

ITD & PEM

NCC April 2018



YOUR *Safety* • • • ► YOUR *Mobility* • • • ► YOUR *Economic Opportunity*



YOUR Safety ● ● ● ► **YOUR Mobility** ● ● ● ► **YOUR Economic Opportunity**

Silica Fume

- 4500^a psi, Minimum Cement -560 lbs
- ^a Overdesign is limited to a maximum **6,500** psi when produced in a laboratory. Cementitious material content may be reduced to meet the overdesign limits. The Engineer will waive the overdesign if the Contractor reduces the cementitious materials content by at least 10 percent.



ITD & PEM

- History
- Draft Specification



History

- ASR
 - 1950's
 - ASR Detected
 - 1980's
 - Test & Specification Limits
 - 2004
 - I 84





Today's Specification

Concrete Class in (100 psi) (28 day) ^(a)	Minimum Cementitious Content lb/yd ^{3(b)(c)}	Maximum Water Cement Ratio	Air Content Percent
45 and greater (d)(e)(f)(g)	660	0.44	0 - 6.0
35 to less than 45 (d)(e)(f)(g)	560	0.44	0 - 6.0
30	560	0.49	6.5 ± 1.5
Seal Concrete	660	0.60	0 - 6.0



Class 40 AF vs. 40AD

	Class 40 AF	Class 40 AD
Strength	4000 psi	4000 psi
Cementitious	560 lbs. minimum	No Minimum
Water Cement Ratio	0.44 Maximum	Not Specified
Air Content	6.5% +/- 1.5%	6% +/- 1.5% or 90% Durability Factor, T161 – Procedure A, 3% minimum



Class 40 AF vs. 40AD

	Class 40 AF	Class 40 AD
Aggregate	3/4" nominal	1-1/2" nominal
SCMs minimum (if used)	Fly ash -20% Slag- 20% Silica Fume -7.5% 20% Minimum	Fly ash -20% Slag- 20% Silica Fume - 5% 20 Minimum
SCMs maximum (if used)	Fly ash -25% Slag- 35% Silica Fume -10% 50 % Maximum	Fly ash -30% Slag- 50% Silica Fume -10% 50 % Maximum



40 AD

• Additional Requirements

- Rapid Chloride Permeability when tested in accordance with AASHTO T 277 - less than 3000 coulombs @ 28 days or surface resistivity of more than 16.5 k Ω -cm. when tested in accordance AASHTO T 358 at 28 days on 6 X 12 water cured cylinders.
- Length change when tested in accordance with AASHTO T 160, less than 0.038% at 28 days.
- Scaling, a visual rating of less than or equal to 2 when tested in accordance with ASTM C 672.
- Report the Modulus of Elasticity when tested in accordance with ASTM C 469
- Report Coefficient of Thermal Expansion when tested in accordance with AASHTO T 336
- Report the maximum theoretical density.



40 AD

- For Informational purposes only
 - Report the estimated time to cracking when tested in accordance with AASHTO T 334 (Ideally this test runs 180 days or more, may want to initially specify reporting a 28 day result with a final reported when available.)
 - Provide concrete with a system air metric (SAM) number target of 0.25 when tested in accordance with AASHTO TP 118.



40 AD

- Perform AASHTO T 318 a minimum of once per placement, and randomly thereafter within every 100 yds. Report the W/C ratio to the Engineer immediately after testing. Suspend placement and provide corrective action plan if W/C ratio exceeds mix design W/C ratio by 0.030.



40 AD

- **Wearing surface texturing.** Grinding may be used in place of tining at the discretion of the contractor.



40 AD

- **Surface Smoothness.** Profile the bridge deck and approach slabs, if applicable. Provide a concrete wearing surface with a maximum International Roughness Index of 70 inches per mile and localized areas not exceeding 150 inches per mile in any 25 foot segment when evaluated over the length of the bridge deck and associated approach slabs. Profile both sides of the lane, three feet from and parallel to each edge lane edge and average the result. Correct any section by diamond grinding as required to meet these limits.

