I-85 Guilford & Randolph County RCC
PROJECT HISTORY

- Condition of Existing Shoulders
- Construction Sequence
Material Selection

- RCC vs Concrete vs Asphalt
  - Limitations of Placement of RCC
  - Price of Concrete Pavement
  - Difference in Materials with Asphalt
• Outside Shoulders

• 10 feet wide, 8 inches deep of RCC

• 81,583.54 SY of RCC or 13.9 Miles

• Completed in 18 production days from July 29, 2017 to August 30, 2017. 2 weeks shutdown for Golf Tournament
• Inside Shoulder from Asphalt to RCC
  • History

• Changed from 4 feet wide, 4 inches deep of S9.5C to 4 feet wide, 6 inches deep of RCC

• 34,992.56 SY or 14.9 Miles

• Completed in 16 Production days from April 21, 2018 to May 11, 2018
CONSTRUCTION CHANGES
Exit 111 Ramps

- History
  - SouthBound Ramp
    - 2411.78 SY
    - Ramp closed June 2, 2018, Ramp opened June 5, 2018
    - 1 day to pour ramp
  - Northbound Ramp
    - 4018.44 SY
    - Ramp closed June 6, 2018, Ramp opened June 13, 2018
    - 2 days to pour ramp
    - 2 days waiting on Pavement Markings
• TESTING

• Tests were done on a lot by lot basis
  • Lots are 2,000 SY or portion
  • Density Test
    • 3 Wet Density shots with a Nuclear Gauge per Lot
    • 96 % per Test and 98 % Average
  • Strength Test
    • 1 set of 3 6 X 12 Cylinders as per ASTM C1435 per Lot
    • 4,500 PSI required strength
  • Thickness Test
    • 1 Core per Lot
Innovative Pavement Technologies
NCDOT Division 7 Shoulder Construction
Five hundred years ago, everybody knew the earth was flat.

“If you don't know where you're going, you might not get there.” - Yogi Berra
RCC is not new to North Carolina...
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
raleigh, n.c.

contract and
contract bonds
for contract no. c20914

51609.11_nepm:98313111

wbs

tip no.

county of
cullowhee

this is the
roadway & structure contract

route number
183

location
1.55 from u.s. 35 business to main street in arcadia.
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
3176 N. Ohio
Wichita, Kansas 67219

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

Dear Mr. Munsick:

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 II 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  
**Job No.:** SL-340-15  
**Specified Strength:** 4500 PSI at 28 days  
**Date Batched:** 05/02/17  
**Time Cast:** 12:30 PM  
**% Moisture:** 6.4

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**Remarks:**
- Cement: 464 lbs
- Stone: 3313 lbs
- Water: 223 lbs

**Tester:** RG  
**Checked by:** NH
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RCC has been called and “ugly” pavement; What about finished RCC?
Matt Munsick
Andale Construction
864-434-3550 (m)
316-832-0063 (o)
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