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Roller-Compacted Concrete (RCC) Rescues Failed Truck Route in Chester, South Carolina

1 Successive overlays nearly covered the curb while the pavement deteriorated

2 Milling the pavement to lower it two inches below the original gutter elevation

3 Immediately prior to RCC placement, the pavement is milled an additional eight inches

When the South Carolina Department of Transportation (SCDOT) built the J.A. Cochran Bypass in an undeveloped area around Chester, South Carolina, in 1974, minimal traffic used this route. Today, the Bypass serves as a major truck route shortcut between I-77 and I-85, in addition to connecting to Chester's main shopping area. In 2014, the average daily traffic for this location was 15,300, which made it the busiest road in Chester County, outside of I-77. The original asphalt pavement was never designed for this loading and has been overlaid multiple times during the years, to the point the curb was nearly covered (Photo 1). Despite the extra thickness, the pavement cracked through, and became a maintenance issue for the local SCDOT office.

To solve this problem economically and with minimum disruption, the SCDOT turned to roller-compacted concrete (RCC). RCC provided the deep strength necessary to handle future traffic and allowed SCDOT to uncover the filled-in curb and restore its water-carrying capability. During the last seven years, SCDOT has performed more than 600,000 square yards of RCC on over 20 projects throughout the state. Most of these projects utilized RCC for reconstruction in urban areas with highly distressed curb-and-gutter pavement and little tolerance for extended disruption to adjacent businesses. Reconstruction of this particular route began with two earlier RCC projects constructed in 2012 and 2013.

Lane Construction Corporation was the general contractor. The RCC subcontractor was Site-Prep, Inc. of North Carolina.

The RCC was produced at Site-Prep's portable pug mill, which was set up within 15 minutes of the site.

The contract quantity for RCC pavement was 12,500 square yards to be constructed at a depth of eight inches. This project's complicating factor was a tie-in to an active rail line; the railway elevation had to be met and work within the railroad right-of-way had to be coordinated with the railroad company.

The speed of construction was a key element in this successful RCC project. The entire RCC layer was placed in one operation, avoiding the necessity of constructing multiple lifts and exposing traffic in adjacent lanes to drop off between lanes for an extended time period. Another factor favoring the use of RCC was the ability to place limited traffic on the RCC almost immediately after placement.

Overall, the five-lane, 1,800-foot long project was completed in approximately two weeks. The RCC portion required three days, and the asphalt and various other work took five days. "RCC gives us a tool, among others, for rapidly reconstructing pavement against curb where we can't raise the pavement elevation," said SCDOT District 4 District Engineering Administrator John McCarter. "Reconstructing urban pavements with many points of access is always a difficult challenge. The ability to place the RCC base in one lift and then open it to light traffic immediately has benefitted us greatly in our engineering district."

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4 RCC is delivered to high-density paver while traffic uses the RCC pavement in the adjacent lane placed 48 hours earlier

5 Even before rolling, driveways may be immediately reopened behind the paver if alternative access is not available

6 During the curing period, mainline traffic is kept off the RCC pavement, but crossing traffic is allowed at driveways

President of Site-Prep, Inc. of North Carolina John Edwards is sold on the benefits of RCC.

"RCC provides owners a cost-effective full-depth pavement replacement option with minimal impact to the motoring public due to the shorter project duration as compared to conventional pavement replacement options," he said. He feels RCC is particularly well-suited to urban reconstruction projects. Edwards further stated, "In this particular application, the RCC can be placed to address previous drainage and cross slope issues to improve safety, improve ride ability, and achieve longer-lasting performance of the final riding surface. Due to its strength, RCC allows the owner the ability to utilize an overall thinner pavement section by which utility conflicts and costly utility relocation can be avoided."

RCC is a proven, durable, and economical solution. RCC provides outstanding value for many types of paving projects.

Typical Construction Sequence of Roller-Compacted Concrete Pavement

1. Mill the existing asphalt approximately six inches to a depth of two inches below the original gutter elevation. The preferred pavement cross slope may be reestablished during this operation. During the milling operation, traffic is not exposed to any adjacent lane drop-offs greater than two inches and access to driveways is maintained. All lanes are open at the end of the day with drop-offs of an inch or less, and no overnight lane closures or detours are required (Photo 2).
2. Mill an additional eight inches and immediately replace with eight inches of RCC. This is achieved one 12-foot wide lane at a time (Photos 3-4). On this project, it was elected to mill and replace the median with RCC, but other projects have retained the existing median, depending on pavement conditions. White-pigmented curing compound was applied and pavement joints were cut every 16 feet to one-quarter of the RCC depth using an early entry concrete saw almost immediately after compaction was completed.
3. Although mainline traffic was kept off of the new RCC for 24 hours, traffic was permitted to cross the fresh RCC immediately to allow driveways to remain open, if alternate access was not available (Photo 5-6).
4. Approximately three days after placement, a few short rough spots in the RCC were milled to ensure a good final ride. Grinding is recommended if the RCC is the final riding surface due to the potential for minor joint damages; experience shows milling is acceptable prior to overlay.
5. After RCC was placed on the existing pavement, a two-inch asphalt cap was applied up to the level of the gutter pan for aesthetic purposes.
6. Finally, all driveways were adjusted to tie in to the new, correct pavement elevation, and damaged curb and gutter sections were replaced.

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