



STATE OF NORTH CAROLINA  
**DEPARTMENT OF TRANSPORTATION**

Michael F. Easley  
Governor

Lyndo Tippet  
Secretary

March 2, 2004

MEMORANDUM TO: Division Engineers

FROM: Cecil L. Jones, PE  
State Materials Engineer

SUBJECT: Determining Air Content of Fresh Concrete Containing Marine Limestone and Lightweight Aggregates

Current procedures require the use of a correction factor of 1% when determining the air content of fresh concrete containing marine limestone aggregates with a pressure meter in accordance with AASHTO T 152. In reviewing project records, we discovered inconsistencies in the application of this correction factor. The Materials and Tests Unit also conducted comparisons with several different concrete mixes with different marine limestone sources during last construction season. We found the differences between the pressure meters and the volumetric meters to vary to the extent that the 1% correction factor is not felt to adequately identify the correct air content of concrete using these aggregates.

The durability of concrete is dependent to some degree on the air void content of the mixture, exclusive of air that may be inside voids within aggregate particles. For this reason, it is important to make sure that we are not measuring voids within aggregate particles when determining the air content of fresh concrete. AASHTO T 152 states that the pressure method is applicable to concrete made with relatively dense aggregate particles and requires the determination of an aggregate correction factor. Most aggregates in North Carolina are very dense, so this is not a concern. However, marine limestones are more porous and it therefore becomes important to make sure that we are not measuring voids within the aggregate. Because the volumetric method described in AASHTO T 196 does not apply external pressure, it only measures air voids of the mix and it applies to any type aggregate, whether it is dense, cellular or lightweight. It has always been the Department's policy to use the volumetric method, or "rollometer" as described by T 196 for lightweight concrete.

Based upon the results of our findings, beginning May 1, 2004 all concrete mixes produced using lightweight aggregates, including marine limestone, must be tested using the volumetric method. Current sources of marine limestone include Belgrade, Castle Hayne, Clarks, Goretown Mine, Myrtle Beach, New Bern, Onslow and Rocky Point. Current lightweight aggregate sources include Stalite and Solite.

All NCDOT certified concrete field technicians have received training and have demonstrated proficiency using the volumetric meters. The volumetric meters currently being used are much lighter in weight and easier to use than those used in previous years. We have a supply of volumetric meters available and have more on order to supply those offices affected by this change.

Additional meters will be available through our central office in Raleigh. If you are interested in acquiring one or have any questions concerning this new policy please contact Sam Frederick at 919-733-7091. Your local concrete technician can also provide additional training, or assist you in any concrete related matter.

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