South Carolina
Department of Transportation

Preliminary Investigation Report

TO: Assistant Program Manager Bickley
Geotechnical Engineer Alternative Delivery Harris

FROM: State Pavement Design Engineer Carroll
Assistant State Pavement Design Engineer Kim

DATE: November 22, 2023

RE: I-77 Blythewood Exit 26 New Interchange Pavement Design Summary

This memo provides a brief summary of our investigation and findings for the above referenced pavement section mainly on shoulders. On the night of Wednesday June 7th, representatives from the Office of Materials and Research visited I-77 between mile points 24 and 27 in Richland County to provide recommendations for interchange improvement. OMR collected 21 cores and performed Falling Weight Deflectormeter (FWD) to evaluate the existing pavement structure on shoulders. The following is a summary of our observations from these cores.

Pavement Investigation

MM 24-27 North Bound

Mainline:
I-77 northbound is an old continuously reinforced concrete pavement (CRC). The surface condition of the CRC pavement is fair except for areas with joint issues (as shown in picture #9). The section between approximate mile market 24 and 25 is 3 lanes and the pavement appears to be CRC including the extra lane because there are no transverse joints. Cores were not obtained from the mainline, but based on plans and cores from the southbound, the depth of the concrete should be close to 9 inches for CRC, and 6 inches for the lean concrete base over 5 inches of Macadam.
FWD testing for the existing structure number calculation was not conducted on the concrete section due to the nature of the concrete pavement.

Shoulder:
The shoulder is a full-depth asphalt pavement and an average depth of 8.0 inches, ranging from 7.0 and 9.5 inches. The existing structural number, determined from the FWD test results, is 2.8. Both the inside and outside shoulders in this area have an existing structure number as low as 2.68.

The surface condition is generally good, with the exception of low severity transverse cracking occurring approximately every 20 feet. Please refer to the pictures of locations #6, #9, and #19 for typical cores.
The shoulder does not appear to be adequate to carry temporary traffic for MOT due to the amount of distress present and potential weak areas. Caution should be exercised before utilizing the existing structure.

MM 24-27 South Bound

Mainline:
I-77 southbound is 2 lanes which is an old Continuously Reinforced Concrete (CRC) pavement that has been overlaid with asphalt. The average depth was 21.3 inches, typically comprising 6.3 inches of asphalt over 9 inches CRC, and 6 inches of lean concrete base over 5 inches of Macadam.
The surface condition of the existing asphalt pavement is relatively good with no noticeable deterioration. The southbound lanes were previously resurfaced with two layers of 200 psy Surface B and 110 psy of OGFC under the design-build project, while the northbound lanes were not resurfaced. Consequently, the pavement on the southbound side is approximately 5 inches thicker than the pavement on the northbound side in general.
FWD testing for the existing structure number calculation was not conducted on the concrete section due to the nature of the concrete pavement.

Shoulders:
The shoulder is a full-depth asphalt pavement with an average depth of 13.8 inches, ranging from 11.5 to 15.3 inches based on the cores, which includes the existing OGFC thicknesses of approximately 1.2 inches. The existing structure number of the both inside and outside southbound shoulders in this area is 4.75, as determined from FWD test results.

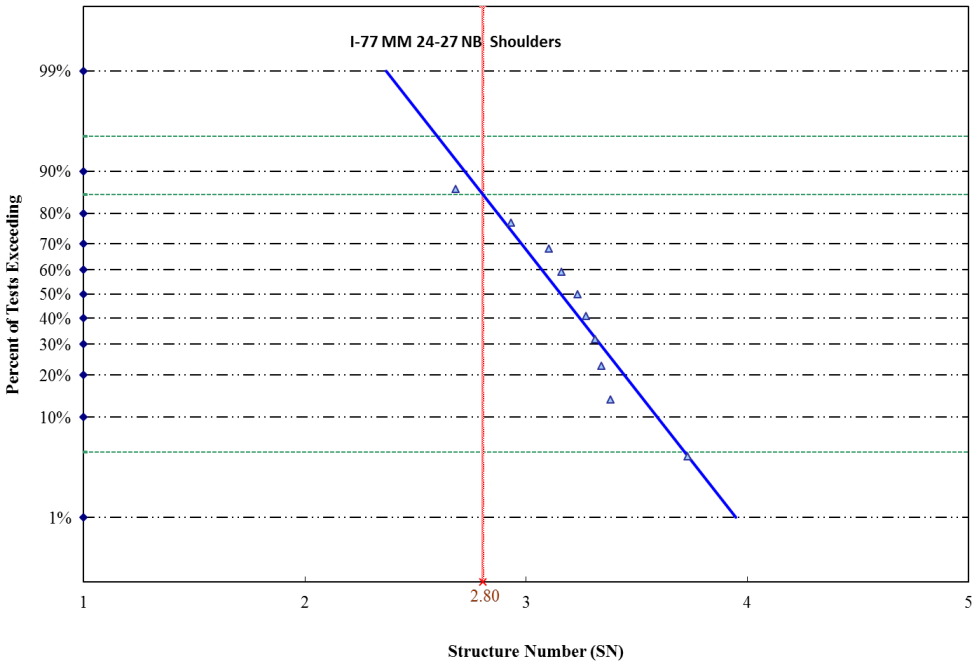
The surface condition is relatively good with no noticeable deterioration. Please refer to the pictures of location # 3 and #4.

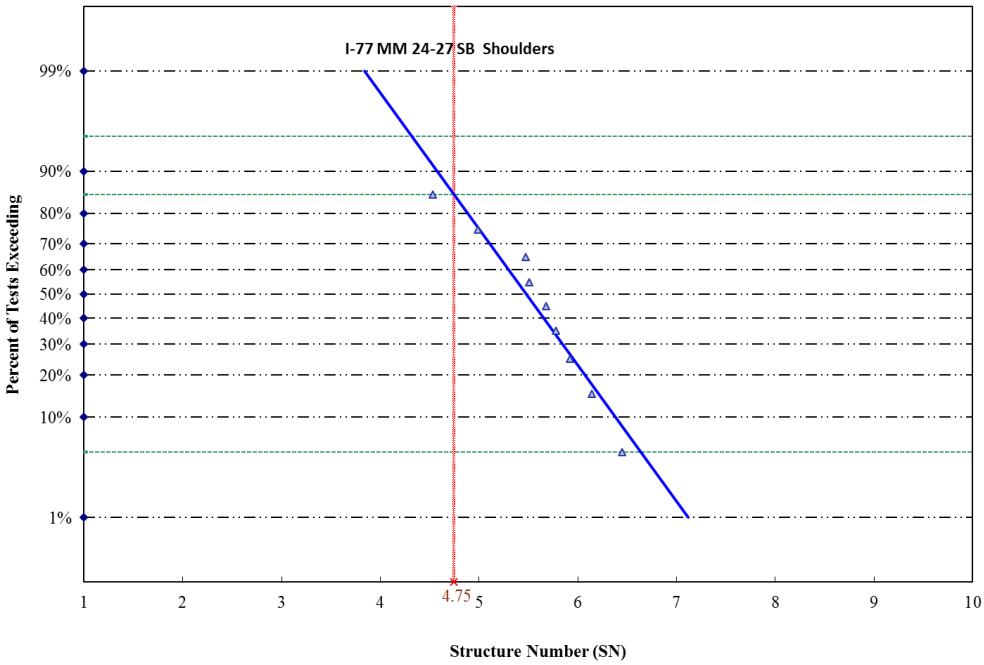
The shoulder may not be sufficient to accommodate temporary traffic for MOT depending on the construction period and potential weak areas. Please consult with OMR to finalize temporary pavement designs.

Attachments

- Structural Number Existing
- Core Photos
- Core Data Table

Structural Number Existing





Pictures
MM 24-27

Core #3 – SB Outside Shoulder

Core #4 – SB Outside Shoulder (relatively good condition)

Core Location #6 – NB: Transvers Joints on Extra Lane

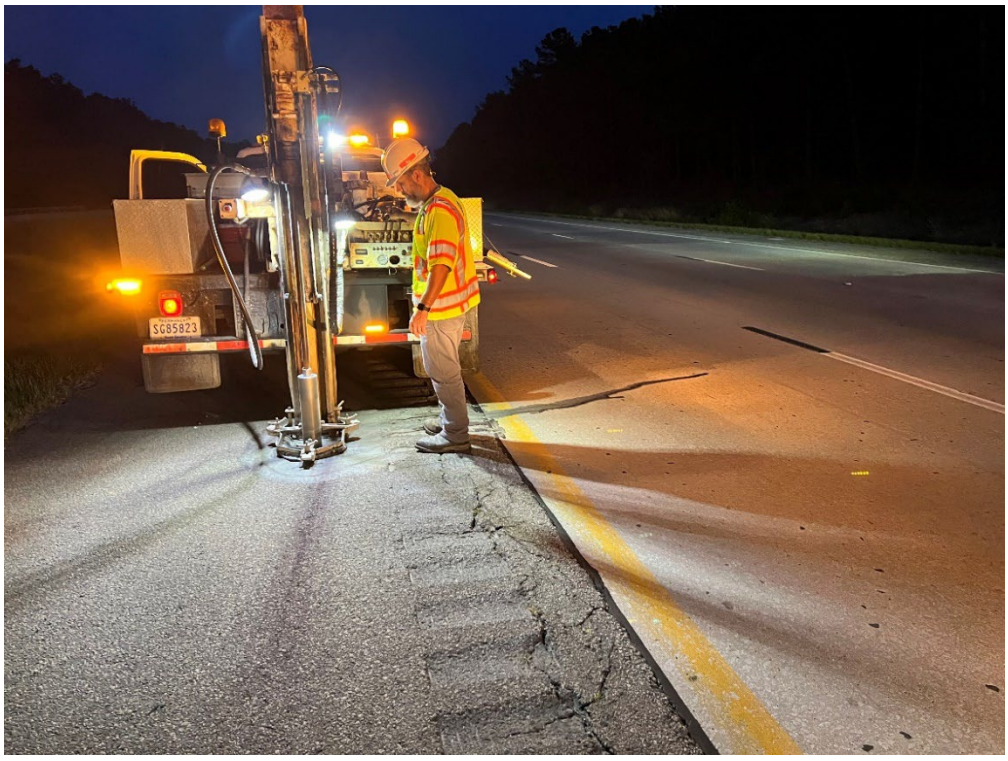
Core Location #9 – NB Joint Failure

Core #9 – NB Outside Shoulder

Core Location #14 – SB: AC on Shoulders, AC over CRC on Mainline

Core #14 – SB Inside Shoulder

Core Location #19 – NB: AC on Shoulders, PCC on Mainline



Core #19 – NB Inside Shoulder

Core Data Table

Shoulders

Core Number	Approximate Location (Mile marker)	Direction	Total Thickness (Inches)	OGFC (Inches)	Sand AC (Inches)	Debonding (Inches)	Underlying Base Material	Core from
1	26.65	SB	15.25	1.25		4 and 7.5	Aggregate Base	Outside Shoulder
2	26.26	SB	14.25				Aggregate Base	Outside Shoulder
3	25.75	SB	11.75			5.0	Aggregate Base	Outside Shoulder
4	25.23	SB	11.50			4.3	Aggregate Base	Outside Shoulder
5	24.75	SB	13.50			4.5	Aggregate Base	Outside Shoulder
6	24.27	NB	8.25			4.0	Aggregate Base	Outside Shoulder
7	24.75	NB	7.25			4.0	Aggregate Base	Outside Shoulder
8	25.25	NB	7.25				Aggregate Base	Outside Shoulder
9	25.75	NB	9.00				Aggregate Base	Outside Shoulder
10	26.25	NB	7.00				Aggregate Base	Outside Shoulder
11	26.75	SB	13.75	1.25			Aggregate Base	Inside Shoulder
12	26.25	SB	14.50	1.25			Aggregate Base	Inside Shoulder
13	25.75	SB	13.50	1.25			Aggregate Base	Inside Shoulder
14	25.25	SB	15.00	1.25		9.0	Aggregate Base	Inside Shoulder
15	24.75	SB	16.00	1.25		10.0	Aggregate Base	Inside Shoulder
16	23	NB	16.00	1.00			Aggregate Base	Inside Shoulder
17	24.25	NB	8.00		1.5	1.5	Aggregate Base	Inside Shoulder
18	24.75	NB	9.50				Aggregate Base	Inside Shoulder
19	25.25	NB	7.75				Aggregate Base	Inside Shoulder
20	25.5	NB	7.00				Aggregate Base	Inside Shoulder
21	25.75	NB	9.00				Aggregate Base	Inside Shoulder

Mainline Southbound

Direction	Lane	Core	Mile Point	Total Thickness	AC Thickness	Sand Asphalt	Concrete	Underlying material	Latitude	Longitude
SB	Outside	1	26	22	7		15	Sand Clay	34.1951	-80.9853
SB	Outside	2	23	20.75	5.5		15.25	Sand Clay	34.1556	-80.9647
SB	Outside	3	20	21.75	6.5		15.25	Sand Clay	34.1077	-80.9622