



WATCO
Specifications
for
Concrete Repairs
for
South Kansas & Oklahoma Railroad (SKOL)



SECTION X – CAST-IN-PLACE CONCRETE

X-01 General

A. Scope

These specifications cover all cast-in-place concrete required for repairs within this project. Except as otherwise specified hereunder, the current American Railway Engineering Association (AREMA) Manual for Railway Engineering (Specifications), Chapter 8 - Concrete Structures and Foundations, shall apply to all work under this section.

B. Strength, Proportions, and Mixes

1. Cement, unless otherwise specified, shall conform to the following:
 - a. Standard Concrete
Cement shall be Portland Cement, Type I or Type IA, conforming to the requirements ASTM Designation C150.
 - b. High Early Strength Concrete
Cement shall be Type III, or Type IIIA, conforming to the requirements of ASTM Designation C150.
2. Minimum compressive strength at 28 days shall be 4000 PSI, unless indicated otherwise on the Plans.
3. Nominal size of coarse aggregate shall be 1" - No. 4 (Size 57). See AREMA Table 1.3.3
4. Concrete shall be air-entrained by the use of an air entraining admixture conforming to requirements of ASTM Designation, C260, or by the use of air-entraining Portland cement meeting the requirements of ASTM Specification C150. The concrete shall have an air content between 4.0% and 6.0%
5. Admixtures, except air-entraining agents, used to alter the normal properties of concrete for densifying, dispersing, retarding, accelerating, plasticizing, coloring, or waterproofing shall be used only upon written permission of the Engineer.
6. Testing: If repairs require the use of twenty cubic yards or more of concrete, compression tests and field tests will be required as specified in the AREMA Manual, Chapter 8, Part 1.
 - No less than four test cylinders shall be made for each twenty cubic yards, or fraction thereof, of cast-in-place concrete. One pair of cylinders shall be tested at 7 days and the second pair at 28 days
 - The Contractor shall furnish all test materials and test cylinder molds, shall perform all work to make and cure the test cylinders, and after proper curing, shall deliver the test cylinders to an independent testing laboratory where they shall be tested at the Contractor's expense. The test results shall be furnished directly to the Engineer in writing, by the testing laboratory, on a standard testing report form.
 - At least one slump test shall be made for each truckload of concrete delivered to the project for inclusion in the work. Slump range shall be two to four inches. A record of the amount of slump shall be made and furnished to the Engineer.



C. Interfacing with Existing Concrete

1. Surface preparation and anchorage shall be as specified in AREMA Specifications, Chapter 8, Part 14, unless otherwise indicated on the Plans. Dowels shall be made of deformed bars, ASTM A615, Grade 60, and shall be spaced as shown on the Plans. Dowels shall be grouted in place with an Epoxy Grout intended for dowel bars and shall be applied in accordance with the manufacturer's recommendations. Horizontal dowel holes shall be drilled downward on a slope of approximately one inch per foot or as otherwise indicated on the Plans.
2. The surface of the existing material to which the new concrete will be bonded shall be cleaned by either sandblasting, waterblasting, hammers or wire brushes, so that all foreign material and loose or unsound concrete is removed and that a clean sound surface remains. The exposed surface shall be washed with clean water or air cleaned with oil free air to remove all loose dust. Grease and oil shall be scrubbed and removed with a detergent and the surface washed with clean potable water.
3. New concrete shall be bonded to clean sound material with an Epoxy Bonding Compound. Bonding System shall meet the requirements of ASTM C881, Type II Grade 1 or 2, and shall be subject to approval by the Engineer. Bonding System shall be applied in accordance with manufacturer's recommendations. It is further recommended that Bonding Compound be applied as a spray application by use of a Binks bottom discharge pressure vessel operating at approximately 100 psi. Bonding Compound shall not be applied to surfaces that have visible or standing water.

E. Dampproofing

All surfaces of concrete in contact with backfill or embankment shall be dampproofed, with Asphalt Primer and Asphalt, in accordance with AREMA Specifications, Chapter 29, Part 3.

F. Construction Joints

Construction joints shall be made only where shown on the Plans, unless otherwise approved by the Engineer, and shall be adequately keyed and, if required by the Engineer, be provided with 6"x3/8" polyvinyl-chloride waterstops.

G. Formed Surface Finish

All unformed surfaces shall be constructed to lines and contours shown on the drawings with a wood or hard rubber float finish. Formed surfaces shall be made with plywood faced wood forms or with steel faced forms.

H. Curing

Concrete shall be protected as required by AREMA Specification, Chapter 8, Section 1.17, for a minimum of 7 days. Membrane curing compounds are permitted, on all cast-in-place concrete surfaces except those that will abut other new concrete. Curing of such abutting surfaces shall be by wet curing methods. Membrane curing shall be compatible with the specified Concrete Surface Sealer, or the membrane curing compound shall be removed to promote adhesion of the sealer to the concrete.

I. Cold Weather Curing

1. Concrete work should not be performed if air temperature falls below 20 degrees. The following guidelines shall be adhered to for cold weather concreting:
 - a. Air Temp.: Between 20 and 30 Deg. F
Then Min. Placement Temp.: Greater than 65 Deg. F
 - b. Air Temp.: Between 30 and 40 Deg. F
Then Min. Placement Temp.: Greater than 60 Deg. F
 - c. Air Temp.: Between 40 and 50 Deg. F
Then Min. Placement Temp.: Greater than 55 Deg. F
2. A minimum surface temperature of 50 degree F. shall be maintained continuously for at least seven days after concrete placement. Approved daily logs of air and concrete temperature measurements (6-hour intervals) shall be submitted to the engineer for filing.
3. Concrete temperature measurements shall be rendered at one per 100 square feet of surface area (but not less than one measurement per surface).
4. One temperature reading is required per each free edge of the cast concrete. Temperature measurement shall be taken with a heavily insulated thermometer placed on concrete surface.

X-02 Reinforcing Steel

- A. Reinforcing steel bars shall be intermediate grade, new billet steel, conforming to ASTM A615, Grade 60. For splicing, the bars shall be lapped a minimum of 30 diameters, and shall be securely wired at all intersections, unless otherwise noted in the specifications or on the drawings. Reinforcing bars shall be bent cold in the shop or in the field around a pin not less than six times the diameter of the bar. Reinforcing partially embedded in concrete or in mortar in dowel holes shall not be field bent, except as permitted by the Engineer.
- A. Welded wire mesh, if used, shall conform to drawing specifications.
- C. Epoxy Grout for Dowels and Anchor Bolts, per drawings.
 1. Reinforcing dowels and anchor bolts shall be set in drilled holes per drawings using a pourable epoxy mortar grout prepared by extending epoxy resin adhesive with oven-dried fine aggregate, in accordance with the manufacturer's recommendations. Polymer grouts may be used in lieu of the above. All materials will be subject to approval by the Engineer before its usage.
 2. Epoxy grout materials shall not be diluted with solvents.
 3. All free water shall be removed from dowel and anchor bolt holes by an air jet or vacuum before placing epoxy grout. Epoxy grout shall be poured into the dowel or anchor bolt hole in sufficient quantity to completely fill the hole when the dowel or anchor bolt is inserted. The dowel or anchor bolt shall be inserted in the liquid grout and agitated to completely wet the perimeter of the dowel or bolt and to completely fill the annular space around the dowel or bolt. A small amount of grout may be added if the annular space is not filled flush with the surrounding surface. Grouted dowels and anchor bolts shall not be disturbed for at least 12 hours after installation.



X-03 Submittals

The following shall be submitted prior to acceptance of materials:

A. Shop drawings:

1. The Contractor shall furnish detailed shop drawings to the Engineer for approval prior to starting construction. Unchecked drawings shall not be submitted for approval.
2. Approval by the Engineer of the shop drawings shall not relieve the Contractor from furnishing material of proper dimensions, quantity, and quality, nor will such approval relieve the Contractor from the responsibility for errors of any sort in the shop drawings.

B. Concrete Submittals:

1. The Contractor shall submit a concrete admixture design for approval by the Engineer two weeks in advance of work. Admixture design shall comply with the target strength, air content, slump, and aggregate size as mentioned in sections above.
2. Copies of batch tickets shall be submitted orderly to the Engineer weekly.
3. If testing is applicable per sections above, results shall be submitted to the Engineer within two days of test completion.

C. Reinforcing Submittals:

1. Reinforcing certifications shall be submitted to the Engineer in an ordered manner two weeks in advance of concrete placement. Inability of Contractor to prove compliance of material reinforcing requirements shall result on unapproved order to proceed with casting of concrete.