



# CDOT’s Performance Engineered Concrete Specification

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## Why make the change?

- Lower material cost
- Improve durability
- Encourage supplier innovation
- Optimizing local aggregate sources
- Lower environmental impact
- Most mixes were well above CDOT strength requirements by 1,000-2,500+ psi.

## Development History

- 2012 CRMCA & CDOT formed a task force to look into revising CDOT specifications to be less prescriptive.
- A research project with CU Denver “Developing Criteria for Performance-Based Concrete Specifications” was initiated to set performance criteria
- 2015 Allowed optimized gradations for Class P
- 2016 “Non-standard” mix design requirements set for various classes of concrete
  - Allowed cement contents outside standard
  - Allowed alternate aggregate blends
  - Allowed alternate cementitious material replacement limits.
- 2017 CDOT joins TPF-5(368) Performance Engineered Concrete Paving Mixtures
- 2018 Allowed SCC
- 2016-2018 despite industry requesting performance criteria allowances to replace prescriptive requirements, industry had not utilized the new criteria and stuck to the same old mixes that had been previously prescribed.
- 2018-2019 CDOT & Industry rewrote the specification to require performance testing and removed most prescriptive requirements

Old Requirement	New Requirement	Test Method
Minimum cement Contents	RCP or Surface Resistivity	ASTM C1202 @ 56 days for RCP
Class BZ, D, DT, G & P	<2,500 Coulombs or 12 kΩ-cm	AASHTO T358 @ 28 days for surface resistivity
Class S35 & S40	<2,000 Coulombs or 14 kΩ-cm	
Class S40	<1,500 Coulombs or 18 kΩ-cm	
Maximum cement contents	Shrinkage	CP-L 4103 @ 28 days
Class BZ, D, DT, P, S35 & S40	<0.050%	(Modified ASTM C157)
Class S40	<0.040%	
Slip formed concrete Slump	Edge slump < 0.25 inches <30% Surface voids	Box Test AASHTO T396

## Additional Requirements

- SCC Requirements when slump is greater than 9 inches
  - Slump flow between 20 - 26 inches (ASTM C1611)
  - Blocking assessment of 2.0 inches or less (ASTM C1621)
  - Maximum static segregation of 10% (ASTM C1610)
- Minimum of 20% Class F fly ash or 30% slag cement in Class P concrete.
- Up to 50% substitution of all C150 and Type IL C595 cements with fly ash and slag
- Up to 50% total cement content for C595 Type IP cements can be substituted with slag cement

## Field Control

- Water to Cementitious Material (w/cm) ratio in the field limited to trial mix w/cm ratio
- Slump in the field limited to a maximum of 9.00 inches and must be within +/- 2.00 inches of trial mix slump. Or SCC