

PART 1: GENERAL

1.01 Scope of Standard

- A. The scope of this standard includes recommendations for the specification of cast-in-place concrete.

1.02 Related Standards

- A. Structural Systems (currently Sam Houston State University Office of Facilities Planning and Construction Owner’s Design Guidelines, Section K, Structural Criteria).

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

- 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.

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

C. Flyash

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 shall not be used without written permission from SHSU Project Manager.

I. Water-stops

1. The drawings and/or specifications should carefully address proper placement of flexible water-stops.
2. Water-stops shall be installed as per 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. Under no circumstances shall concrete be re-tempered with water after slump test and test cylinders are pulled. If water is added to mix not otherwise tested, a slump test and cylinder shall be pulled at the expense of the contractor.
- E. Contractor shall adhere to ACI guidelines for max time from batch to placement.
- F. Trucks with broken rotation counters will be returned to plant without placing concrete.

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 & Forms

- A. Reinforcing bars field cut on the job shall be cut by shearing or sawing. Field cutting with a torch is not acceptable.
- B. Welding of reinforcing bars is prohibited. Mechanical methods for splicing bars are preferred.
- C. All outside corners of structural concrete shall have a minimum $\frac{3}{4}$ " chamfer.
- D. Earth forming of all structural concrete must be approved by SHSU prior to start of construction.

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.
- D. Cold Joints will not be permitted unless approved by engineer previous to placement

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. 100 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.
 - 3. 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.
2. Smooth form finish shall be in accordance with ACI 301, Section 10.2.2.
3. Smooth rubbed finish shall be in accordance with ACI 301, Section 10.3.1.
4. For concrete with specified protective coating, finish shall be in accordance of manufacture guidelines.

5. Exterior concrete on walking surfaces shall be light broom finish. All others shall be smooth rub.

1. 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. In addition to the initial mix design(s), the Contractor shall be required to coordinate with, at his expense, a commercial testing laboratory, hired by the Owner, to prepare and test the mix design for each class of concrete for which the material source has been changed.

B. Field Test Cylinders During Construction.

1. Pull test cylinders and test slump per 50 yards of placement.
2. Mold four cylinders for each set of tests specified.

END OF STANDARD 03300