KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, 2015 EDITION

Delete SECTION 404 and replace with the following:

SECTION 404

CONCRETE FOR PRESTRESSED CONCRETE MEMBERS

404.1 DESCRIPTION

Provide concrete with the release and 28 day compressive strengths specified in the Contract Documents.

This specification is specific to Concrete for Prestressed Concrete Members. See **SECTION 401** for general concrete requirements.

404.2 MATERIALS

Provide materials that comply with the applicable requirements.

General Concrete..... **SECTION 401**
Aggregate..... **DIVISION 1100**
Admixtures and Plasticizers..... **DIVISION 1400**
Grade 2 Calcium Chloride..... **DIVISION 1700**
Cement, Fly Ash, Silica Fume, Slag Cement and Blended Supplemental Cementitious..... **DIVISION 2000**
Water..... **DIVISION 2400**

404.3 CONCRETE MIX DESIGN

a. General. Design concrete mixes specified in the Contract Documents. A mix design must be approved by the Engineer before the mix can be used in the production of prestressed concrete members.

b. Concrete Mix Design. Use the requirements outlined in **SECTION 401** and **TABLE 404-2** to design structural concrete mixes.

c. Concrete Strength Requirements. Unless shown otherwise in the Contract Documents, design concrete to meet the compressive strength requirements of **TABLE 404-1**. For prestressed bridge beams, the Engineer will determine the strength requirements from the table except when specified elsewhere in the Contract Documents.

TABLE 404-1: COMPRESSIVE STRENGTH REQUIREMENTS

Type of Unit	For Stress Application (Release) and/or moving* (Minimum) (psi)	Age 28 Days (Minimum)** (psi)
Prestressed Bridge Beams	5800	7000
	4800	6000
	4000	5000
Prestressed Piles	3000	5000
Prestressed Panels	4000	5000

* From casting bed to producer's storage only. Not a shipping strength.
** Also required for shipping strength.

d. Portland Cement, Blended Hydraulic Cement and Individual and Blended Supplemental Cementitious Materials. Unless specified otherwise in the Contract Documents, select the type of portland cement, blended hydraulic cement and individual and blended supplemental cementitious materials according to **SECTION 401**.

e. Specific Requirements for Concrete used in Prestressed Concrete Members. Design concrete to meet the requirements of **TABLE 404-2**.

TABLE 404-2: CONCRETE REQUIREMENTS						
Self-Consolidating Concrete (SCC)			Non SCC	All Concrete		
Slump Flow From Target (Inches)	Blocking Assessment (Inches)	Visual Stability Index	Maximum Slump (Inches)	Minimum Cementitious per Cubic Yard (Lbs)	Mixing Water: Maximum lb. per lb. Cementitious	Air Content (%)
± 2	2 maximum	0 or 1	5 or 7 ± 25%	602	0.44	6.5 ± 1.5

(1) Determine the slump flow using ASTM C 1611, "Standard Test Method for Slump Flow of Self-Consolidating Concrete." The target value is determined during the mix design and approval process (see below). At the point of placement, slump flow can deviate from target by no more than 2 inches.

(2) Determine the blocking assessment using ASTM C 1621, "Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring."

(3) Determine the visual stability index (VSI) using Appendix X1 of ASTM C 1611. When approved by the Engineer, the VSI may be determined using additional concrete stability observations.

(4) Designate a slump for each concrete mix design that is no greater than 5 inches when not using mid-range or high-range water reducing admixtures. When a water reducing admixture is being used, designate a slump no greater than 7 inches. The tolerance from design at the point of delivery is ± 25%.

(5) It may be necessary to adjust the mix proportions, as permitted by the specifications, to provide a mix that complies with placement, and the release and 28-day strength requirements.

(6) Maximum limit of lb. of water per lb. of cementitious material includes free water in aggregates, but excludes water of absorption of the aggregates.

(7) Non-air entrained concrete may be used in concrete piling not subject to freezing and thawing and wetting and drying.

(8) There are no permeability requirements.

(9) Use Quality Requirements for Structural Aggregates as listed in **SECTION 1102**, Aggregates For Concrete Not Placed on Grade. Keep a copy of the KDOT Official Quality test report from the approved source on file at the prestress plant and available for review by the Engineer.

(10) Use gradation requirements for aggregates as listed in **SECTION 1102**, Aggregates For Concrete Not Placed on Grade.

(11) For the approved source of water, keep a copy of the KDOT test report on file at the prestress plant and available for review by the Engineer.

(12) Use admixtures that are prequalified. Maintain a copy of the Type C certification on file at the prestress plant and available for review by the Engineer. No other additives may be used without written approval by the Engineer.

f. Additional Design Requirements for Self-Consolidating Concrete (SCC). SCC is defined as a concrete mixture which can be placed by means of its own weight with little to no vibration. It is accomplished by adjusting traditional mix designs using special admixtures.

(1) Do not rod or vibrate when making test cylinders.

(2) Provide scales capable of determining test block weights for the strand bond test that are calibrated (National Institute of Standards and Technology (NIST) traceable) and approved by the Engineer.

(3) Perform a strand bond test (KT-83) for each mix and strand to be used in the future production of prestressed beams. Any change in admixture, aggregate source or gradation, cementitious material content or source, and strand producer or size requires that a new strand bond test be completed using the replacement materials. Make 2 test beams for each bond test. Cure the test beams in an environment that is representative of future production (i.e. – moisture and heat until release then ambient conditions).

(a) With the Engineer observing, perform a single Slump Flow test for each pair of test beams cast. This spread establishes a target value from which future point of placement values are to be compared to. Assign a Visual Stability Index (VSI) number to the concrete spread.
(b) With the Engineer observing, perform a single J-Ring test for each pair of test beams cast. Calculate a "blocking assessment" value.
(c) Make a minimum of 2 sets of 3 cylinders for each pair of test beams cast. Cure the cylinders with the test beams they represent.

(i) With the Engineer observing, test 1 set of cylinders at the producer's plant to measure for release (equal to the release strength of future production). De-tension the strand in both test beams only after this cylinder set indicates that release strength has been attained.

(ii) With the Engineer observing, test 1 set of cylinders at the producer's plant to measure for 28-day strength (equal to the 28-day strength of future production). Perform the bond test on both test beams only after this cylinder set indicates that the 28-day strength has been attained.

(iii) In both cases, the required strength is met when the average compressive strength of the 3 cylinders equals or exceeds the required strength, and no more than 1 cylinder in the tested set had a strength that was no more than 5% below the required strength.

(d) With the Engineer observing, measure the dimensions of both test beams to verify the required casting tolerances. Calculate the weight of the required test loads.
(e) With the Engineer observing, load the test beams using the calculated loads and KT-83.
(f) Submit all beam dimensions, calculations (intermediate and final), release and 28-day strengths, observations, measurements, pictures, and test results related to strand bond, cylinder strength, slump flow, and J-ring testing to the Engineer for review.
(g) In addition to the requirements of this section and **SECTION 401**, the mix design represented by this testing may be approved provided there are 2 passing bond tests, and the assigned blocking assessment and the calculated VSI satisfy the requirements of **TABLE 404-2**.