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346 PORTLAND CEMENT CONCRETE – CLASSIFICATION, STRENGTH, SLUMP AND AIR CONTENT.
(REV 3-28-11) (FA 5-18-11) (1-12)

SUBARTICLE 346-3.1 (Pages 320 - 321) is deleted and the following substituted.

346-3.1 General: The separate classifications of concrete covered by this Section are designated as Class I, Class II, Class III, Class IV, Class V and Class VI. Strength, slump, and air content of each class are specified in Table 2.

Substitution of a higher class concrete in lieu of a lower class concrete may be allowed when the substituted concrete mixes are included as part of the Contractor's Quality Control Plan, or for precast concrete, the Precast Concrete Producer's Quality Control Plan. The substituted higher class concrete must meet or exceed the requirements of the lower class concrete and both classes must contain the same types of mix ingredients. When the compressive strength acceptance data is less than the minimum compressive strength of the higher design mix, notify the Engineer. Acceptance is based on the requirements in Table 2 for the lower class concrete.

TABLE 2			
Class of Concrete	Specified Minimum Strength (28 day) (psi)	Target Slump Value (inches) (c)	Air Content Range (%)
STRUCTURAL CONCRETE			
I (a)	3,000	3 (b)	1.0 to 6.0
I (Pavement)	3,000	2	1.0 to 6.0
II (a)	3,400	3 (b)	1.0 to 6.0
II (Bridge Deck)	4,500	3 (b)	1.0 to 6.0
III (e)	5,000	3 (b)	1.0 to 6.0
III (Seal)	3,000	8	1.0 to 6.0
IV	5,500	3 (b) (d)	1.0 to 6.0
IV (Drilled Shaft)	4,000	8.5	0.0 to 6.0
V (Special)	6,000	3 (b) (d)	1.0 to 5.0
V	6,500	3 (b) (d)	1.0 to 5.0
VI	8,500	3 (b) (d)	1.0 to 5.0

(a) For precast three-sided culverts, box culverts, endwalls, inlets, manholes and junction boxes, the target slump value and air content will not apply. The maximum allowable slump is 6 inches, except as noted in (b). The Contractor is permitted to use concrete meeting the requirements of ASTM C 478 4,000 psi in lieu of Class I or Class II concrete for precast endwalls, inlets, manholes and junction boxes.

(b) The Engineer may allow a higher target slump when a Type F, G, I or II admixture is used, except when flowing concrete is used. The maximum target slump shall be 7 inches.

(c) For a reduction in the target slump for slip-form operations, submit a revision to the mix design to the Engineer.

(d) When the use of silica fume, ultrafine fly ash, or metakaolin is required as a pozzolan in Class IV, Class V, Class V (Special) or Class VI concrete, ensure that the concrete exceeds a resistivity of 29 KOhm-cm at 28 days, when tested in accordance with FM 5-578. Submit three 4 x 8 inch cylindrical test specimens to the Engineer for resistivity testing before mix design approval. Take the resistivity test specimens from the concrete of the laboratory trial batch or from the field trial batch of at least 3 yd^3. Verify the mix proportioning of the design mix and take representative samples of trial batch concrete for the required plastic and hardened property tests. Cure the field trial batch specimens similar to the standard laboratory curing methods. Submit the resistivity test specimens at least 7 days prior to the scheduled 28 day test. The average resistivity of the three cylinders, eight readings per cylinder, is an indicator of the permeability of the concrete mix.

(e) When precast three-sided culverts, box culverts, endwalls, inlets, manholes or junction boxes require a Class III concrete, the minimum cementitious materials is 470 lb/yd^3. Do not apply the air content range and the maximum target slump shall be 6 inches, except as allowed in (b).