PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Architectural precast concrete.
   B. Supports, anchors, and attachments.

1.02 RELATED REQUIREMENTS
   A. Section 03.20.00 - Concrete Reinforcing.
   B. Section 03.30.00 - Cast-in-Place Concrete: Admixtures.
   C. Section 04.20.00 - Unit Masonry.
   D. Section 07.62.00 - Sheet Metal Flashing and Trim: Reglets recessed in units.
   E. Section 07.92.00 - Joint Sealants: Sealing perimeter and intermediate joints.

1.03 REFERENCE STANDARDS
   A. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010 (Errata 2012).
   B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
   G. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.
   O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete; 2012.
S. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2011 w/Errata.
V. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; Precast/Prestressed Concrete Institute; 2007.
X. PCI MNL-122 - Architectural Precast Concrete; Precast/Prestressed Concrete Institute; 2007, Third Edition.
Y. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1988, Second Edition.
Z. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; Precast/Prestressed Concrete Institute; 2000.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.05 SUBMITTALS
A. See Section 01.30.00 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, integral insulation, insulated panel system connectors, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.
   1. Include details of mix designs.
   2. Include structural design calculations.
D. Fabricator's Qualification Statement: Provide documentation showing precast concrete fabricator is accredited under IAS AC157.
E. Sustainable Design Reporting: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete, mix design(s) used showing the quantity of Portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use Material Content Form.
F. Maintenance Data: Indicate surface cleaning instructions.

1.06 QUALITY ASSURANCE
A. Design Engineer Qualifications: Design precast concrete units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in Tennessee.
B. Fabricator Qualifications:
   1. Firm having at least 5 years of documented experience in production of precast concrete of the type required.
   2. Plant certified under Precast/Prestressed Concrete Institute Plant Certification Program; product group and category A1 - Architectural Precast Concrete.

C. Welder Qualifications: Qualified within previous 12 months in accordance with AWS D1.1/D1.1M and AWS D1.4/D1.4M.

1.07 **MOCK-UP**
   A. Construct temporary mock-up, 4 feet long by 2 feet wide, with lifting device, and attachment points, and finish in accordance with approved sample.
   B. Locate where directed.
   C. Mock-up may not remain as part of the Work.

1.08 **DELIVERY, STORAGE, AND HANDLING**
   A. Handling: Lift and support precast units only from support points.
   B. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.
   C. Protect units to prevent staining, chipping, or spalling of concrete.
   D. Mark units with date of production in location that will be concealed after installation.

**PART 2 PRODUCTS**

2.01 **MANUFACTURERS**
   A. Architectural Precast Concrete:
      1. Any manufacturer holding a PCI Group A Plant Certification for the types of products specified; see [www.pci.org](http://www.pci.org).
      2. Substitutions: See Section 01.60.00 - Product Requirements.

2.02 **PRECAST UNITS**
   A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
      1. Concrete Face Mix: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent; comply with ACI 301.
      2. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
      3. Calculate structural properties of units in accordance with ACI 318.
      4. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
      5. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.
   B. Finish Type A: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.

2.03 **REINFORCEMENT**
   A. Comply with requirements of Section 03.20.00.

2.04 **CONCRETE MATERIALS**
   A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   B. Other Cementitious Materials:
      1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.
2. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.
E. Surface Finish Aggregate: Conforming to sample in office of Architect.
F. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range.
G. Water: Clean and not detrimental to concrete.
H. Air Entrainment Admixture: ASTM C260/C260M.
I. Grout:
   1. Non-shrink, non-metallic, minimum 10,000 psi, 28 day strength.

2.05 SUPPORT DEVICES
A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
   1. Clean surfaces of rust, scale, grease, and foreign matter.
   2. Galvanize after fabrication in accordance with requirements of ASTM A123/A123M.
B. Bolts, Nuts, and Washers: ASTM A325 (A 325M) heavy hex structural bolts, Type 1, plain, with matching ASTM A563 (A563M) nuts, and washers as follows:
   1. Compressible Direct Tension Indicators: ASTM F959, Type 325.
C. Primer: Zinc rich type.

2.06 ACCESSORIES
A. Bearing Pads: High density plastic; Shore A Durometer ____; 1/8 inch thick, smooth both sides.
B. Reglets: Specified in Section 07.62.00.

2.07 FABRICATION
A. Fabricate in conformance with PCI MNL-117 and PCI MNL-135.
B. Maintain plant records and quality control program during production of precast units. Make records available upon request.
C. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
D. Maintain consistent quality during manufacture.
E. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
F. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.
G. Place recessed flashing reglets continuous and straight.
H. Locate hoisting devices to permit removal after erection.
I. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
J. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.08 FABRICATION TOLERANCES
A. Conform to PCI MNL-117 and PCI MNL-135.
2.09 SOURCE QUALITY CONTROL
   A. Provide testing and analysis of concrete mix.
   B. Take 4 concrete test cylinders for every 10 cu yd of concrete placed; make and cure in accordance with ASTM C31/C31M.
   C. Take 1 slump tests for every 100 test cylinders in accordance with ASTM C143/C143M.
   D. Take one air entrainment test cylinders for each set of exterior concrete test cylinders taken.
   E. Take water absorption test in accordance with PCI MNL-117.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION
   A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION
   A. Erect units without damage to shape or finish. Replace or repair damaged panels.
   B. Erect units level and plumb within allowable tolerances.
   C. Align and maintain uniform horizontal and vertical joints as erection progresses.
   D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.
   E. Weld units in place. Perform welding in accordance with AWS D1.1/D1.1M.
   F. Provide non-combustible shields during welding operations.
   G. Touch-up field welds and scratched or damaged primed painted surfaces.
   H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit.
   I. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES
   A. Erect members level and plumb within allowable tolerances. Conform to PCI MNL-135, except as specifically amended below.
      1. Plan Location from Building Grid Datum: Plus or minus 3/8 in.
      2. Top Elevation from Nominal Top Elevation: Plus or minus 3/8 inch.
      3. Maximum Plumb Variation Over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.
      6. Differential Bowing or Camber as Erected Between Similar Adjacent Members: Plus or minus 3/16 inch.

END OF SECTION