

SECTION 03400 – STRUCTURAL PRECAST CONCRETE CONSTRUCTION STANDARD

PART 1: GENERAL

1.01 SCOPE OF STANDARD

- A. This standard provides general guidance concerning the specific preferences of the University of Texas at Austin for the design, fabrication and erection of structural precast concrete systems.

1.02 RELATED STANDARDS

- A. Structural Systems.
- B. Cast-In-Place Concrete
- C. Joint sealants.

1.03 REFERENCE STANDARDS

- A. PCI Design Handbook.
- B. PCI MNL-116 Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
- C. ACI 318 – Latest edition of Building Code Requirements for Reinforced Concrete.
- D. ACI 301 Specifications for Structural Concrete for Buildings.
- E. CRSI – Manual of Standard Practice.
- F. American Welding Society (AWS) D1.1 – Structural Welding Code – Steel.
- G. American Society for Testing and Materials (ASTM) – Standard Specifications.

1.04 QUALITY CONTROL

- A. The precast concrete fabricator shall provide evidence of successful fabrication of precast concrete structures of similar size and complexity for a continuous period of at least five (5) years immediately prior to the bid date. The precast fabrication plant must be PCI certified under the PCI Plant Certification Program. Fabricator must also provide evidence that the plant has sufficient production capacity to produce the required units within the allotted time on the project schedule.
- B. The precast concrete erector shall provide evidence of successful erection of precast concrete structures of similar size and complexity for a continuous period of at least five (5) years immediately prior to the bid date.
- C. Qualifications for welding work: All welders and welding processes shall be qualified in accordance with AWS “Standard Qualification Procedure.” All welders shall have passed AWS qualification tests within the past six months.
- D. The building erector is required to visit the project site at least 30 days prior to start of erection to review existing site conditions such as site access, clearances, utilities, adjacent structures, overhead obstructions, site topography and security requirements.

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1.05 SUBMITTALS

- A. Fabricator shall submit, as a minimum, the following:
 - 1. Mill certificates for all reinforcing steel, steel embeds, and prestressing tendons.
 - 2. Mix designs for all classes of concrete to be used in the project.
 - 3. Complete shop drawings, including placement plans, member sizes, inserts, reinforcing, embeds, connection details, bill of materials, dimensions of members, joints, and locations of splices.
 - 4. Submit complete structural design calculations sealed by a Registered Professional Engineer licensed in the State of Texas. Calculations shall be submitted for all members and connections, and shall include both vertical and lateral load analyses.
 - 5. Fire-Resistance Rated Precast Units – Where precast concrete units are shown or scheduled to meet certain fire resistance classifications, provide units tested and listed by Underwriters Laboratories (U.L.) in the U.L. Fire Resistance Directory, or with each unit bearing the U.L. label and marking.

PART 2: PRODUCTS

2.01 GENERAL

- A. All precast concrete and materials to produce the precast units shall be domestically manufactured, unless foreign sources are accepted by the University of Texas.

PART 3: EXECUTION

3.01 ERECTION

- A. Prior to erection, erector shall check elevations of concrete and masonry bearing surfaces, locations of anchor bolts and similar devices before proceeding with erection. Report any discrepancies to U.T. project representative.
- B. Erector is responsible for all temporary shoring and bracing.
- C. Level and plumb individual members and precast frame to within ACI tolerances.

3.02 QUALITY CONTROL

- A. The University of Texas will contract with an independent testing agency to provide inspection services during the course of the project. The fabricator and the erector shall provide access to all parts of the work for inspection by the testing agency to accomplish its work. The testing agency may require access to the fabricator's shop at any time during fabrication or just prior to shipment of the precast concrete units.
- B. The University of Texas reserves the right to reject any and all materials or workmanship not complying with specified requirements at any time.

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- C. Fabricator and/or erector shall correct all deficiencies and work which is not in compliance with the specified requirements. Any additional testing or inspection costs will be at the expense of the fabricator/erector.

PART 4: DESIGN

4.01 GENERAL

- A. In the design of structural steel systems, the design engineer shall take into consideration the future flexibility of the system and the need to make frequent modifications to building systems.
- B. The detailing of connections and joints in precast concrete is particularly important in order to prevent cracking and reduce long-term maintenance problems in the structural system. Expansion and contraction of the structure due to thermal movements must be considered and dealt with appropriately in the design.
- C. The design engineer should also give careful consideration to exposure conditions and possible corrosion of the reinforcing in precast members. The cover requirements must be adjusted to ensure long-term serviceability of the system.
- D. If the Contractor is permitted to submit this as an alternate, there must be an agreement of design standards by UT-Austin _____? _____ the alternate system is equivalent.

4.02 DESIGN

- A. Refer to U.T. Structural Systems standard for design loads.
- B. Live load reduction shall be in accordance with the U.T. Structural Systems standard.
- C. Deflections - Unless approved by the U.T. Structural Engineer, steel member deflections shall be limited to the following:

Live Load Only	L / 360
Dead Load + Live Load	L / 240

In addition, the engineer should give due consideration to the control of excessive floor vibration and to the control of pounding on roofs. The engineer shall also consider the affect of deflections on architectural finishes attached to the structural members. In some cases, it may be necessary to provide greater stiffness than the above deflection limits require.

- D. Lateral Forces – In the design of precast concrete systems for lateral loads, the use of a braced frame (usually this accomplished with precast concrete shear walls) is preferred in order to reduce the chance of cracking in brittle finishes. The use of a Moment-Resisting Frame to resist lateral forces is at the discretion of the U.T. Structural Engineer.
- E. Prestressing Tendons – All prestressing tendons shall be 7-wire, low-relaxation strand meeting the requirements of ASTM A416. All tendons shall be bonded unless approved the University of Texas Structural Engineer.
- F. Control Joints in Toppings – The topping slabs in precast concrete systems tend to crack over essentially every joint between precast members. For instance, in parking

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garages the topping slab usually cracks at the ends of double tees and at the joints between adjacent double tees. In order to control these cracks, continuous control joints (minimum width = $\frac{1}{8}$ "") shall be installed in the topping slabs over all joints between the precast members below. This includes the joints between double tees and their supporting beams or walls and at the joint between adjacent double tees. The control joints may be hand scored with a long straight-edge (minimum length = 10 feet) before the concrete sets, or the joints may be sawcut with a soft-cut saw within 8 - 12 hours of concrete placement. After the concrete has cured, the joints shall be ground, primed, and sealed with a high quality, two component, traffic-grade polyurethane or polysulfide sealant.

- G. Expansion Joints – Expansion joints in the precast structural system must be sized appropriately and designed for the proper loading conditions. Expansion joint systems which are embedded or recessed into the concrete topping are preferred.

4.03 SYSTEMS TO AVOID

- A. Avoid precast members with excessive span/depth ratios. Deflections should be kept within acceptable limits.
- B. Avoid the use of unbonded tendons.
- C. Avoid steel yield strengths higher than 36 ksi, except for tubular steel members which can be 55 ksi.

END OF STANDARD 03400