SECTION 03415 – PRECAST CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including other Division 1 Specification Sections apply to this section.

1.02 SUMMARY

A. This Section includes precast concrete units, including the following:
   1. Metering Pit.

B. Related Sections include the following:
   1. Section 01400 “Quality Control Services” for inspections testing to verify compliance with Contract Documents.
   2. Section 02200 “Earthwork” for excavation and backfilling of precast structures.
   3. Section 02260 “Excavation Support and Protection” for excavation protection system (EPS).

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast concrete units and connections capable of withstanding design loads within limits and under conditions indicated.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixes: For each concrete mix.

C. Shop Drawings: Detail fabrication and installation of precast structural concrete units. Indicate plans, dimensions, cross sections, openings, and types of reinforcement, including special reinforcement.
   1. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Concrete materials.
   2. Reinforcing materials
   3. Admixtures.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast concrete units similar to those indicated for this Project and with a record of successful in-service performance.
   1. Assumes responsibility for engineering precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
   2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast concrete that are similar to those indicated for this Project in material, design, and extent.
   3. Has sufficient production capacity to produce required units without delaying the Work.

C. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators' precast concrete units complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

PART 2 - PRODUCTS

2.01 FABRICATORS

A. Available Fabricators: Subject to compliance with requirements, fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Superior Concrete.
   2. Precast Concrete Sales.
   3. Fort Miller.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

C. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 116, and as follows:
   1. For uncoated reinforcement, use all-plastic bar supports.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source.

B. Lightweight Aggregates: ASTM C 330.

C. 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.

D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

E. Water-Reducing Admixture: ASTM C 494, Type A.

2.04 CONCRETE MIXES

A. Prepare design mixes for each type of concrete required.
   1. Limit use of fly ash and silica fume to not exceed, in aggregate, 25 percent of portland cement by weight.

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

C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.

D. Normal-Weight Concrete: Proportion mixes 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:
   1. Compressive Strength (28 Days): 5000 psi.
   2. Maximum Water-Cementitious Materials Ratio: 0.40.
   3. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows, with a tolerance of plus or minus 1-1/2 percent:
      a. Air Content: 6 percent for 1-inch- nominal maximum aggregate size.
      b. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.
      c. Air Content: 7 percent for 1/2-inch- nominal maximum aggregate size.
      d. Air Content: 2.5 to 4.5 percent.

E. Lightweight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
   1. Compressive Strength (28 Days): 4000 psi.
   2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft., plus or minus 3 lb/cu. ft., according to ASTM C 567.
   3. Add air-entraining admixture at manufacturer's prescribed rate to result in lightweight concrete at point of placement having an air content as follows:
      a. Air Content: 4 to 6 percent for 3/4-inch- nominal maximum aggregate size.
      b. Air Content: 4.5 to 7.5 percent for 3/8-inch- nominal maximum aggregate size.
      c. Air Content: 4 percent, minimum.

F. Other Admixtures: Use water-reducing, admixtures according to manufacturer's written instructions.

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

2.05 FABRICATION

A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances.
   1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.

B. Cast-in openings larger than 10 inches in diameter or 10 inches square according to Shop Drawings. Smaller holes may be field cut by trades requiring them, as approved by Engineer.

C. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
   2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
   3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
   4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

D. Mix concrete according to requirements in this Section. After concrete batching, no additional water may be added.

E. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

F. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items.

G. Comply with ACI 306.1 procedures for cold-weather concrete placement.

H. Comply with ACI 305R recommendations for hot-weather concrete placement.

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

J. Cure concrete, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

K. Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true.

L. Finish formed surfaces of precast structural concrete as indicated for each type of unit, and as follows:

1. Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.

M. Smooth steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

2.06 PROTECTIVE COATINGS

A. Description: One or two coat, coal tar epoxy, 16-20 mils dft, thickness, factory coated on exterior surfaces below finish grade. Coal tar epoxy to be Tnemec Series 44-465 as per Section 09800 or approved equal.

2.07 ACCESSORIES

A. Install access doors as shown on the drawings and as per manufacturer's instructions.

2.08 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to ACI requirements.

B. Strength of precast concrete units will be considered deficient if units fail to comply with the following:
1. Units fail to comply with compressive-strength test requirements.
2. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
3. Units are damaged during handling and erecting.

C. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Offloading: The General Contractor will provide a crane for offloading the precast meter pit sections and set the base unit on prepared compacted gravel base as shown on the drawings.

B. Erection Tolerances: Install precast concrete units level, plumb, square, and true.

3.03 FIELD QUALITY CONTROL

A. Remove and replace work that does not comply with specified requirements.

3.04 CLEANING

A. Clean exposed surfaces of precast concrete units after erection to remove markings, dirt, and stains.
   1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
   2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION 03415