

Section 03420 Plant-Precast Concrete Stairs

Part 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Section includes:
 - 1. Precast concrete stairs.
- B. Related Sections:
 - 1. Division 3 Section "Cast-in-Place Concrete" 03300.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provision of following codes, specifications and standards, except as otherwise indicated.
 - 1. ACI 301 "Specifications for Structural Concrete".
 - 2. ACI 318 "Building Code Requirements for Structural Concrete".
 - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 - 4. Pre-stressed Concrete Institute MNL 116, Manual for Quality Control for Plants and Production of Precast Concrete Products".
 - 5. Pre-stressed Concrete Institute MNL 135, "Tolerance Manual for Precast and Pre-stressed Concrete Construction".
 - 6. Pre-stressed Concrete Institute MNL 120, "PCI Design Handbook".
 - 7. American Welding Society, AWS D1.1 "Structural Welding Code-Steel", D1.4 "Structural Welding Code – Reinforcing Steel", D1.6 "Structural Welding Code - Stainless Steel", C5.4, "Recommended Practices for Stud Welding".
- B. Fabricator Qualifications: Fabricator must be producer member of the Pre-stressed Concrete Institute (PCI) and/or participate in its Plant Certification Program.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design precast concrete stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.
- C. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Stairs shall be designed to support the full deadload plus 100 psf live load.
 - 2. Short term and long term deflection maximums shall be not greater than Table 9.5 (b) of ACI-318

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Shop drawings shall show dimensions for proper fabrication; reinforcing steel sizes, grades and locations; inserts accessories and handling methods; calculations for reinforcing; details, sections, jointing anchoring, and all other necessary information.
 - 2. Indicate each piece by number on setting drawings, and mark units with corresponding non-staining numbers.
- B. Tests and Reports
 - 1. Perform all concrete testing in accordance with PCI MNL-116 requirements.

1.5 PRODUCT HANDLING

- A. Protection:
 - 1. Carefully transport and handle precast concrete stairs so as to prevent soiling or damage. Store clear of ground in manner to prevent cracking, distortion, warping and to protect from damage and dirt. Soiling or staining of precast units may be cause for rejection of units, if in Architect's opinion units cannot be adequately cleaned.
 - 2. Lift and support units only at designated lifting or supporting points as shown on approved shop drawings.
- B. Delegated-Design Submittal: For precast concrete stairs indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation

Part 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fabricators: Subject to compliance with requirements, provide products by the following:
1. Castcon-Stone, Inc.
www.castconstone.com

2.2 MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185 or A497 fabricated from plain steel wire into flat sheets having a minimum yield strength of 70,000psi.
- C. Plates and Angles: Cast-in loose plates and angles shall conform to ASTM 36.
- D. Water: Potable, clean and free from oils, acids, salts or other injurious substances.
- E. Admixtures:
1. Air entrainment agents shall conform to ASTM C 260 and shall be:
 - a. MB-VR by BASF
 - b. Darex AEA by W.R. Grace & Co.
 - c. Sika AER by Sika Chemical Co.
 - d. Air Mix by Euclid Chemical Co.
 2. Precast elements exposed to weather or vulnerable to deicers shall have $6\% \pm 1.5\%$ of air entrainment.
 3. Water reducing agent shall conform to ASTM C 494, Type A and shall be:
 - a. Polyheed 997 by BASF
 - b. Eucon W.R. by Euclid Chemical Co.
 - c. Plastocrete 160 by Sika Chemical Co.
 4. High range water reducing agent shall conform to ASTM C494 Type A and shall be:
 - a. Glenium series by BASF
- F. Portland cement: ASTM C 150, Type III, gray, unless otherwise indicated.
- G. Normal-Weight Aggregates:
1. Fine Aggregates: ASTM C 33, washed natural sand
 2. Course Aggregates: Crushed stone conforming to ASTM C 33. Aggregate shall be graded crushed stone with a resulting weight of concrete up to 155 lbs./cu.ft.

H. Grout:

1. Cement shall be grey Portland cement, free from soluble salts and complying with ASTM C 150, Type I or Type III High Early Strength, one brand throughout work. Strength shall be 4,000 psi in 28 days.
2. Sand shall be clean natural bank sand. Sample of sand and analysis of its contents by qualified testing laboratory shall be performed for approval prior to sand delivered to project site. All sand shall be same color and come from the same source.

2.3 STRENGTH

- A. Concrete strength shall be 5,000 psi in 28 days.

2.4 RAILINGS

- A. Refer to Division 5 Section "Metal Stairs" for metal railings and handrails associated with stairs. Railing shall be configured to comply with IBC 2003 and all other applicable building code requirements.

2.5 FABRICATION

- A. Casting shall be done in rigidly constructed forms designed to produce dimensionally correct members with uniform surfaces per shop drawings.
- B. At time of casting, Contractor shall incorporate all accessories, reinforcing steel and handling devices required for proper installation and handling of units.
- C. Welding shall be continuous with Low-Hydrogen rods per AWS A5.1 or A5.5
- D. Provide additional temporary or permanent steel hangers to support stairs during construction and until permanent structural supports are in place.
- E. Provide finished units, which are straight, true to size and shape, and within specified casting tolerances.
- F. Make exposed edges sharp, straight, and square. Make flat surfaces into a true plane.
- G. Place and secure in the forms all anchors, clips, stud bolts, inserts, lifting devices, shear ties, and other devices required for handling and installing the precast units and for attachment of subsequent items indicated and specified.

H. Curing:

1. Form curing by moisture retention without supplemental heat until concrete reaches adequate strength for removal of product from forms, a minimum of 2,500 psi.
 2. Precast units shall be cured to the required 28 day strength prior to shipment.
- I. Casting tolerances: Maintain casting, bowing, warping and dimension tolerances within PCI MNL-116 and PCI MNL-135.

Part 3-EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting, building structural framing has attained minimum allowable design compressive strength or until supporting steel or other structure is complete.

3.2 INSTALLATION

- A. Install in accordance with shop drawings and manufacturer's recommended installation procedures. Anchor all components firmly into position.
- B. Powder Actuated Fasteners: Do not use Powder Actuated Fasteners for surface attachment of accessory items except as specifically accepted by precast unit manufacturer.
- C. Handling and Erection:
 - 1. Temporarily stabilize all precast work until permanent connections and/or adjoining cast-in-place concrete work or masonry has been completed and the framework is stable.
- D. Grouting:
 - 1. After precast units have been placed and secured, grout open spaces at connections and joints between platforms and stairs, and between platforms and floor plank.
 - 2. Provide forms or other acceptable method to retain the grout in place until it is sufficiently hard to support itself.
 - 3. Place grout in a manner to finish smooth, plumb, and level with adjacent concrete surfaces.
 - 4. Keep grouted surfaces damp for not less than 24 hours after grout has taken its initial set. Promptly remove grout material from exposed surfaces before it harden.
 - 5. Mix for grout shall have a minimum compressive strength of 4,000 psi at 28 days and have an 8 inch minimum to 10 inch maximum slump. Mortar shall not be used for grout.
- E. Patching: Patch precast units if strength and appearance has not been impaired. Manufacturer of precast units shall point up all chopped areas. Pointed up areas shall have minimum variation in texture and color. Amount of variation shall be acceptable to the Architect.

3.3 REJECTION

- A. Damaged or structurally questionable precast stair and platform units shall be subject to load test in accordance with Building Code of American Concrete Institute (ACI 318). Units failing to pass load test shall be rejected. Costs of failed tests shall be borne by Contractor.
- B. Precast units, which require patching, shall be rejected if patching does not restore the damaged unit to its original intended strength and original appearance with minimum variations in color and texture according to PCI MNL-116 standard structural finishes or subject to Architect's approval.

END OF SECTION 03420