OKLAHOMA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
FOR
HYDRAULIC CEMENT CONCRETE

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 1999 Standard Specifications for Highway Construction, English and Metric. Units of measurement are provided in the subsections in both English and Metric equivalents. The units for this project shall be those specified in the project plans. These Special Provisions apply to Portland Cement Concrete Pavements.

701.01. MIX DESIGN AND PROPORTIONING. *(Amend to include the following:)*

A. Classes of Concrete. Class A concrete used in Hydraulic Cement Concrete Pavements utilizing an Optimized Gradation Concrete Mix Design (OGCMD) procedure may reduce the minimum cement content to 510 lbs/yd^3 (303 kg/m^3). Class A concrete used in OGCMD Pavements shall have a minimum flexural strength requirement of 700 psi (4.83 MPa) at 28 days in accordance with AASHTO T 97. Flexural strength testing will only be required for OGCMD approval and field testing will not be required.

B. **Proportioning.** Class A and AP concrete used in Hydraulic Cement Concrete Pavements utilizing an OGCMD procedure shall base the concrete mix design on absolute volume for the class of concrete specified and the consistency suitable for satisfactory placement of the concrete by slipform paving. Concrete mixtures shall be designed and produced in conformance with section 701.01(A). Meet the minimum 28 day compressive strength requirement within 72 hours of placement for high early strength concrete. Submit the mix design at least 30 days before production to the Materials Engineer. Do not place any optimized gradation concrete until the mix design is reviewed and approved by the Materials Engineer.

Include at least the following information with each Optimized Gradation Concrete Mix Design (OGCMD):

(1) Project identification
(2) Name and address of the contractor and producer
(3) Mix design designation
(4) Expected travel time from batch to placement
(5) Aggregate sources
(6) Gradations for each aggregate. Sieve sizes shall include the 1 ½ in. (37.5mm), 1 in. (25.0mm), ¾ in.(19.0mm), ½ in. (12.5mm), ⅜ in. (9.5mm), No. 4 (4.75mm), No. 8 (2.36mm), No. 16 (1.18mm), No. 30 (600µm), No. 50 (300µm), No. 100 (150µm), and the No. 200 (75µm).
(7) Hydraulic cement type and source
(8) Types of cement replacement, if used, and sources
(9) Types of admixtures and sources
(10) Material proportions
(11) Combined gradation charts
  (a) Coarseness / Workability Chart
  (b) 0.45 Power Curve
  (c) Percent Retained Chart
(12) Air content

(13) Slump
(14) Unit weight
(15) Water / cementitious materials ratio
(16) Compressive and flexural strengths at 7 and 28 days
(17) Compressive strength at 72 hours for high early strength concrete
(18) Certified Materials

The optimized gradation concrete mix design and the initial job mix formula are the responsibility of the contractor and shall be submitted to the Materials Engineer for review and approval. The review of the proposed mix design will be to determine that the mix meets the design criteria. The contractor shall furnish one mix design for each type of hydraulic cement concrete utilizing an optimized gradation. The job mix formula shall provide a combined aggregate gradation that plots in Area II on a Coarseness/Workability Chart as described in the *ODOT Aggregate Proportioning Guide for Optimized Gradation Concrete Mix Designs*. The OGCMD job mix formula shall establish a single percentage of aggregate passing each required sieve in 701.01(B)(6). Field samples of the combined aggregate shall be within the allowable tolerances shown below as established in the OGCMD job mix formula.

Sieve Size	**Percent Variation From Job Mix Formula**
No. 4 (4.75mm) or greater	± 5%
No. 8 (2.36mm) to No. 30 (600µm)	± 4%
No. 50 (300µm)	± 3%
No. 100 (150µm)	± 2%
Sieve Size	**Percent Passing**
No. 200 (75µm) combined aggregate	3.0% maximum

The combined aggregate that passes the No. 4 (4.75mm) sieve shall have an acid insoluble residue of at least 50% by weight when tested in accordance with OHDL-25.

Determining an optimum combined aggregate blend will require the use of all three combined gradation charts required for the mix design submittal as well as sound practical experience. The coarseness/workability chart should be the primary method used to develop an aggregate combination that will produce a mixture with the appropriate properties for the intended application and placement method. The 0.45 power curve and the percent retained chart should be used as secondary means to verify the coarseness/workability chart results and to identify areas deviating from a well graded aggregate combination.

Submit new mix designs if:
A. The optimized gradation concrete mix design is rejected by the Materials Engineer.
B. The source of any material changes.
C. The mix design produces unacceptable workability or production test results.

701.05. FINE AGGREGATE.

Fine Aggregate for OGCMD Class A and AP Hydraulic Cement Concrete used in pavement does not have to meet the gradation requirements of section 701.05(e) of the Standard Specifications. OGCMD Fine and manufactured fine aggregates shall be tested by means of laboratory sieves and shall meet the following requirements:

Sieve No.	Percent Passing
½ inch (12.5mm)	100
No. 200 (75µm)	0.0 - 3.0

All natural sand sources of fine aggregate shall be from a fine aggregate source on the Approved Materials List for use in hydraulic cement concrete. All crushed fine aggregate (manufactured sand) in the mix shall be obtained from a coarse aggregate source on the Approved Materials List for use in hydraulic cement concrete .

701.06. COARSE AGGREGATE.

Coarse Aggregate for OGCMD Class A and AP Hydraulic Cement Concrete used in pavement does not have to meet the gradation requirements of section 701.06(c) of the Standard Specifications. OGCMD Coarse Aggregate shall be tested by means of laboratory sieves and shall meet the following requirements:

Sieve No.	Percent Passing
1 ½ inch (37.5mm)	100
1 inch (25mm)	95 - 100
No. 200 (75µm)	0.0 - 3.0

All OGCMD aggregate sources that have material retained on or above the ½ inch (12.5 mm) sieve shall be considered coarse aggregate. All coarse aggregate shall be obtained from a source on the Approved Materials List for use in hydraulic cement concrete.