Innovative Pavement Technologies

NCDOT Division 7 Shoulder Construction
“If you don't know where you're going, you might not get there.” -Yogi Berra
RCC is not new to North Carolina...
CONTRACT AND CONTRACT BONDS
FOR CONTRACT NO. C203914

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

WBS
TLP NO. 4-5756, 4-5780, 4-5821
CULLFORD, RANDOLED
ROADWAY & STRUCTURE CONTRACT
LS5
LENGTH 7,400 MILES
LS5 FROM US BUSINESS TO MAIN STREET IN ARCHDALE.
What is RCC?

RCC is a no-slump concrete that is compacted by a high density screed paver and vibratory rollers.

- Zero slump (very dry...less paste)
- Little to no forming—depends on application
- No reinforcing steel
- Limited finishing required
- Compacted with vibratory rollers
- High and Fast strength gain
- Resistant to freeze/thaw cycles and permeability
- Very dense
- Highly efficient installation methods
RCC is a Granular Solid

- Compressive strength \( (f'_c) \)
  - 4,000 to 10,000 psi
- Flexural strength (MR)
  - 500 to 1,000 psi
  - \( MR = C(f'_c)^{1/2} \) where \( C = 9 \) (up to 11)
- Modulus of elasticity
  - 3,000,000 to 5,500,000 psi
  - \( E = C_E(f'_c)^{1/2} \) where \( C_E = 57,000 \) (up to 67,000)
TXDOT Rest Area On I-20 Ranger, TX
Project Description:

- Replace existing flexible asphalt and stone shoulder with RCC
- Support traffic during slab replacements
- Relatively fast installation

- Project Specifications was set forth by NCDOT
  Very similar to traditional RCC specifications

Base bid was 63,000 sy of 8” RCC

Typical method of operation:
- Traffic Control
- Mill
- Fill
- Saw
- Cure
- Remove Traffic Control
Areas of “Opportunity”

Design/Specifications:
- Gradation requirements
- Lane Closure/restrictions

On The Ground:
- Subgrade Stability
- Quality Control
- Cure Time
- Flow of Material (Consistency)

One of the main reasons for the Success of this portion of the project:

TEAMWORK
June 5, 2017

Mr. Matt Munsick
Andale Construction
3170 N Ohio
Wichita, Kansas 67219

Subject: Laboratory Mix Design on Roller Compacted Concrete (RCC)
1/85 Randolph/Guilford County
50% #78M with 50% Natural Sand
SUMMIT Project No. SI-340-15

Dear Mr. Munisick:

Summit Laboratory, P.C. (SUMMIT), an AASHTO R18 Accredited Laboratory meeting the requirements of ASTM C1077 and ASTM E329, has completed the requested laboratory testing on the RCC mix designs for the above referenced project. The objective of the laboratory testing was to evaluate the appropriate amount of Portland Cement required to yield a laboratory unconfined compressive strength of 4,500 psi at 28 days utilizing 13.0% and 15.0% cement with the addition of 0.02% ACEit admixture by weight of cement. The RCC mix design procedure and specifications used in the laboratory evaluation was provided by Mr. Munsick with Andale Construction.

An Andale Construction representative delivered approximately 600 lbs each of #78M aggregate from the Martin Marietta Jamestown Quarry and Natural Sand from the Lemon Springs Quarry. The aggregate blend utilized in the RCC mixes consisted of 50% natural sand and 50% #78M stone. The cement used in the mixes was an ASTM C150 Type III Roanoke Cement.

Initially, the blended aggregate was tested in accordance with ASTM C136 (Sieve Analysis of Fine and Coarse Aggregate) to verify that the aggregate blend met the gradation requirements for RCC aggregate. The grain size analysis of the blended aggregate is provided in the Particle Size Distribution Report.

The proportioning method used to produce the RCC mixes was based on the Soil Compaction Test Method. This involved performing ASTM D1557, Method C (Modified Proctor Test) at 14.0% cement by weight of aggregate with 0.02% ACEit by weight of cement, and establishing a moisture-density curve to determine the optimum moisture content and maximum dry unit weight of the aggregate-cement mix.
# Compressive Strength Report

**Roller-Compacted Concrete Laboratory Mix Design**

**Client:** Andale Construction  
**Project:** NCDOT I-85 Randolph/Guilford County  
**Report Date:** 06/06/17  
**Specified Strength:** 4500 PSI at 28 days

**Date Batched:** 05/02/17  
**Time Cast:** 12:30 PM  
**Unit Weight (PCF):** 147.8  
**% Moisture:** 6.4

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Remarks:  
- Cement: 464 lbs  
- Stone: 3313 lbs  
- Water: 223 lbs
### Gradation for Roller Compacted Concrete Aggregate

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<th>Sieve Size</th>
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### Test Results

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RCC has been called and “ugly” pavement;  
What about finished RCC?
What could possibly go wrong?

Matt Munsick
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