

**DIVISION II**  
**CONSTRUCTION AND MATERIAL SPECIFICATIONS**  
**SECTION 2700 STRUCTURES**

APPROVED AND ADOPTED THIS 23RD DAY OF MAY 2001

KANSAS CITY METROPOLITAN CHAPTER  
OF THE AMERICAN PUBLIC WORKS ASSOCIATION

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**SECTION 2701 GENERAL**

**2701.1 Purpose:** The purpose of these specifications is to provide uniformity in the Metropolitan Kansas City Area for the Public Works structures which are designed and constructed for the many separate municipal and county jurisdictions included therein.

**2701.2 Scope:** These specifications are intended to cover the construction procedures and materials for the bridges, culverts, retaining walls and other miscellaneous structures routinely addressed within the various jurisdictions. Procedural and administrative items covered in The General Conditions and the Supplemental Conditions shall supersede such items covered in the specifications referenced below unless specifically noted in the project Special Provisions.

**SECTION 2702 SPECIFICATIONS**

**2702.1 Jurisdiction in Kansas:** For jurisdictions in Kansas, the current edition of the Standard Specifications for State Road and Bridge Construction, State Highway Commission of Kansas shall apply. This specification is available from:

Kansas Department of Transportation  
Bureau of Fiscal Services  
Docking State Office Building  
7th Floor  
Topeka, Kansas 66612  
(913) 296-3545

**2702.2 Jurisdiction in Missouri:** For jurisdiction in Missouri, the current edition of the Missouri Standard Specifications for Highway Construction, Missouri Highway and Transportation Commission shall apply except as modified herein. This specification is available from:

Missouri Highways and Transportation Commission  
1-(573) 751-2860

**SECTION 2703 SPECIAL AGGREGATE CONCRETE: Bridge Deck, Sidewalk, Barriers and Curbs, Diaphragms, and Approach Slabs.**

**2703.1 General:** All new bridge deck shall be full depth special aggregate concrete constructed as shown on the plans. Bridge sidewalk, barrier and curb, diaphragms, and approach slab shall also be special aggregate concrete.

**2703.2 General Concrete Control and Quality:** The current editions of the following Bulletins and Sections of the “CONCRETE STANDARDS” issued by the Mid-West Concrete Industry Board, Inc., are made a part hereof by reference. However, when the provisions of this specification for Special Aggregate Concrete differ from the provisions of such “Bulletins” and “Sections”, the provisions of this Specification shall govern.

Section 3-1 Air Entraining Admixtures  
 Section 3-1 Materials-Fine Aggregate  
 Section 4-1 Concrete Mix Design, Tables, Air Entrained Concrete  
 Section 4-4 Concrete Pavement  
 Section 8 Placing Concrete  
 Section 9 Curing and Protection  
 Section 10 Cold Weather Concrete  
 Section 11 Hot Weather Concrete

Copies of the current MCIB Bulletins and Sections are available for inspection at the office of the City Engineer and may be obtained from the Secretary of the MCIB.

All work shall be done under the supervision of a qualified superintendent experienced in concrete construction.

**2703.3 Materials**

- A. **Portland Cement:** Portland Cement shall conform to ASTM Designation C 150 for Type I. Type IP cement or Type I (PM) cement shall not be used in the special aggregate concrete mix.
- B. **Fine Aggregate:** Fine aggregate shall conform to MCIB Section 1. Method of sampling and testing shall conform to the applicable portions of Section 10 of ASTM Designation C33, Concrete Aggregates.
- C. **Special Aggregate (Coarse Aggregates):** The special aggregate shall be Iron Mountain Trap Rock, Nepheline Syenite, Sioux Quartzite (quarried South Dakota or Minnesota), or approved equal. The gradation of the aggregate shall conform to the following:

<b>Sieve Designations (Square Openings)</b>	<b>Percentage Passing (By Weight)</b>
1 – inch sieve (25.0mm)	100
¾ - inch sieve (19.0mm)	90-97
½ - inch sieve (12.5mm)	45-70
3/8 – inch sieve (9.5mm)	20-55
No. 4 Sieve (4.75mm)	0-10
No. 8 Sieve (2.36mm)	0-5

The fineness modules for the aggregate shall not vary more than plus or minus 0.20 from the fineness modulus of the gradation on which the mix is designed. The combined weight of the sulfides such as Pyrite, Marcasite and Chalcopyrite shall not exceed 0.1% of the weight of special aggregate sample. The material finer than the No. 200 (75  $\mu$ m) sieve shall not exceed one (1) percent of the weight of special aggregate sample.

**D. Mixing Water:** Water for mixing concrete shall be clean and free from injurious amounts of sewage, oil, acid, alkali, salt or organic matter. (Only potable water will be acceptable without testing.)

**E. Air-Entraining Agent:** Air-entraining agents used to produce specified amounts of air-entrainment shall conform to applicable requirements of ASTM Designation C260 and MCIB Section 1.

**F. Admixtures:** Admixtures used shall meet ASTM Designation C494, Chemical Admixtures for Concrete. Water-reducing admixtures shall be Type A except when the ambient air temperature is 80°F (27°C) and forecast to rise, a Type D water-reducing and retarding admixtures shall be used. Calcium Chloride shall not be used.

**G. Class F fly ash or slag** shall be added as necessary to offset any ASR potential in the mix. Fly Ash shall conform to ASTM C 618. Slag shall conform to ASTM C989, Strength Grade 120.

**2703.4 Concrete Mix:** The Contractor shall submit a tentative special aggregate concrete mix, designed by a competent testing laboratory, to the Engineer for approval before the use of special aggregate concrete. After a mix has been approved, it shall be subject to additional adjustment in the field by the Engineer whenever necessary to produce a mixture of proper workability, uniform consistency, and acceptable density and strength. The tentative special aggregate concrete mix design shall include the following:

- A. Complete tests of the fine aggregate and the special aggregate showing their conformance to these specifications
- B. Source of aggregates and location of ready mix plant
- C. Weights of all materials used for one cubic yard (meter) of fresh mixed concrete (aggregate weights shall be based on saturated, surface dry materials)
- D. Brand names of the cement, the air entraining agent, the water reducer and/or retarder
- E. Air content of the tentative mix design
- F. Slump in inches (mm) of the tentative mix design.
- G. Special aggregate concrete shall conform to the basic requirements table below:

Item Mix No.	Special Aggregate Concrete	
	SA-1	SA-2
28 Day f'c	4,000 psi (27.58MPa)	4,500 psi (31.03MPa)
Cement (lbs/CY)	634 (376.2 K/m <sup>3</sup> )	683 (405.2 K/m <sup>3</sup> )
Course Aggregate	Special Aggregate	Special Aggregate
Fine Aggregate	(Missouri or Kaw River)	(Missouri or Kaw River)
Slump	Max. 4" (100mm)	Max. 4" (100mm)
Air Entrainment	6% -1+2	6% -1+2
Max W/C Ratio	.385	.385
Admixtures (Water-Reducing or Water-Reducing and Retarding)		

- H. The required average compressive strength (fcr) shall be 5,200 psi for the SA- 1 mix and 5,700 psi for SA-2 mix as set forth in ACI 301 (American Concrete Institute Manual of Concrete Practice).
- I. The special aggregate concrete shall have a minimum of 634 pounds of cement per cubic yard (376.2 K/m<sup>3</sup>) of fresh mixed concrete for Mix No. SA-1 and a minimum of 683 pounds of cement per cubic yard (405.2 K/m<sup>3</sup>) of fresh mixed concrete for Mix No. SA-2. The air content shall be 6 percent plus 2 or minus 1 percent tolerance.
- J. Mixing water shall not exceed 4.34 gallons per 94 pound (19.3L per 50 kilo) sack of cement. Moisture in excess of Saturated Surface Dry (SSD) in the aggregate shall be considered as part of the mixing water. Water which is absorbed by the aggregates before placing shall not be included as part of the mixing water.
- K. The mix shall be designed to produce a three (3) inch (75mm) slump and shall be rejected at the job site if the slump exceeds four (4) inches (100mm).
- L. The relative proportions of fine and coarse aggregates in the mix shall be determined by ACI 211.1 (American Concrete Institute Manual of Concrete Practice).

### 2703.5 Sampling and Testing

- A. The special aggregate mix design and materials test reports shall be dated within 90 days prior to placement and submitted for approval no later than 21 days before placement.
- B. Only approved ready mix plants with mix designs, certifications and materials test reports will be allowed to supply ready mix concrete. Only one plant shall supply concrete for each deck.
- C. The ready mix plant shall have the cement and aggregate scales calibrated by an independent scale calibration company. The plant scales shall be calibrated yearly or as deemed necessary by the City.
- D. Methods of sampling and testing aggregate shall conform to the applicable portions of Section 10 of ASTM Designation C33, Concrete Aggregates
- E. Submit compressive strength of test specimens made and cured in accordance with ASTM Designation C192, Making and Curing Concrete Test Specimens in the

Laboratory and tested in accordance with ASTM Designation C39, Compressive Strength of Cylindrical Concrete Specimens. A minimum of one specimen shall be tested at seven days and two specimens at twenty-eight days.

- F. Measuring Air Content. The air content shall be measured in accordance with the Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method, ASTM Designation C173, or the Standard Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method, ASTM Designation C231, at the option of the Engineer.
- G. Alkali Silica Reaction. Combined aggregates when mixed with proposed cementitious materials shall exhibit a mean mortar bar expansion at 14 days of no more than 0.10% when tested in accordance with ASTM C1260. Coarse and fine aggregate blending should be the same as proposed in the submitted concrete mix. Submit reports.

### **2703.6 Placing, Finishing, and Curing**

- A. Special aggregate concrete shall be placed in accordance with MCIB.
- B. Ready-Mixed Concrete: All special aggregate concrete used in this work shall be ready-mix concrete. Ready-mix concrete shall be mixed and transported in accordance with the Standard Specifications for Ready-Mixed Concrete, ASTM C94. Any concrete, which is not plastic and workable when placed in the work, will be rejected.
- C. Full Depth Special Aggregate Deck: The Contractor shall place a full depth special aggregate deck. Pre-stressed panels are not required to be special aggregate.
- D. Finish and Curing: After surface irregularities have been corrected, the concrete surface shall be given a uniformly textured surface finish by use of a Kansas Mop. The finished texture shall consist of transverse grooves approximately 0.125 inches (3.2mm) deep spaced at ½ inch centers (13mm). The Kansas Mop and the manner and time of its use shall provide a uniform surface texture without tearing or unduly roughening the concrete.
- E. Curing of the special aggregate concrete shall be a continuously applied wet cure for a minimum of 120 hours. The special aggregate concrete shall be covered with a wet burlap or wet cotton mat covering with water applied to the mats as necessary to maintain a wet condition.

**2703.7 Field Testing:** All concrete testing shall be done by the City or by an independent laboratory for the City at the City's expense.

- A. Three cylinders shall be taken on each continuous pour for every 50 cubic yards (35 cubic meters), or fraction thereof, placed in one continuous operation. The cylinders shall be made in accordance with AASHTO T23-73 (ASTM C-31) procedures. The set of three cylinders shall be identified as to time and location of placement. One cylinder of the set shall be tested at seven

days and the other two cylinders tested at twenty-eight days. All tests shall be performed in accordance with AASHTO T22-92 (ASTM C39-96) procedures.

***During concrete placement, if more than 100 cubic yards is to be placed in a single day, the contractor shall supply a water tank to cure all test cylinders in for the first 24 hours after the pour. The tanks shall be of sufficient size to hold three 6"X12" cylinders for every 50 cubic yards poured that day and to allow for the water to maintain a temperature between 60°F and 80°F after being filled with water from the ready mix delivery trucks. The contractor shall be responsible for protecting persons from entering the tanks.***

- B. Special Aggregate Concrete deficient in the required 28 Day f'c strength shall be removed and replaced. Testing of special aggregate concrete shall be limited to cylindrical concrete specimens for compressive strength made at the time of placement of the fresh concrete. No coring of the special aggregate concrete deck will be allowed. If Contractor desires additional concrete cylinders for quality assurance in removing falsework and formwork, they shall be made and tested in accordance with the previous standards at the contractor's expense. Generally, the concrete shall obtain seventy-five (75) percent of the minimum 28 day compressive strength prior to removal of false work or formwork. Deviations from this requirement must be approved by the Engineer.
- C. Any load of concrete, in which the air content does not conform to the requirements of the above item entitled "Concrete Mix", shall be rejected and removed from the job site.

**2703.8 Payment:** Special Aggregate Concrete, measured to the nearest 0.1 cubic yard (0.1 m<sup>3</sup>), complete in place, shall be paid for at the contract unit price bid for "Special Aggregate Concrete" as listed in the Bid Form – Unit Prices. Such payment and price shall constitute full compensation for all the labor, materials, equipment, and for the performance of all related work, including protection in cold weather, necessary to complete the item.