

Technical Advisory

Calcium Aluminate Cement Concrete (Class CAC Concrete)

Important Items for Construction and Inspection

Read and be familiar with the details in TxDOT SS-4003

Materials

- Ensure that the material and mix design requirements of TxDOT SS-4003 are met.
 - Verify that a sample of the cement has been tested and approved by MTD (Table 1 in SS-4003).
 - Consult with the cement producer to ensure the type and dosage of admixtures (accelerators and high range water reducers) is correct. The accelerator is usually lithium based, and the dosage is dependent on the temperature.
- Crushed limestone aggregate is preferred for the coarse aggregate.

Trial batch requirements

- Early age strength requirement—minimum of 3,000 psi at 3 hours of age. Two 6"x12" cylinders should be cured at the expected ambient temperature (e.g., temperature during actual pour).
- Ultimate compressive strength—minimum of 4,000 psi at 24 hours of age. Four 6"x12" cylinders cured in adiabatic (well insulated) box with temperature recorded.

Construction

- Moisture correction should be taken for the coarse and fine aggregate by the producer at least once a day. Maintaining uniform moisture in the stockpiled material is crucial for success when utilizing volumetric mixers.
- Repair area should be dampened before the pour—do not allow water to pond.
- Approximately 2 ft³ of material should be discharged into a box supplied by the contractor and discarded before the concrete is poured in the repair area.

- Begin pouring at one side of the repair area and work your way to the other—do not skip around as a cold joint is likely to occur. The working time of the material is about 10-20 minutes.
- Once flush, begin screeding and finishing immediately—do not wait until the entire repair area is poured.
- Do not add finish water as this has a major influence on the strength of the material.
- Use minimal vibration as this material is very fluid.
- A plastic sheet should be placed over the top of the repair area to help trap heat and cure the concrete until it is opened to traffic. Curing blankets may also help to insulate the surface of the concrete.

Job control testing

- Make six 6"x12" cylinders and three 4"x8" cylinders from every 30 cu. yd. of concrete or fraction thereof on each production day during construction, or more frequently as directed. Fill the 4"x8" cylinders in two equal lifts, tapping the sides of the cylinder 10-15 times with an open hand during each lift, and then striking the surface level. For 6"x12" cylinders, use three equal lifts.
- Cure four of the six 6"x12" cylinders in the adiabatic (well insulated) curing box. Measure the temperature of the concrete in the adiabatic box. Record the maximum temperature. The temperature recording device can be placed in the chamber next to the specimens—it does not have to be inserted into one of the specimens.
- Two of the six 6"x12" cylinders should be tested at 3 hours to ensure the concrete strength is a minimum of 3,000 psi.
- The three 4"x8" cylinders should be cured in accordance with ASTM C 31. After 24 hours of cure in the molds, they should not be placed in lime water. Instead, a wet material (e.g., towel) and plastic should be used to keep them moist.

- Testing is as follows:

Specimen Size	Number of Samples	Curing Type ¹	Age of Test	Strength Requirement
6"x12"	2	Adiabatic	24±2 Hours	4,000 psi
6"x12"	2	Adiabatic	48±4 Hours	4,000 psi
6"x12"	2	Ambient	3±0.25 Hours	3,000 psi
4"x8"	3	ASTM C 31	7±0.25 Hours	See footnote 2

¹Adiabatic refers to curing the specimens in the adiabatic curing box, ambient refers to field curing at actual conditions, ASTM C 31 refers to maintaining the curing temperature range of 60°F to 80°F.

²Strength is used if the temperature of the cylinders in the adiabatic box does not exceed 140°F. If the temperature does not exceed 140°F, it is recommended that the 7-Day strength is twice the design strength. Do not cure these samples in lime water.

- If the maximum adiabatic concrete temperature exceeds 140°F in the well-insulated box:
 - The ultimate strength is determined by the minimum compressive strength of the adiabatic 6"x12" cylinders at 24 or 48 hours of age, whichever value is the lowest. Caution: these specimens may be extremely hot.
- If the maximum adiabatic concrete temperature does not exceed 140°F:
 - The ultimate strength is determined by testing the 7-Day 4"x8" cylinders, and the strength should be twice the design strength. The 6"x12" specimens still need to be tested and recorded.
- It is recommended that during the winter months when the temperature is below 40°F, an extra set of 6"x12" cylinders are made for early strength determination (e.g., greater than 3 hours) to ensure the repair is greater than 3,000 psi before opening to traffic.

Documentation

- Record all strength data and the maximum temperature of the well-insulated curing box.
- Good record keeping will determine the consistency of pours over time which will give an indication of the expected strength reduction due to conversion.
- The concrete supplier should be certified by the Volumetric Mixer Manufacturers Bureau (VMMB) or have an inspection report signed and sealed by a licensed professional engineer demonstrating that the equipment meets the requirements of ASTM C 685.

Contact Information

Refer to the CAC Tip Sheet or contact the Rigid Pavements and Concrete Materials Section at 512-506-5858 for any questions.