SP- 150898
(New)

SPECIAL PROVISIONS
FOR
PRECAST CONCRETE MONUMENTS

Johnson County
IM-080-6(488)242--13-52

Effective Date
August 16, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150898.01 DESCRIPTION.

A. This special provision includes the requirements for precast concrete for Decorative Monuments, Intermediate.

B. Refer to the Special Provisions for Integral Thin Veneer Brick for Structural Concrete for the installation of thin brick in the precast concrete.

C. Submittals.

1. **Product Data:** For each type of product.

2. **Design Mixtures:** For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.

3. **Delegated-Design Submittal:** For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, licensed in the state of Iowa, responsible for their preparation. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on supporting elements from precast structural concrete.

4. **Shop Drawings.**
   - **a.** Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
   - **b.** Detail fabrication and installation of precast structural concrete units, including connections to adjoining construction.
   - **c.** Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
   - **d.** Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.

e. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
f. Include and locate openings.
g. Indicate location of each precast structural concrete unit by same identification mark placed on unit.
h. Indicate relationship of precast structural concrete units to adjacent materials.
i. Indicate shim sizes and grouting sequence.
j. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

5. Samples.
a. 12 inches by 12 inches by 2 inches sample representative of the finish and texture. Sample shall illustrate workmanship of form face and float finish faces.
b. Grout Samples for Verification: Showing color and texture of joint treatment.

6. Mockups: Refer to intermediate monument mock-up notes on the plans.

7. Information Submittals.
a. Material Certificates for cementitious materials, reinforcing materials, and admixtures.
b. Material Test Reports for aggregates, by a qualified testing agency.
c. Preconstruction test reports.
d. Source quality-control reports.
e. Field quality-control and special inspection reports.

D. Delivery, Storage, and Handling.

1. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

2. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

3. Store units with dunnage across full width of each bearing point unless otherwise indicated.

4. Place adequate dunnage of even thickness between each unit.

5. Place stored units so identification marks are clearly visible, and units can be inspected.

6. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

7. Lift and support units only at designated points indicated on Shop Drawings.

E. Scheduling and Conflicts.

1. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

2. Preinstallation Conference: Conduct conference at Project site.

F. Special Requirements.

1. **Fabricator Qualifications:** A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

2. Designated as a PCI-certified plant as follows: Group A, Category AC – Architectural Precast Concrete Products

150898.02. MATERIAL.

A. Performance Requirements.

1. **Design Standards:** Comply with ACI 318 and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

2. **Structural Performance:** Precast structural concrete units shall have the minimum amount of steel reinforcement required by ACI 318.

B. Mold Materials.

1. **Molds:** Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

2. **Mold-Release Agent:** Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

3. **Surface Retarder:** Chemical set retarder, capable of temporarily delaying setting of newly placed concrete mixture to depth of reveal specified.

C. Reinforcing Materials.

1. **Epoxy-Coated Reinforcing Bars:** ASTM A615/A615M, Grade 60 epoxy coated, with less than 2% damaged coating in each 12 inch bar length.

2. **Epoxy-Coated-Steel Wire:** ASTM A884/A884M, Class A coated, plain, flat sheet, Type 1 bendable coating.

3. **Supports:** Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

D. Concrete Materials.

1. **Portland Cement:** ASTM C150/C150M, Type I or Type III, gray, unless otherwise indicated.

2. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

3. **Supplementary Cementitious Materials.**
   a. **Fly Ash:** ASTM C618, Class C or F, with maximum loss on ignition of 3%.
   b. **Metakaolin:** ASTM C618, Class N.
   c. **Silica Fume:** ASTM C1240, with optional chemical and physical requirement.
   d. **Ground Granulated Blast-Furnace Slag:** ASTM C989, Grade 100 or 120.

4. **Normal-Weight Aggregates:** Except as modified by PCI MNL 116, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
   a. Gradation: Uniformly graded.
   b. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate to match approved finish sample.

5. **Water:** Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

6. **Air-Entraining Admixture:** ASTM C260, certified by manufacturer to be compatible with other required admixtures.

7. **Chemical Admixtures:** Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15% chloride ions or other salts by weight of admixture.
   a. **Water-Reducing Admixtures:** ASTM C494/C494M, Type A.
   b. **Retarding Admixture:** ASTM C494/C494M, Type B.
   c. **Water-Reducing and Retarding Admixture:** ASTM C494/C494M, Type D.
   d. **Water-Reducing and Accelerating Admixture:** ASTM C494/C494M, Type E.
   e. **High-Range, Water-Reducing Admixture:** ASTM C494/C494M, Type F.
   f. **High-Range, Water-Reducing and Retarding Admixture:** ASTM C494/C494M, Type G.
   g. **Plasticizing Admixture:** ASTM C1017/C1017M, Type I.
   h. **Plasticizing and Retarding Admixture:** ASTM C1017/C1017M, Type II.
   i. **Corrosion-Inhibiting Admixture:** ASTM C1582/C1582M.

E. Accessories.

1. **Reglets:** PVC extrusions, felt or fiber filled, or with face opening of slots covered.

2. **Precast Accessories:** Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

F. Grout Materials.

1. **Sand-Cement Grout:** Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2 1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06% by weight of cement when tested according to ASTM C1218/C1218M.

2. **Epoxy-Resin Grout:** Two-component, mineral-filled epoxy resin; ASTM C881/C881M, of type, grade, and class to suit requirements.

G. Concrete Mixtures.

1. Prepare design mixtures for each type of precast concrete required.

2. Limit use of fly ash to 20% replacement of Portland cement by weight and ground granulated blast-furnace slag to 20% of Portland cement by weight; metakaolin and silica fume to 10% of Portland cement by weight.

3. Add crystalline waterproofing admixture to concrete mix in compliance with manufacturers written instructions.

4. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

5. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C1218/C1218M.

6. **Normal-Weight Concrete Mixtures:** Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
   a. Compressive Strength (28 Days): 5000 psi.
   b. Maximum Water-Cementitious Materials Ratio: 0.45.

7. **Water Absorption:** For structural precast concrete with an architectural finish, limit water absorption to 6% by weight or 14% by volume, tested according to ASTM C642, except for boiling requirement.

8. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

9. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

10. **Concrete Mix Adjustments:** Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

H. Mold Fabrication

1. **Molds:** Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

2. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
   a. Form joints are not permitted on faces of structural precast concrete.
   b. Edge and Corner Treatment: Uniformly chamfered as indicated on the drawings.

I. Fabrication

1. **Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware:** Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

2. Furnish loose hardware items including anchors, dowels, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.

3. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the contract documents.

4. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Engineer's approval.

5. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
   a. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
   b. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
   c. Place reinforcing steel and prestressing strand to maintain at least 3/4 inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1 1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
   d. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

6. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

7. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

8. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

9. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

10. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.

11. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.

12. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

13. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Engineer's approval.

J. Fabrication Tolerances.

Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

K. Finishes

1. Manufacture member faces free of joint marks, grain, and other obvious defects with corners, including false joints, uniform and straight.

2. **Exposed Face Finish.**
   - **a.** Light-Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to remove surface laitance, glaze, blemishes, curing compounds, and form-release agents.
   - **b.** Finish exposed face surfaces of precast concrete units to match approved sample panel.

3. **Thin Brick Finish:** See Special Provisions for Integral Thin Veneer Brick for Structural Concrete.

150898.03. CONSTRUCTION.

A. Examination.

1. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

B. Installation.

1. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

2. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.
   - **a.** Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
   - **b.** Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
   - **c.** Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.

3. Connect precast structural concrete units in position by bolting, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed. Do not permit connections to disrupt continuity of roof flashing.

4. Field cutting of precast units is not permitted without approval of the Engineer.

5. **Fasteners:** Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

6. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
   a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
   b. For slip-critical connections, use method and inspection procedure approved by the Engineer and coordinated with inspection agency.

7. **Grouting or Dry-Packing Connections and Joints:** Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.
   a. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces.
   b. Fill joints completely without seepage to other surfaces.
   c. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
   d. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
   e. Keep grouted joints damp for not less than 24 hours after initial set.

C. Erection Tolerances.

1. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

2. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by the Engineer.

D. Field Quality Control.

1. Special Inspections: Engage a qualified special inspector to perform the following special inspections: Erection of precast structural concrete members.

2. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

3. Testing agency will report test results promptly and in writing to Contractor and Engineer.

4. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

5. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

6. Prepare test and inspection reports.

E. Repairs.

1. Repair precast structural concrete units if permitted by the Engineer. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.

2. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 5 feet.

3. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

F. Cleaning

1. Clean mortar, plaster, and other deleterious material from concrete surfaces and adjacent materials immediately.

2. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove markings, dirt, and stains.
   a. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

150898.04. METHOD OF MEASUREMENT.

The Engineer will count each installed Decorative Monument, Intermediate.

150898.05. BASIS OF PAYMENT.

Contractor shall be paid the contract unit price for Decorative Monument, Intermediate for each Decorative Monument, Intermediate measured. Payment for Decorative Monument, Intermediate includes all labor, materials, equipment, and supervision required to furnish and install precast concrete units, caps, hardware, and Thin Brick as specified in the Special Provisions for Integral Thin Veneer Brick for Structural Concrete. Mock-ups shall be incidental to the Decorative Monument, Intermediate bid item.