

**Tennessee Department of Transportation
Division of Materials and Tests**

**Quality Control and Acceptance of
Portland Cement Concrete for Bridge Decks (SOP 4-1)**

- Purpose- The purpose of this document is to establish the minimum TDOT requirements for the quality control and acceptance testing of Portland cement concrete for bridge decks.
- Background- Quality control for concrete, both at the plant and at the job site, is critical to the final performance. Though designs call for 6% air content, many loads of concrete are being rejected due to air content below the minimum of 4%. Other loads of concrete are rejected due to being out of specification on slump or temperature. This costs both the contractor and the TDOT in both time and money. It has been determined that a better system, one in which the quality control testing at the plant cooperates with that at the job site, be developed in order to cut these losses and promote better quality concrete.
- Procedure- Before any deck pour there shall be a “pre-pour conference”. The purpose of the conference shall be to discuss the Quality Control (QC) and acceptance procedures and responsibilities. A representative for each the contractor and/or subcontractor, ready-mix supplier, pumper (if applicable), and the TDOT shall attend. The authority and responsibilities for each of the following shall be discussed: addition of water, plant operations, concrete mix design, boom configurations, sampling and testing, concrete delivery/# of trucks, specifications, acceptance testing, and mixture rejection. A TDOT or ACI Level One Certified Technician shall complete all QC and Acceptance sampling and testing. As required in section 604.03 of the TDOT Specifications, the Contractor or concrete material supplier shall complete all QC sampling and testing, all acceptance sampling, and shall make, cure and deliver the acceptance cylinders for strength testing. TDOT inspectors shall conduct acceptance testing for air content, slump, and temperature from the same sample used to cast test cylinders.

During placement operations, whether by direct pouring, by bucket, or by pumping, there is an assumed air loss. Research has shown that an air loss of 0-2.0% as a result of pumping can be expected. Furthermore, it is assumed that a smaller air loss can be expected during other placement means, and during finishing. This air loss will be assumed to be 0.5%. These assumed air losses shall be addressed as follows:

Bridge Deck Concrete placed by pumping shall have an air content of **6.0% - 8.5%** at the discharge end of the truck chute* immediately prior to pumping, no exceptions. Bridge Deck Concrete placed by other means shall have an air content of **5.0% - 8.5%** at the discharge end of the truck chute* immediately prior to placement. The concrete shall be tested before placed in the pump truck, bucket, or deck. Any load of concrete failing to meet these specifications, or those for slump or temperature, shall be rejected and not used in a TDOT project.

The first three trucks shall be tested for air content, slump, and temperature to determine consistency. Thereafter QC and acceptance testing shall be conducted at least once every fifty cubic yards (50 CY), including cylinders for compressive strength. The samples taken every fifty cubic yards (50 CY) are to be taken randomly within the lot, so as not to establish a pattern, i.e. every fifth truck. Should a load be found not to be in the allowable air content, slump, or temperature range, then it shall be rejected. Each delivery truck thereafter is to be tested until two consecutive trucks are found to be within the acceptable range(s). At that point, testing frequency shall return to at least once in every fifty cubic yard (50 CY) lot.

All QC and acceptance test results conducted in accordance with this procedure shall be documented on TDOT form DT-0311 and DT-0311A.

- The TDOT/Consultant Inspector may request additional Q.C. testing at any time at either the plant or at the job site, including during the pumping operation. The TDOT/Consultant inspector and the Contractor QC technician have full authority to reject any truckload of concrete not in compliance with this procedure or with the TDOT specifications.
- If taking a concrete sample during pumping operations, the pump is not to be stopped. The sample is to be obtained from the pumped concrete stream during placement.
- Before concrete is placed, it must be in full compliance with the TDOT specifications including air content, slump, temperature, and time. Any mixture not in compliance shall be rejected.
- When possible, a TDOT Project Inspector should either be at the ready mix plant, or make a short visit to the plant to assure proper Q.C. techniques and procedures.

*Sample per AASHTO T141, section 5.2, Note 3: sample for tests may be taken after at least one-quarter cubic yard of concrete has been discharged.

{FOR INFORMATION ONLY- During the initial implementation of this procedure (until September 2005), TDOT will take approximately 50 samples per Region, on various projects, at the discharge end of the pump hose to determine air losses by pumping. The sample from the discharge end shall be from the same truck tested for

acceptance. The test results shall be documented on the DT-0311A report for evaluation of this procedure.}

Revision 4/1/04- As discussed at the TDOT Specification committee meeting on March 23, 2004, revised the last paragraph, clarifying that TDOT will collect additional samples from the discharge end for information.