified in Section 03 20 00 - Concrete Reinforcing.
- D. Portland-cement concrete is specified in Section 03 05 15 - Portland Cement Concrete.
- E. Finishing of formed and unformed concrete surfaces, including repair of surface defects, are specified in Section 03 35 00 - Concrete Finishing, except as specified otherwise herein.
- F. Precast, prestressed concrete is specified in Section 03 05 18 - Prestressed Concrete.
- G. Steel supporting brackets and plates are specified in Section 05 50 00 - Metal Fabrications.

##### 1.03 MEASUREMENT AND PAYMENT

- A. General: Measurement and payment for precast concrete will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for precast concrete indicated in the Bid Schedule of the Bid Form.
- B. Lump Sum: If the Bid Schedule indicates a lump-sum for precast concrete, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 - Price and Payment Procedures, Article 1.03.
- C. Unit Prices: If the Bid Schedule indicates a unit price for precast concrete, the unit-price method of measurement and payment will be as follows:
  - 1. Measurement:

- a. Precast concrete units will be measured for payment by the individual unit (each), erected and installed in place, multiplied by the total number of identical units installed.
  - b. Each different type and size of precast concrete unit will be measured separately for payment.
  - c. All other items specified in this Section will be considered incidental to precast concrete units and will not be measured separately for payment.
2. Payment: Precast concrete will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1.

**1.04 REFERENCES**

A. American Concrete Institute (ACI):

- 1. ACI 301 Standard Specifications for Structural Concrete
- 2. ACI 318 Building Code Requirements for Structural Concrete

B. American Society for Testing and Materials (ASTM):

- 1. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- 2. ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- 3. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
- 4. ASTM C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
- 5. ASTM C494 Specification for Chemical Admixtures for Concrete
- 6. ASTM C509 Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
- 7. ASTM C542 Specification for Lock-Strip Gaskets
- 8. ASTM C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- 9. ASTM C1017 Specification for Chemical Admixtures for Use in Producing Flowing Concrete

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10. ASTM D257 Test Methods for DC Resistance or Conductance of Insulating Materials
11. ASTM D638 Test Method for Tensile Properties of Plastics
12. ASTM D1622 Test Method for Apparent Density of Rigid Cellular Plastics
13. ASTM D2240 Test Method for Rubber Property - Durometer Hardness

C. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code - Steel
2. AWS D1.4 Structural Welding Code - Reinforcing Steel

D. Precast/Prestressed Concrete Institute (PCI):

1. PCI MNL 117 Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products

**105 DEFINITIONS**

- A. Regular Precast: Acoustical barrier panels and such other members or components as indicated.
- B. Architectural Precast: Stair components, windscreen and bench components, bollards precast concrete bases, and such other architectural precast members or components as indicated.

**1.06 SUBMITTALS**

- A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Shop Drawings: Submit Shop Drawings showing the following:
1. Detailed drawings of panels, members, and components, showing dimensions and sections of each.
  2. Quantities, dimensions, and locations of sleeves, anchors, brackets, inserts, reglets, reinforcing steel, lift devices, accessories, and methods of securing same in forms.
  3. Casting, consolidating, and finishing procedures.
- C. Product Data: Submit manufacturer's product data of manufactured products and accessories. Include manufacturer's detailed drawings and dimensions when applicable.
- D. Samples: Samples require approval of the Engineer, as follows:
1. For precast concrete to be exposed in the finished work to public view, submit form facing material, 12 inches by 12 inches or larger in size as appropriate.

2. For precast concrete to receive sandblasted or other surface finish, submit sample of concrete with specified finish, 12 inches by 12 inches or larger in size as appropriate.
- E. Quality Plan: In compliance with applicable requirements of Section 01 45 00 - Quality Control, the Contractor shall provide a quality control plan to ensure uniformity of materials, conformance with accepted mix designs, and compliance with these Specifications.
- F. Certificates:
1. Submit evidence of current plant certification under the PCI Plant Certification Program or approval by the International Conference of Building Officials (ICBO).
  2. Submit manufacturers' certifications of compliance for materials as required by PCI MNL-117.
  3. For welders, furnish welding certificates or affidavits attesting to the welders' qualifications to perform the indicated and specified welding.

## **1.07 QUALITY ASSURANCE**

- A. Qualifications of Fabricator:
1. Fabricator of precast concrete products shall be an active and approved participant in the PCI Plant Certification Program or an ICBO-approved precast fabricator.
  2. Precast concrete work shall be produced in a plant or production facility by a fabricator who has been regularly and continuously engaged in the manufacture of precast concrete products.
  3. Fabricator shall have sufficient production capacity to produce the required units without causing any delay in the work.
- B. Qualifications of Welders: Welders shall be prequalified in accordance with AWS D1.1 or AWS D1.4, as applicable to the work.
- C. Tolerances: Fabricate and erect precast concrete members within the tolerances recommended in PCI MNL-117.
- D. Mock-Ups: Construct sample panel or unit at the casting plant, of the actual item, or section of item not less than 10 square feet in surface area, of the features, finish, and color of concrete surfaces exposed to public view, for review and acceptance by the Engineer, prior to starting production.
- E. Control Samples: All finishes and colors shall match the Engineer's control samples. Control samples require the Engineer's approval before they may be used as a standard.

## **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Transport, handle, and store units in a manner that will prevent damage to the members.

- B. If storage of precast units at the site is necessary, store units in a manner that will prevent cracking, distortion, staining, or other damage. Support members at their normal support points.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Reinforcing Steel: Comply with applicable requirements of Section 03 20 00 - Concrete Reinforcing.
- B. Portland Cement Concrete:
  - 1. Comply with applicable requirements of Section 03 05 15 - Portland Cement Concrete. Provide class of concrete as indicated.
  - 2. When a dense, high-strength concrete is required, as for stair treads, a fly ash or pozzolanic admixture (ASTM C618), not to exceed 10 percent of the weight of the cement, may be introduced in the mix along with the required plasticizer (ASTM C1017) or water-reducing admixtures (ASTM C494, Type F or Type G).
  - 3. Provide white portland cement and crushed white aggregate where required to achieve colored concrete matching the approved control sample.
  - 4. Coloring material for colored concrete shall be a standard commercial brand of chemically inert mineral oxide coloring material accurately measured by weight in a definite manner for each batch of concrete to produce a consistently even color. Material shall be readily dispersible in water. Color shall be as selected by the Engineer from samples prepared and submitted by the Contractor.
- C. Anchors, Lift Devices, and Accessories: Provide concrete inserts, reglets, anchors, brackets, and fasteners as indicated or required for fabrication and installation work. All items shall be zinc-coated or galvanized in accordance with ASTM A153 or ASTM A123, as applicable. Contractor shall select the lift devices, and shall be responsible for their performance and for any damage resulting from the use of faulty or inferior devices. Lift devices shall not be visible on exposed faces of precast members.
- D. Stair Nosings: Abrasive white bronze with "hot patina" finish. Provide stair nosings of size and profile indicated, with nonslip finish and clean and well-defined cross-hatching and fluting a minimum of 1/16 inch deep. Provide stair nosings with appropriate integral concrete anchors; holes and countersinks for screw-type anchors are not acceptable. Minimum width of tread surface: 4 inches. Width of platform edge safety nosing: 3 inches. Minimum thickness of tread or horizontal portion of nosing: 5/16 inch
  - 1. "Hot patina" finish shall be produced with the following chemicals to achieve a statuary bronze color acceptable to the Engineer; as follows:
    - a. Liver of sulfur
    - b. Ammonium sulfide
    - c. Ferric nitrate

2. Stair nosings for cast-in-place concrete steps are specified in Section 05 50 00 - Metal Fabrications.

E. Dielectric Insulation at Platform Edge:

1. Dielectric insulation membrane shall be as specified in Section 07 13 19 - Modified Bituminous Sheet Waterproofing.
2. Dielectric insulation for dowels shall be terluran resin plastic ribbed or deformed sleeves conforming to the following requirements:
  - a. Tensile strength at yield (ASTM D638): 45 MPa (6.5 ksi)
  - b. Shear modulus (ASTM D638): 900 MPa (130.5 ksi)
  - c. Impact strength, at 23 degrees C (ASTM D1622): No break
  - d. Volume resistivity (ASTM D257):  $10^{15}$   $\Omega$ -cm minimum
3. Epoxy grout: Grout for securing plastic sleeves to concrete slab and to precast concrete platform edge units and to secure dowel within plastic sleeve shall be a non-shrink vinyl-ester resin designed to adhere to plastic, steel, and concrete.

F. Noise Abatement Seal:

1. Provide noise abatement seal at juncture of acoustical barrier panels and concrete girders, of size, profile, and configuration indicated. Seal shall be manufactured of dense neoprene meeting requirements of ASTM C542 for durometer A hardness of 75, plus or minus 5, when tested in accordance with ASTM D2240. Color: black.
2. Provide end plugs for each length of seal, one for each end. Plugs shall be manufactured of closed cell neoprene meeting requirements of ASTM C509, Type II.

**2.02 FABRICATION**

A. Requirements and Standards:

1. Manufacture precast concrete units in accordance with PCI MNL-117, PCI "Architectural Precast Concrete," and applicable requirements of ACI 318/318R, Chapter 16.
2. Forms shall be accurately constructed to produce members to dimension, shape, configuration, and profile indicated. When not otherwise indicated, construct forms to produce smooth concrete.
3. Concrete reinforcement, lifting reinforcement, and concrete inserts and anchorage devices shall be placed and secured against movement as required. Place stair nosings and secure against movement as indicated.
4. Concrete shall be placed and consolidated to shape, configuration, and dimensions indicated.

5. Members shall be moist cured in accordance with curing requirements specified in PCI MNL-117. Minimum curing period for combined initial curing and secondary curing shall be seven days or until the specified strength of concrete is attained.

**B. Finishes:**

1. Provide finishes for exposed concrete matching approved samples and mock-ups and the approved control samples.
2. When sandblasted finish is indicated, provide "sandblast finish" as specified in ACI 301. Degree of sandblasting shall be as required to provide surface finish matching the approved control sample.
3. For those items not exposed to public view, provide "smooth form finish" as specified in Section 03 35 00 - Concrete Finishing.

- C. Markings:** Provide permanent markings in precast units to identify pick-up points and orientation in the structure, conforming with the markings indicated on Shop Drawings. Imprint the date of casting on each precast unit where it will not show in the finished structure.

**2.03 QUALITY CONTROL**

- A.** In accordance with Section 01 45 00 - Quality Control, the Contractor-employed independent testing laboratory or agency shall perform such inspections and tests as required to verify compliance with these Specifications. All such inspections and tests shall be conducted at no additional cost to the District.
- B.** Concrete shall be tested for compressive strength as specified in Section 03 05 15 - Portland Cement Concrete. A set of seven cylinders shall be prepared for every ten precast units, or fraction thereof, cast in any one day. Two cylinders shall be tested at 3 days, two cylinders at 7 days, two cylinders at 28 days, and one cylinder shall be retained for further testing as may be required. Cylinders shall be prepared and moist cured in accordance with ASTM C31, and tested in accordance with ASTM C39.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A.** Examine all parts of the supporting structure and the conditions under which the precast concrete units are to be erected and installed. Verify the locations of anchors to pre-determine the accuracy of the installation of each member.

**3.02 ERECTION/INSTALLATION**

- A.** Transport and erect precast concrete units in accordance with PCI MNL-117 and as specified herein.
- B.** Erect precast concrete units and accurately install in place with mechanical hoisting equipment more than adequate for the loads.

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- C. Maintain precast concrete unit in upright position at all times. Handle unit only by indicated lifting devices or cushioned pads, and in a manner that will not overstress or damage the unit.
- D. Erect precast concrete units in accordance with indicated erection tolerances. Comply with erection sequences indicated. Position units to avoid eccentric application of forces, and make complete and uniform contact with bearing surfaces.
- E. Provide anchorage and attachment welding and bolting, as indicated, in accordance with PCI MNL-117, Division VI. Provide touch-up painting of field welds and abraded steel surfaces as specified in Section 09 91 00 - Painting.
- F. At completion, units shall be plumb, level, and square, true to line, with angles and edges parallel with related building lines.
- G. Install noise abatement seals as indicated. Compress at least 15 percent to form a tight seal.
- H. Provide sealant material and application, where indicated, in accordance with applicable requirements of Section 07 90 00 - Joint Protection.

**END OF SECTION 03 40 00**