

SECTION 03 45 00 - ARCHITECTURAL PRECAST CONCRETE

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. Requirements of Division 1 shall apply to all Work of this Section.

1.2 SCOPE

- A. The work shall consist of furnishing all plant, labor, equipment and materials, and performing all operations as required to install the following precast concrete elements:
  1. Infinite Façade (Composite Architectural Precast Panels)
  2. Architectural Precast Concrete
  3. Insulated Architectural Precast Concrete
  4. Clay Product-Faced Architectural Precast Concrete
  5. Stone Veneer-Faced Architectural Precast Concrete

1.3 RELATED WORK (SEE ALSO TABLE OF CONTENTS)

- A. Off-Site Mockup Assembly 01 43 40
- B. Reinforcing Steel: Section 03 21 00
- C. Cast-In-Place Concrete: Section 03 30 00
- D. Precast Structural Concrete: Section 03 41 00
- E. Glass-Fiber-Reinforced Concrete: Section 03 49 10
- F. Dimension Stone Cladding: Section 04 85 10
- G. Cast Stone: Section 04 72 00
- H. Unit Masonry: Section 04 81 00
- I. Structural Steel: Section 05 12 00
- J. Metal Fabrications: Section 05 50 00
- K. Water Repellents: Section 07 19 00
- L. Spray Foam: Section 07 27 03
- M. Sheet Metal Flashing and Trim: Section 07 62 20
- N. Joint Sealants: Section 07 92 00
- O. Ceramic Tile: Section 09 31 00

P. Window Washing Equipment: Section 11 24 23

1.4 QUALITY ASSURANCE

A. General:

1. Fabricator Qualifications: Firms which have 5 years successful experience in fabrication of precast concrete units similar to units required for this Project will be acceptable. Fabricator must have sufficient production capacity to produce required units without causing delay in work. Fabricator must be a producer member of the Precast/Prestressed Concrete Institute (PCI), participant in the PCI Plant Certification Program, and/or hold an International Accreditation Service (IAS) AC-157 certification as a precast fabricator.
2. Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged primarily in manufacturing of similar units, unless plant fabrication or delivery to Project site is impractical. If units are not produced at precast concrete fabricating plant, maintain procedures and conditions for quality control which are equivalent to plant production. Plant fabrication shall comply with PCI MNL 117.
3. Fire-Resistance Rated Precast Units: Where precast concrete units are shown or scheduled as requiring fire-resistance classification, design and fabricate units to applicable codes and standards

B. Standards and References: (Latest edition unless otherwise noted):

1. California Building Code (CBC) or otherwise required Building Code Standard adopted by the Building Official with jurisdiction.
2. American Concrete Institute (ACI).
  - a. ACI 117 – “Commentary on Standard Specifications for Tolerances for Concrete Construction and Materials”
  - b. ACI 301 – “Specifications for Structural Concrete”.
3. Precast Concrete Institute (PCI).
  - a. PCI MNL 116 "Manual for Quality Control for Plants and Production of Precast Concrete Products"
  - b. PCI MNL 117 “Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products”
  - c. PCI MNL124 “Specification for Fire Resistance of Precast/Prestressed Concrete”
  - d. PCI MNL 135 “Tolerance Manual for Precast and Prestressed Concrete Construction Tolerance”
4. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice."
5. American Institute of Steel Construction (AISC) – “ANSI/AISC 360 Specification for Structural Steel Buildings”.
6. American Welding Society
  - a. AWS – AWS D1.1 Structural Welding Code – Steel.
  - b. AWS – AWS D1.3 Structural Welding Code – Sheet Steel.
  - c. AWS – AWS D1.4 Structural Welding Code – Steel Reinforcing Bars.

C. Quality Assurance Submittals

1. Samples:
  - a. Submit three preliminary samples, approximately 12" by 12", representative of finished exposed face.
  - b. Prior to commencement of manufacture, architect to review approximately 4' x 4' sample for final approval of colors and textures.
2. Concrete Mix Designs: Submit all precast mix designs for approval. Mix designs shall be prepared by an independent testing facility or qualified employee of the Precast Manufacturer.
3. Weld Procedures Specifications: Submit Welding Procedure Specifications in accordance with AWS D1.1, D1.3 and/or D1.4 requirements for all welding performed under this

- Section. In addition, submit Procedure Qualification Records for all non-prequalified weld details, as required by AWS D1.1, D1.3 and /or D1.4.
4. Approved Fabricator Application: If applicable, submit application for waiver of Special Inspections and Testing via Fabricator Approval by the Building Official per CBC 1704. Approved fabricator application shall include the Plant Quality Systems Manual (QSM), and applicable certifications (PCI and IAS). The manufacturer shall be certified as an IAS Certificate of Accreditation facility with certified Fabricator Inspection Program in accordance with CBC Section 1704.2.5.1, or equivalent. If manufacturer does not receive Approved Fabricator waivers, then Special Inspection and Testing shall be conducted on all products per CBC 1705.2 and 1705.3.
  5. Other Material-Related Submittals Requiring Approvals
- D. Tests and Inspections:
1. Special Inspections and material testing shall be conducted at required construction stages and on required elements as specified in CBC Sections 1705.2 and 1705.3. Special Inspections and testing shall be performed by a third party firm approved by the Building Authority and hired by the Owner, unless manufacturer has advanced Approved Fabricator status per CBC 1704 and waiver of special inspections and testing.
  2. A documented testing program is required prior to start of construction.
  3. Testing of materials and inspection of production techniques shall be the responsibility of the Precast Manufacturer Quality Control Department.
    - a. Keep quality control records available for two (2) years after final acceptance.
    - b. Keep certificates of compliance available for five (5) years after final acceptance.
  4. All other testing and inspection to be provided by Owner.
    - a. The precast manufacturer shall allow Owner's testing representatives access to materials storage areas, concrete production equipment, and concrete placement and curing facilities. Cooperate with Owner's testing representatives and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- E. Out of Tolerance Units: Out of Tolerance Units: Units having dimensions outside specified tolerance limits may be subject to additional testing to validate performance and acceptance. Out of tolerance units may be rejected if appearance or function of the structure is adversely affected and outside industry standards, including interfaces with other construction. Repair or remove and replace rejected units per PCI recommendations to meet tolerances.
- F. Investigation of Low-Strength Results:
1. The strength of precast concrete units may be considered deficient if the manufacturing processes fail to comply with any of the requirements which may affect the strength of the precast units, including the following conditions:
    - a. Failure to meet compressive strength tests requirements.
    - b. Reinforcement placement and/or strength/grade not in conformance with the specified fabrication requirements.
    - c. Placement of and/or pretensioning and detensioning of tendons not in conformance with the specified fabrication requirements.
    - d. Concrete curing and protection of precast units against extremes in temperature or exposure not in conformance with ACI recommended practices.
    - e. Precast units damaged during handling or installation.
    - f. For investigation of low strength results, follow the requirements for of ACI 318 Chapter 27 – Strength Evaluation of Existing Structures and or manufacturer's approved QSM. Elements that do not meet the acceptance criteria of ACI 318 shall be replaced.

## 1.5 STRUCTURAL DESIGN AND DOCUMENTATION

- A. Design Criteria:
1. Panels shall be designed to support themselves and any attached materials and transfer those weights to the supporting structure.
  2. Panels shall be designed to resist code-required seismic, wind, and blast loading (if applicable), and to deliver those forces to the supporting structure.
  3. Panels, panel joints, and connections shall accommodate displacements of the structure as follows:
    - a. Vertical floor deflections due to live load of 1/2"
    - b. Horizontal floor displacements due to seismic forces as required by building code
    - c. Thermal expansion/contraction of the panel due to a seasonal temperature range of 80°(F), and an interior to exterior temperature gradient (difference) of 40 °(F)
  4. Panels shall be designed with the following deflection limits:
    - a. Vertical Deflection of horizontal spanning units – 3/8" maximum under self- weight of panel and attached materials.
    - b. Out-of-Plane deflections limited by building code requirements for exterior wall systems.
- B. Design of Precast Concrete Elements and the resulting structure shall comply with the requirements of the CBC and the current edition of the following design standards:
1. ASCE – ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures
  2. ACI 318 – Building Code Requirements for Structural Concrete.
  3. AISC – ANSI/AISC 360 – Specification for Steel Buildings.
  4. AWS – AWS D1.1 Structural Welding Code – Steel.
  5. AWS – AWS D1.3 Structural Welding Code – Sheet Steel.
  6. AWS – AWS D1.4 Structural Welding Code – Steel Reinforcing Bars.
  7. PCI – PCI MNL 120 – PCI Design Handbook.
  8. PCI MNL 120 “PCI Design Handbook, Precast and Prestressed Concrete”
  9. PTI – Post Tensioning Manual.
- C. Design of Structural Stability During Construction:
1. ASCE – ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures
- D. Submittals: (Submit under provisions of Section 01 33 00)
1. Construction Drawings showing:
    - a. Material specifications.
    - b. Elevations identifying location of panels and their connections.
    - c. Floor plans identifying location of precast products.
    - d. Details as necessary to describe relationship of precast products to adjacent material.
    - e. Details of precast connections including hardware, grouting, bolting, and/or welding requirements.
  2. Submittal drawings shall be signed by a California licensed Professional Engineer (or PE properly licensed in the applicable jurisdiction). Submit sets electronically in pdf format or hard copy wet signed (if required).
  3. Design Calculations: Submit supporting structural design calculations. Submittal calculations shall be signed by a California licensed Professional Engineer (or PE properly licensed in the applicable jurisdiction). Submit sets electronically in pdf format or hard copy wet signed (if required).
- E. Design Modifications:

1. Submit design modifications necessary to meet performance requirements and field conditions.
2. Variations in details or materials shall not adversely affect the appearance, durability, or strength of products.
3. Maintain general design concept without altering size of members, profiles, and alignment unless otherwise approved by the Architect/Engineer.

## PART 2 - PRODUCTS

### 2.1 FORMWORK

- A. Provide forms and, where required, form facing materials of metal, plastic, wood, or other acceptable material that is nonreactive with concrete and will produce required finish surfaces.
- B. Accurately construct forms, mortar-tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and when prestressed, pretensioning and detensioning operations occur.
- C. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL 135.
- D. Unless forms for plant-manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or to movement during detensioning.

### 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 706 Gr 60, ASTM A706 Gr 80, or ASTM A615 Gr 60.
- B. Welded Reinforcing Bars: ASTM A 706 Gr 60, ASTM A706 Gr 80.
- C. Galvanized Reinforcing Bars: ASTM A 767, Class II (2.0 oz. zinc psf), hot-dip galvanized after fabrication and bending where shown.
- D. Welded Wire Reinforcing (WWR): ASTM A 1064.
- E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

### 2.3 PRESTRESSING TENDONS

- A. Uncoated, 7-wire strand complying with ASTM A416. Use per ASTM E328 Grade 270, strand to be low relaxation.

### 2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM Ch150, Type I, Type II, Type II/V, Type III or White Type I.
- B. Cement Substitutes:
  1. Fly Ash shall conform to ASTM C618

2. Slag cement shall conform to ASTM C989
- C. Aggregates: Fine and coarse aggregates for face mix shall conform to ASTM C33 except for grading.
- D. Water: Potable and free from deleterious materials in amounts corrosive to embedded steel or detrimental to concrete performance, durability, workability, or aesthetics.
- E. Air-Entraining Admixture: ASTM C260.
- F. Water-Reducing Admixture: ASTM C494.
- G. Coloring Agent: ASTM C979.
  1. Shall not compromise design strength and set time of concrete.
  2. Shall not exceed 10% by weight of cement content.
  3. Shall be stable at high temperature.
  4. Shall be alkali-resistant.
- H. Calcium Chloride or admixtures containing chlorides shall not be used.

## 2.5 CONNECTION AND/OR FRAME MATERIALS

- A. Steel Plates and Flat Bar: Structural quality, hot-rolled carbon steel, ASTM A36, ASTM A572.
- B. Steel Structural Shapes: ASTM A36, ASTM A572, ASTM A992.
- C. Hollow Structural Sections: ASTM A500 Gr B, ASTM A1085.
- D. Standard Pipe: ASTM A53 Gr B.
- E. Bolts:
  1. Weldable: ASTM A108/A29 Grades 1016-1026 or A36 material used to manufacture bolts meeting the requirements of ASTM A307 Gr A S1, ASTM A307 Gr A S1
  2. Non-Weldable: ASTM A325, ASTM A449, SAE J429 Gr 5
- F. Threaded Rods (UNC):
  1. Weldable: ASTM A36, ASTM F1554 Gr 36 & Gr 55 S1, ASTM A572 Gr 50
  2. Non-Weldable: ASTM 1554 Gr 55 & Gr 105, ASTM A449, ASTM A354 Gr BD
- G. Coil Rods and Bolts: ASTM A108/A29, Gr 1005-1026, Fu/Fy = 70/50 ksi minimum with strength verification by supplier. High strength materials shall not be substituted.
- H. Nuts (UNC and Coil):
  1. Weldable: ASTM A108/A29 Grades 1016-1026 or A36 material used to manufacture hex or heavy hex nuts meeting ASTM A563 Gr A requirements; coil nuts shall meet a minimum proof load stress of 80 ksi based on the tensile area of the matching coil rods and bolts specified above.
  2. Non-Weldable: ASTM A563 Gr A hex and heavy hex; coil nuts shall meet a minimum proof load stress of 80 ksi based on the tensile area of the matching coil rods and bolts specified above.
- I. Welded Studs / Headed Anchors: ASTM A108/A29 Gr 1010 – 1020, also to conform to AWS D1.1 Chapter 7. Mechanical properties to meet AWS D1.1, Table 7.1 requirements for Type "B"

Studs,  $F_u = 65$  ksi,  $F_y = 51$  ksi. Stud dimensions to conform to AWS D1.1 Figure 7.1. Mechanical properties to be verified by Mill Certificates.

- J. Track and Studs, Cold Formed:
  - 1. Rust Inhibitive Coated: ASTM A1003 Gr ST33H or ST50H (Coating Designation G60)
  - 2. Galvanized: ASTM A653 SS Gr 33 or 50 Class 1 (Coating Designation G60)
- K. Infinite Panel Anchors: ASTM A510 Gr 1006-1012.
- L. Electroplated per ASTM B633.  $F_u/F_y = 60/45$  ksi minimum.
- M. T-31 Stone Anchor: ASTM F593 Type 304, 1/4" Diameter
- N. Finish of steel plates and fabrications exposed to weather items shall be protected from corrosion by one of the following means:
  - 1. Hot Dipped Galvanized Coating per ASTM A123 or ASTM A153.
  - 2. Zinc Plating (electroplating) per ASTM B633, Type III, SC2.
  - 3. Weld through inorganic Zinc Primer – SSPC-Paint 30 single (1) shop coat (2 dry mils)
  - 4. Touch up all removed coatings due to welding/grinding with Zinc Rich Paint conforming to DOD-P-21035A or MIL-P-26915-D. Acceptable products include or equal (with a minimum 92% dry zinc content):
    - a. Rust-Oleum 2117
    - b. ZRC Galvilitite
    - c. Rust-Oleum 2185
    - d. ZRC 221
    - e. ZRC Cold Galvanizing Compound
- O. Bearing Pads: Provide bearing pads for precast concrete units as indicated on Drawings.
  - 1. Random oriented fiber reinforced pads (ROF pads): ASTM D 2240 Shore A Hardness 75, ASTM D575 compressive strength 8,000 psi minimum.
  - 2. Cotton Duck layer reinforced: ASTM D2240 Shore A Hardness 90, ASTM D575 compressive strength 10,000 psi minimum. Conform to Division II, Section 18.10.2 of AASHTO Standard Specifications for Highway Bridges.
  - 3. Sliding Bearing Pads: Polytetrafluoroethylene (PTFE), bonded to ROF of Cotton Duck bearing pads as noted in 1 or 2 above.
  - 4. Plastic: Multi-monomer plastic strips shall be non-leaching and support construction loads with no visible overall expansion. Minimum ASTM D 695 compressive strength of 8,000 psi.
- P. Accessories: Provide clips, hangers, and other accessories required for installation of Project units and for support of subsequent construction or finishes.

## 2.6 GROUT MATERIALS

- A. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C1107.
- B. Hollowcore Plank Keyway and Cell Grout: 3-Part Sand, 1-Part Cement, minimum compressive strength 3,000 psi.
- C. Type-2 Reinforcing Splice Sleeve Grouts: Proprietary grouts specified by the splice sleeve manufacturer. See splice sleeve Evaluation Service Reports (ESR's) or equivalent for requirements.

## 2.7 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type of concrete required.
- B. Design mixes may be prepared by independent testing facility or by qualified precast manufacturing plant personnel, at precast manufacturer's option.
- C. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for each type of concrete required, complying with ACI 301.
- D. Produce concrete consisting of specified Portland cement, aggregates, admixtures, and water to produce properties and compressive strength as required by the structural design of the precast elements and/or the Construction Documents.
- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Design-Build Contractor before using in the work.
- F. Admixtures:
  - 1. Use air-entraining admixture in concrete where air entrainment is required by the Construction Documents.
  - 2. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Design-Build Contractor's acceptance.
  - 3. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

## 2.8 FABRICATION

- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL 117, and as specified for types of units required.
- B. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.
  - 1. Addition of water to batch will not be permitted.
  - 2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
  - 3. When the air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1 1/2 hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.
- C. Cast-in Embedments and Anchorages: Accurately position cast-in embedments and anchorages and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or placing of concrete.
- D. Holes and sleeves 3 inch and larger in diameter shall be coordinated with the design and shown on the shop drawings. Blockouts shall not violate concrete cover on reinforcement unless corrosion protection of bars is provided. Holes smaller than 3 inch in diameter may be plant cut, field cut or cored only with the approval of the Precast Structural Engineer.
- E. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely



affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.

- F. Clean reinforcement of loose rust, mill scale, earth, and other materials which reduce or destroy bond with concrete. A light uniform coating of oxidation without signs of pitting is acceptable.
- G. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by chairs, runners, bolsters, spacers and hangers, as required.
- H. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- I. Pretensioning of tendons for prestressed concrete may be accomplished either by single strand tensioning method or multiple-strand tensioning method. Comply with PCI MNL 117 requirements.
- J. Infinite Façade Framing:
  - 1. Frame shall be a prefabricated welded frame produced in accordance with the reviewed Shop Drawings.
  - 2. Stud Frame Tolerances:
    - a. Vertical and horizontal alignment = 1/4" in 10'
    - b. Spacing of framing members = +/-3/8"
    - c. Squareness of frame (difference of diagonals) = +/-3/8"
    - d. Overall size of frame = +/-3/8"
    - e. Location of bearing connections = +/-1/4"
    - f. Location of embeds, frame items, and inserts other than bearing connections = +/-1/2"
- K. Place concrete in a continuous operation to prevent formation of seams, cold-joints, or planes of weakness in precast units. Comply with requirements of ACI 304. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to reinforcement and cast in items.
- L. Identification: Provide markings to identify cast unit name and date of cast complying with markings indicated on final shop drawings. Markings to be placed on a surface which will not show in the finished structure.
- M. Curing by low-pressure steam, by steam vapor, by radiant heat and moisture, or other similar process may be employed to accelerate concrete hardening and to reduce curing time.
- N. Delay de-tensioning of prestressed units until concrete has attained indicated minimum design release compressive strength, as established by test cylinders.
  - 1. If concrete has been heat-cured, perform de-tensioning while concrete is still warm and moist, to avoid dimensional changes which may cause cracking or undesirable stresses in concrete.
  - 2. Detensioning of pretensioned tendons may be accomplished either by gradual release of tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

- O. Exposed panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints, shall be uniform and straight. Finish exposed-face surfaces of architectural precast concrete units to match approved sample.
1. Refer to PCI's Architectural Precast Concrete - Color and Texture Selection Guide
  2. As-Cast Surface Finish: Provide surfaces to match accepted sample or mockup units for acceptable surface air voids, sand streaks, and honeycombs.
  3. Textured-Surface Finish: Impart texture by form liners or inserts, to match accepted sample or mockup units for acceptable surface air voids, sand streaks, and honeycombs, with uniform color and texture.
  4. Bush hammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates to match accepted sample or mockup units.
  5. Exposed Aggregate Finish: Use chemical retarding agents applied to molds, and washing and brushing procedures, to expose aggregate and surrounding matrix surfaces after form removal to match accepted sample or mockup units.
  6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces to match accepted sample or mockup units.
  7. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces to match accepted sample or mockup units. Protect hardware, connections, and insulation from acid attack.
  8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures to match accepted sample or mockup units.
  9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures to match accepted sample or mockup units.
  10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing to match accepted sample or mockup units.
  11. Thin Brick Facings:
    - a. Place form liner templates accurately to provide grid for brick facings. Provide solid backing and supports to maintain stability of liners while placing bricks and during concrete placement.
    - b. Match appearance of sample units.
    - c. Securely place brick units face down into form liner pockets and place concrete backing mixture.
    - d. After stripping units, clean faces and joints of brick facing
  12. Stone Veneer Facings:
    - a. Accurately position stone facings to comply with requirements of and in locations indicated on Shop Drawings. Install anchors, supports, and other attachments indicated by design engineer to secure stone in place. Maintain projection requirements of stone anchors into concrete substrate.
    - b. Stone Anchor Shear and Tensile Capacity: Use anchors per approved design.
    - c. Stone to Precast Concrete Anchorages: Provide anchors in numbers, types and locations required to satisfy specified performance criteria. Locate anchors per design.

## PART 3 - EXECUTION

### 3.1 PRODUCT TRANSPORTATION AND HANDLING

- A. Handle and transport panels in a position consistent with their shape and design in order to avoid excessive stresses or damage.

- B. Support panels during shipment on non-staining shock-absorbing material as needed to prevent damage.

### 3.2 PRE-INSTALLATION

- A. General Contractor's Responsibility:
  - 1. The General Contractor shall provide the control layout grid lines, including grades, at each building elevation on each floor receiving panels.
  - 2. The General Contractor shall provide true, level, and clean support and attachment surfaces.
  - 3. The General Contractor shall provide for the accurate (+/-1/2" in all directions) placement and alignment of connection hardware on the structure.
  - 4. The General Contractor shall be responsible for patching fireproofing after panel installation.
  - 5. The General Contractor shall confirm that the dimensions and tolerances of the structure allow for proper installation of the panels.
- B. Erector's Responsibility: Prior to installation of the panels, notify the General Contractor of any discrepancies discovered which affect the work under this contract. Commencement of installation does not constitute acceptance of the structure.

### 3.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation.
- B. Store units to prevent cracking, distortion, or other physical damage, and such that panel mark numbers are visible.
- C. Lift and support units at designated lift points.
- D. Deliver precast anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions, and directions as required for installation.

### 3.4 INSTALLATION

- A. Unloading Areas and Access: Clear all-weather unloading areas and access roadways around the building and in the building (where appropriate) shall be provided and maintained by the General Contractor so that the hauling and erection equipment for the Architectural Precast, and/or Infinite Panels may operate under their own power.
- B. Safety Aspects: The General Contractor shall provide all required traffic controls, barricades warning lights and/or signs to ensure a safe worksite.
- C. General: Furnish, install, and subsequently remove all temporary elements required for shoring or bracing of panels in place until permanently attached.
- D. Welding: Perform welding in compliance with AWS D1.1, AWS D1.3 and/or AWS D1.4 including qualification of welders.
- E. Protect units from damage by field welding or cutting operations and provide noncombustible shield as required.

- F. Repair damaged metal surfaces by cleaning and applying a coat of liquid galvanizing repair compound to galvanized surfaces and compatible primer to painted surfaces.
- G. Powder-Actuated Fasteners: Do not use powder-actuated fasteners for surface attachment of accessory items in precast prestressed units unless accepted by Structural Engineer and Precast Engineer of Record.
- H. Final Connection of Panels to Structure: Panels shall be attached to the structure as shown in the reviewed shop drawings. All modifications made to details shown on the shop drawings shall be submitted in final As-Build Drawing Set.
- I. Connection Verification: The installer shall verify that all connections are made per reviewed connection details.
- J. Installation Tolerances: Install precast units without exceeding tolerance limits as specified in PCI MNL 135 Tolerance Manual for Precast
- K. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout areas specified on the approved construction documents as follows:
  - 1. Refer to manufacturer recommendations for mixing and placement of all grouted products.
  - 2. Shrinkage-resistant grout consisting of premixed compound and water is to provide a flowable mixture without segregation or bleeding.
  - 3. Unless noted otherwise by the precast designer, provide forms or other acceptable methods to retain grout in place until sufficiently cured. Where dry packing is specified, pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it hardens.

### 3.5 CLEANING

- A. Cleaning methods shall be approved by manufacturer
- B. Use care to prevent damage to architectural precast surfaces and to adjacent materials
- C. Surface must be thoroughly rinsed with clean water immediately after using cleaner
- D. At completion of the project, General Contractor shall be responsible for final cleaning and wash down of building

### 3.6 SEALER

- A. Seal exposed Architectural Precast, and/or Infinite Panel surfaces, where indicated on contract drawings, with one coat of water repellent coating in accordance with product manufacturer's recommendations. Use Prosoco Sure Klean Weather Seal Siloxane PD or approved equal.
- B. Surfaces to be free of dirt, dust, and other foreign material immediately prior to sealer application. The precast manufacturer, (Clark Pacific) may factory apply sealer.
- C. Patches or other work on panel surfaces which have removed sealer shall be resealed by the responsible party.
- D. Precast manufacturer shall not be responsible for appearance of materials applied outside of their contract and scope of work.

### 3.7 PATCHES AND REPAIRS

- A. Patching of exposed-to-view surfaces of panels, when required, shall be performed to be consistent with industry standards.
- B. Repairs shall be sound, permanent, and meet the finish requirements of the project.
- C. Color and texture should be reasonably matched to adjoining surfaces and show no apparent line of demarcation between original and repaired work when viewed from a distance of 20'.

### 3.8 ACCEPTANCE

- A. Immediately after the erection is completed, final inspection and acceptance of the erected Architectural Precast, and/or Infinite Panels shall be made by the Architect and General Contractor to verify conformance with plans and specifications. In cases where installation is phased, panels shall be inspected and approved in phases.
- B. Patching and Repairs: Patching and repairs to be reviewed per PCI MNL 117, Section 2.10.
- C. Defective Work: Precast concrete units which do not conform to specified requirements, including strength, tolerances, and finishes, and cannot be repaired per industry standards shall be replaced with precast concrete units that meet requirements of this Section.

### 3.9 WARRANTY:

- A. All labor and materials under the Architectural Precast, and/or Infinite Panel manufacturer's contract shall be warranted by the manufacturer for a period of one (1) year following final approval of the panels by the Architect. Any additional labor or material warranties, i.e. caulking, shall be passed through to the General Contractor with no responsibility by the manufacturer.

END OF SECTION 03 45 00