SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1: GENERAL

1.01 Scope of Standard

A. This standard provides general guidance concerning the specific preferences of the Texas State University for cast-in-place concrete.

B. Texas State University recognizes that project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification, it is expected that these guidelines will govern the design and specifications for Texas State University projects.

1.02 Design Guidelines

A. All sidewalks will be designed and constructed following Texas State University Campus Master Plan.

1.03 Reference Standards

A. The current editions of the applicable American Concrete Institute (ACI) publications, to the extent applicable in each reference.

B. The current editions of the applicable American Society for Testing and Materials (ASTM) specifications, to the extent applicable in each reference.

C. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practices.

1.04 Environmental Controls

A. Rinsing out of the transit mix trucks, washing or wetting of concrete, site cleanup, or other activity related to water at the site shall be in strict conformance with all EPA requirements for the prevention of water runoff to storm water sewers or creeks.

PART 2: PRODUCTS

2.01 Materials

A. All concrete shall be normal weight concrete weighing not more than 145 pcf, unless otherwise required.

B. Cement

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

1. Cement shall conform to one of the following:

Type/ASTM No.	Description
IA/C150	Standard Portland cement.
IIA/C150	Provides moderate sulfate resistance or moderate heat of hydration.
IIIA/C150	Produces high early strength.
IPA/C595	Type I cement blended with a pozzolan (20% by weight maximum of the cement/pozzolan blend).
E-IKA/C845	Contains anhydrous calcium aluminosulfate, calcium sulfate, and uncombined calcium oxide.

2. Only one type and brand of each type of cement will be permitted in any one structure.

C. Flash

1. Conform to ASTM C618, Class F. Class F flyash is generally the best class of flyash to use. However, flyash varies from area to area and from year to year so the source and quality should always be checked carefully.

2. Flyash shall be produced from a single known and consistent source.

3. The amount of flyash used shall be no greater than 20 percent by volume of the specified cement volume (cement is specified by weight, which can be converted to an equivalent volume).

4. Flyash shall not be used in architecturally exposed concrete.

D. Aggregates

1. Aggregates shall conform to ASTM C33.

2. Use coarse aggregate from only one source and fine aggregate from only one source for exposed concrete in a single structure.

E. Mixing Water shall be potable.

F. Admixtures

1. The use of a super plasticizer is recommended, especially where waterproofing is required since it helps to produce a denser, more water-resistant concrete.

G. Chlorides are not permitted in any form.

H. Reinforcing Steel

1. Conform to ASTM A615, Grade 60 (#3 bars shall be Grade 40).

2. Welded wire fabric is not allowed as reinforcing.

I. Water stops

1. A major problem with flexible water stops is that they are often displaced during concrete placement. Thus water tightness is impaired. The drawings and/or specifications should carefully address proper placement of flexible water stops. Some water stops are manufactured with wire embedded in them that allow the water stops to be tied off more securely during concrete placement. Since water stops are critical to water tightness in a structure, these reinforced water stops should be considered.

2. Splices should be fused or "welded" in accordance with the material chosen and the manufacturer's recommendations.

3. Where "adhesive" or "rope" water stops are specified, the products shall have a proven life consistent with expected life of the structure being designed.

2.02 Proportioning of Concrete

A. Select proportions of ingredients to produce a concrete having proper workability, durability, strength, and appearance. Proportion ingredients to produce a mixture that will work readily into corners and angles of forms and around reinforcement by methods of placing and consolidation employed on the project.

B. The maximum recommended allowable water/cement or water/cement-pozzolan ratio shall not exceed 0.47. Include free water in the aggregate in all water/cement or water/cement-pozzolan ratio computations.

C. Air entrainment shall be included in all concrete mixes, unless required otherwise.

PART 3: EXECUTION

3.01 Rinsing Trucks

A. Rinsing of transit mix trucks or other concrete mixing devices shall either be off of the Owner's site or onsite in a contained area, which does not allow run-off. If

rinsed in a contained area onsite, run-off must be prevented until concrete dries, at which time it must be removed as solid debris.

3.02 Reinforcing

A. Reinforcing bars field cut on the job shall be cut by shearing or sawing.

B. Field cutting with a torch is not acceptable.

C. Welding of reinforcing bars is prohibited. Mechanical methods for splicing bars are preferred.

3.03 Construction Joints

A. Construction joints should be shown on the drawings to assure that the Contractor does not place joints where water tightness or strength of the structure will be impaired. A note should be placed on the drawings that all construction joints not shown on the drawings should be submitted to the Engineer for approval.

B. Constructability is very important to assure good concrete placement. Therefore, the Engineer should be careful in reviewing proposed joints so that those necessary for constructability are not rejected.

C. 100% of reinforcing shall be continuous across construction joints.

3.04 Control Joints

A. Control joints are herein described as joints that are designed to allow for movement either from contraction or expansion.

B. Contraction joints allow for contraction of the concrete and also function as construction joints.

1. Fifty percent of reinforcing shall be continuous across contraction joints.

2. If saw-cutting of contraction joints is allowed, the following shall be adhered to:

a. During hot and dry periods, saw-cutting should occur within 4 to 12 hours of concrete placement.

b. During cool and moist periods, saw-cutting should occur within 24 hours of concrete placement.

3. Where applicable, use water stops to assure water tightness.

C. Expansion joints allow for expansion of the concrete and also function as construction and contraction joints.

1. Reinforcing shall not be continuous across expansion joints, except for shear transfer as noted below.

2. For shear transfer, use smooth dowels with expansion caps on one side.

3. Expansion joints should be considered at approximately 120 foot spacing as a general rule.

4. Where applicable, use water stops to assure water tightness.

3.05 Concrete Finishing

A. Carefully specify the types of concrete finishing required for all areas of the structure to assure proper finishing and to avoid costly change orders due to lack of definition on the drawings or in the specifications.

1. Rough form finish shall be in accordance with ACI 301, Section 10.2.1. This is the roughest finish and is recommended for surfaces that will not be visible in the completed structure.

2. Smooth form finish shall be in accordance with ACI 301, Section 10.2.2. A smooth form finish is recommended for surfaces to be coated or where appearance is not important.

3. Smooth rubbed finish shall be in accordance with ACI 301, Section 10.3.1. A smooth rubbed finish requires an initial smooth form finish as required above. A smooth rubbed finish is recommended for surfaces that will not be coated and do not require a highly finished appearance. A smooth rubbed finish should also be used if recommended by the manufacturer of the specified protective coating(s).

4. Grout cleaned finish shall be in accordance with ACI 301, Section 10.3.2. A grout cleaned finish requires an initial smooth form finish as required above. A grout cleaned finish is recommended for surfaces that will not be coated but do require a highly finished appearance. A grout cleaned finish is labor intensive and requires some skill to produce the desired results. Therefore, the Contractor’s procedure must be monitored carefully to assure that a proper finish is obtained. Depending on the project, a protective coating can be more cost effective.

5. Tops of walls and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed. Float unformed surfaces to a texture consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

B. Carefully specify the finishing slabs and similar flat surfaces for all areas of the structure to assure proper finishing and to avoid costly change orders due to lack of definition on the drawings or in the specifications.

1. Floated finish. Usually most slabs and flat surfaces receive a floated finish, except as noted below.

2. Troweled finish. Usually a troweled finish is specified where a nicer finished appearance is desired or where floor coverings will be applied.

3. To obtain a broom, belt, or rake finish, immediately upon completing a floated finish, draw a broom or rake across the surface to give a coarse transverse scored texture. Usually a broom, belt, or rake finish is specified for sidewalks and ramps.

3.06 Testing and Control

A. Texas State University shall employ, a commercial testing laboratory, to prepare and test the initial mix design for each class of concrete specified.

B. In addition to the initial mix design(s), Texas State University shall employ, a commercial testing laboratory, to prepare and test the mix design for each class of concrete for which the material source has been changed.

C. Field Test Cylinders During Construction.

1. Mold four cylinders for each set of tests specified.

2. Test one specimen at 7 days and two at 28 days according to ASTM C39. If one, or both, of the 28-day tests indicate a compressive strength below the strength required, the fourth specimen shall be tested at 56 days. If all tests indicate a compressive strength below the strength required, Texas State University-San Marcos may, at their discretion, direct the Contractor to perform additional testing at no additional cost to Texas State University.

3.07 Testing of Deficient In-place Concrete

A. The strength of the concrete will be considered potentially deficient if the averages of two consecutive sets of strength test results fail to equal or exceed the specified strength or if any individual strength test result falls below the specified strength. Testing may be required as directed by the Engineer.

B. Concrete work not having the required strength, as determined by the Engineer, shall be replaced at the Contractor's expense.

C. The Contractor shall bear all costs incurred in providing the additional testing and/or analyses required as a result of deficient in-place concrete. All costs as a result of delays due to additional testing and/or analyses will be at the Contractor's expense, with no extension of contract length, regardless of the outcome of the testing.

3.08 Acceptance of Concrete Work

A. Formed surfaces resulting in a configuration of members smaller than permitted under the tolerances specified shall be considered deficient and repaired or replaced as directed by the Engineer.

B. Concrete members cast in the wrong location shall be rejected if the strength, appearance, or function of the structure is, in the Engineer's opinion, adversely affected or if misplaced members interfere with other construction. If rejected, remove members cast in the wrong location and repair or replace at the Contractor's expense as directed by the Engineer.

C. All work required under this section shall be at the Contractor's expense, with no extension of contract length.

END OF SECTION 03 30 00