KDOT Special Provision 15-04001

2025 Redline Specification

2026 KCMMB Portland Cement Concrete Material Specification

1. GENERAL REQUIREMENTS

1.1 The 28-day compressive strength for concrete shall be 5,000 psi and designated as "KCMMB 5K" or shall be 4,000 psi and designated as "KCMMB 4K".

1.1.1 Mixes for High Early Strength Concrete shall meet the same requirements as stated below for standard 4K and 5K mixes (designated as "KCMMB HE"), and any additional requirements noted below specific to High Early Strength Concrete.

1.2 Compressive strength shall be determined in accordance with ACI 318.

1.3 All mix designs submitted to the Kansas City Metro Materials Board shall have a unique mix designation provided by the concrete supplier. This unique designation shall match the designation on the concrete delivery ticket, or the concrete will be rejected.

1.4 Mix designs for Flowable Fill shall be submitted to individual cities for approval.

2. MATERIALS

2.1 Coarse Aggregate

2.1.1 The KCMMB shall approve each coarse aggregate source.

2.1.2 Coarse aggregate shall be entirely granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite, or trap rock. All coarse aggregate shall come from a large, accessible, uniform geological formation and be easily field identifiable in concrete.

2.1.3 All coarse aggregate test results shall not exceed the following percentages by weight:

Coarse Aggregate	Max. Allowable %
AASHTO T103 Soundness by Freeze/Thaw 50 cycles	
3/4 - 3/8	1.0%
3/8 - #4	2.0%
ASTM C127	
Absorption %	0.5%
ASTM C123 Lightweight Pieces	
% Light Weight Pieces	0.5%
ASTM C142 Clay Lumps and Friable	
% Deleterious	0.3%

Coal and Lignite	
% Coal and Lignite	0.05%
ASTM C117 Material Finer than #200 by washing	
% Passing	0.5%
Sum of all deleterious	
% Total deleterious	1.0%
ASTM C88 Sulfate Soundness ($MgSO_4$) Weighted % loss	
3/4 - 3/8	0.5%
3/8 - #4	4.0%
ASTM C131 LA Abrasion	
% Loss	28.0%

2.1.4 Coarse aggregates shall meet the gradation requirements of the current ASTM C33. The acceptable gradation sizes shall be number 1 through 7, 56, 57, 67, 357, or 467.

2.1.5 Limestone found in concrete mixes, delivered from centrally batched concrete plants, shall not exceed 3% by weight of the coarse aggregate fraction. Limestone found in all other concrete mixes shall not exceed 2% by weight.

2.2 Fine Aggregate

2.2.1 Fine aggregate shall meet the requirements set forth in the current ASTM C33.

2.2.2 All fine aggregate test results shall not exceed the following percentages by weight:

Fine Aggregate	Max. Allowable %
ASTM C142 Clay Lumps and Friable	
% Deleterious	0.25%
ASTM C117 Material Finer than #200 by washing	
% Passing	2.0%
Coal and Lignite	
% Coal and Lignite	0.25%

2.2.2.1 Fine aggregate soundness shall be determined using magnesium sulfate.

2.3 Cementitious Materials

2.3.1 Portland Cement shall conform to the current ASTM C150/C150M.

2.3.2 Blended Hydraulic Cement shall conform to the current ASTM C595/C595M.

2.4 Supplementary Cementitious Materials (SCM)

2.4.1 Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the current ASTM C989 Grade 100 or Grade 120.

2.4.2 Fly Ash shall conform to the current ASTM C618 Class F or Class C. In addition, Loss on Ignition is limited to a maximum of 3.0% for Class F fly ash.

2.4.3 Silica Fume shall conform to the current ASTM C1240.

2.5 Water

2.5.1 Only potable water shall be used.

2.6 Admixtures

2.6.1 Air-entraining admixtures shall conform to the current ASTM C260/C260M.

2.6.2 Chemical admixtures shall conform to the current ASTM C494/C494M.

3. CONCRETE MIX DESIGNS

3.1 Aggregates in mixes shall be proportioned to have a minimum of 55% coarse aggregate by weight.

3.2 Mix designs shall specify the coarse aggregate gradation designation.

3.3 Mixes shall be designed for 6.5% air content. The percentage of air content by volume shall be 6.5% plus/minus 1.5%.

3.4 The design water cement ratio shall not exceed 0.44. The minimum design water cement ratio shall be 0.25. The maximum allowable water withheld shall be 2 gallons per cubic yard. No water shall be withheld from high early strength (HE) concrete.

3.5 Concrete mixes approved for use on projects shall include required admixtures in accordance with the currently approved KCMMB mix design. Request for use of admixtures listed as optional on specific mix designs shall be submitted to the Owner and approved by the Owner prior to use on the project. Additionally, any water withheld shall be added to the mix prior to using a superplasticizer.

3.6 The total alkali content of the concrete shall be limited to the sum of the acid soluble alkali content of Portland Cement, one-sixth the alkali content of fly ash, and/or one-half of the alkali content of slag, to a maximum of 5 lb/yd^3.

3.7 The total mass of all cementitious materials shall be a minimum of 600 pounds per cubic yard of concrete and shall include either one or two SCMs as defined in Section 2.4. SCMs can be incorporated in concrete mixes as individual materials and/or as part of an ASTM C595 Blended Hydraulic Cement.

3.7.1 Cementitious combinations incorporating one SCM shall conform to the

requirements of the following table:

One Supplementary Cementitious Material	Cementitious Substitution Rate (Max. % of Total Cementitious by Mass)
Ground Granulated Blast Furnace Slag (GGBFS)	25%
Fly Ash (Class F)	25%

3.7.2 Cementitious combinations incorporating two SCMs shall have a maximum combined cementitious substitution rate of 35% and shall conform to the requirements of the following table:

Two Supplementary Cementitious Materials	Cementitious Substitution Rate (Max. % of Total Cementitious by Mass)
Ground Granulated Blast Furnace Slag (GGBFS)	25%
Fly Ash (Class F)	25%
Fly Ash (Class C)	25%
Silica Fume	5%

3.8 For concrete mixes incorporating one SCM, Mortar Bar Expansion tests are required if the cementitious substitution is less than 25%. Mortar Bar Expansion tests are required for all concrete mixes incorporating two SCMs.

3.8.1 The mortar bar expansion shall be a maximum of 0.10% at 16 days when tested according to ASTM C 1567.

3.8.2 The ASTM C1567 test shall be performed on the cementitious material and the supplementary cementitious material combination submitted for the mix design.

3.8.3 Aggregates used in the ASTM C1567 test shall conform to the requirements of one of the options in the following table:

Option 1:
Test using aggregate proportions and aggregate sources submitted for the mix design.
Option 2:
Test each coarse aggregate and percentage submitted with Missouri River sand obtained from the Holliday Sand Riverside or Randolph Dredges.
For each cementitious combination tested, this option allows only this

specific coarse aggregate source and percentage to meet the Mortar Bar Expansion test.
Option 3:
Test using 100% Missouri River sand obtained from the Holliday Sand Riverside or Randolph Dredges.
For each cementitious combination tested, this option allows any aggregate combination to meet the Mortar Bar Expansion test.)

4. ADDITIONAL REQUIREMENTS

4.1 Precast Concrete

4.1.1 For precast manufacturing facilities that utilize dry cast concrete, air contents will be determined by taking three separate cores at random intervals throughout the KCMMB year.

4.1.2 If submitting for the first time, dry cast suppliers can receive conditional approval by submitting a mix design that meets all the KCMMB specification requirements except for air content. They will be conditionally approved until receiving results from the first air content test.

4.1.3 The core locations will be specified by the participating KCMMB member after the project has been constructed. The cores shall be 4" diameter partial depth through walls of finished concrete products.

4.1.4 Provide a Linear-Traverse Test (ASTM C457), Procedure A, on each core using the proposed mix design.

4.1.5 Provided that for each mix design submitted, the average of the three tests is above 5% total air content, with no single sample being less than 4%, the facility will be approved to dry cast concrete structures using that mix until April 1st of the following year.

4.1.6 Test results for each ASTM C457 test should include the total air content and the corresponding specific surface in square inches per cubic inch, the spacing factor in inches, and a recalculation of the air content, specific surface and spacing factor using bubbles with a size of 0.04" and less.

4.1.7 If submitting the same mix design for the following year, the last three air tests can be submitted for conditional air content approval.

4.2 High Early Strength Concrete

4.2.1 For High Early mix designs, test results for the ASTM C1074 shall be submitted.

4.2.2 Compression tests may be performed at times other than those in ASTM C1074 provided the tests occur within the time limits of ASTM C1074 and give the majority of data points early in the time frame.

4.2.3 Control of slump, time of set, and workability shall be controlled by use of admixtures only. No water shall be withheld from a high early mix.

5. DELIVERY TICKETS

5.1 All concrete delivery tickets shall provide the information in the following table:

Concrete Delivery Ticket Requirements
Plant Name
KCMMB Mix Designation
Design Water Cement Ratio
Batch Weights per Cubic Yard
Total Batched Weight of all Materials for Quantity Delivered
Time Batched
Design Slump
Allowable Slump Range
Water Withheld
Moisture Correction for Aggregates
Dosages of all Approved Admixtures

5.2 Precast concrete manufacturers shall keep concrete delivery tickets on file for one year.

5.3 Certifications for precast concrete products shall be provided when the product is delivered to the job site.

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