

# Bridge Assessment Report

## I-85 Over Thicketty Creek

Project ID: P027114

Cherokee County, South Carolina

Prepared for:  
The South Carolina  
Department of Transportation

Report prepared by:



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## I. INTRODUCTION

### OVERVIEW

This report has been prepared by Mead & Hunt Inc. for the South Carolina Department of Transportation to provide a general assessment of I-85 Northbound/Southbound Bridges over Thicketty Creek in Cherokee County, SC in preparation for the widening of I-85.

### SCOPE OF SERVICES SUMMARY

A visual inspection of the I-85 Northbound/Southbound Bridges over Thicketty Creek was conducted in order to identify items that will need to be addressed during the construction phase of the I-85 widening project.



Figure 1 – Existing Bridge



Figure 2 – Existing Bridge

### EXISTING BRIDGE INFORMATION

The existing bridge is a three (3) span, simply supported welded plate girder structure with an overall length of 383'-9"  $\pm$  C/C at the deflection joints (measured along the inside face of the southern exterior parapet). The existing bridge width is 116'-10"  $\pm$ . The substructure consists of concrete cap and columns/drilled shafts for the interior bents and concrete cap on steel piles for the end bents.

Bridge:	I-85 (Northbound and Southbound near mile marker 89)
Over:	Over Thicketty Creek
Bridge ID:	1110008500100
Type:	Steel Stringer / Multi-Beam or Girder with Concrete Deck and Substructure
Year Built:	2001 (stamped on bridge parapet)
Spans:	140'-9" $\pm$ , 141'-6" $\pm$ , 101'-6" $\pm$ (field measured)
Width:	116'-10" $\pm$ (taken from construction documents)
Loading:	ASSHTO HS25-44 (taken from construction documents)
Skew:	0 degrees (taken from construction documents)



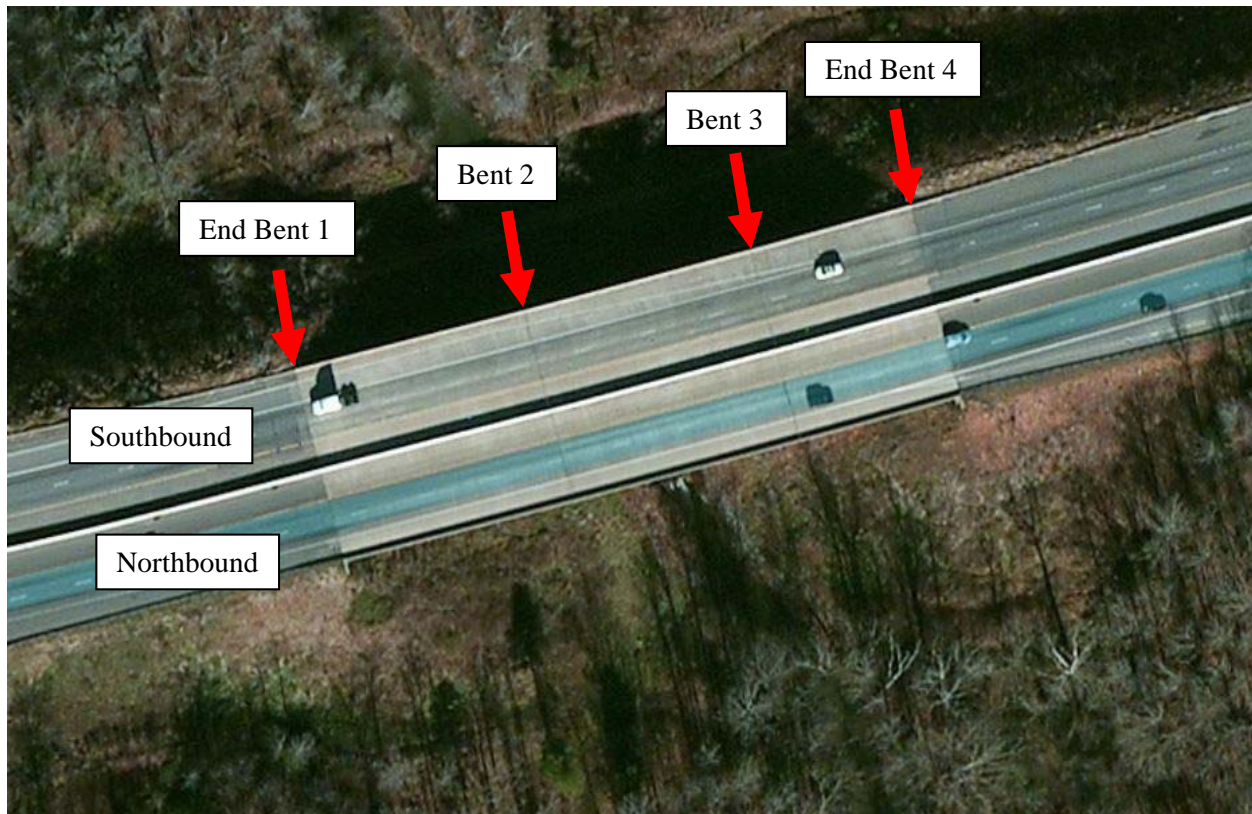


Figure 3 – Existing Bridge Layout

### BRIDGE TYPICAL SECTION

The existing bridge typical section consists of a 52'-9"  $\pm$  roadway width for the Northbound direction and a 58'-9"  $\pm$  roadway width for the Southbound direction. Currently, two travel lanes exist in each direction. A 4'-8"  $\pm$  tall median barrier parapet divides the two travel directions with 2'-8" barrier parapets at the deck edges. The total out/out bridge width is 116'-10"  $\pm$ .

### DECK

The existing deck thickness is approximately 9-1/4"  $\pm$  per the construction documents.

### WELDED PLATE GIRDERS

The superstructure is made up of twelve (12) welded, steel plate girders spaced at 10'-0"  $\pm$ .

### EXPANSION JOINTS

There are two deck expansion joints located within the bridge. They are located at Bent 2 (strip seal) and at Bent 3 (compression seal).

### CROSS FRAMES

The superstructure has two types of cross frames within the bridge; interior and end support cross frames. These cross frames are made of angles welded or bolted to girder connection plates.

**LIGHTING**

The existing bridge has no overhead lighting.

**DRAINAGE**

Deck drains are located on south side of the median barrier parapet and along the north side of the existing deck. The deck drains discharge directly below to the existing ground.

**BEARINGS**

The existing bearings consist of steel reinforced elastomeric bearings with load plates.

**END BENTS**

The existing end bents consist of concrete cap on steel piles with concrete end walls (integral end bents).

**INTERIOR BENTS**

The interior bents consist of concrete cap and columns on drilled shafts.

**SIGNS**

There are no signs located on the existing bridge.

**TRAFFIC COUNTS**

ADT (2012)	53,800
ADT (2032)	94,150
ADTT (2012)	9,684 (18%)

**II. BRIDGE INSPECTION PHYSICAL CONDITION****GENERAL**

Mead & Hunt Inc. performed a visual inspection on October 30, 2015. The inspection was performed in order to determine the physical condition of the existing structure and to identify items that will need to be addressed during the construction phase of the I-85 widening project. All visible areas were visually inspected from either above or below without the aid of ladders, man lifts, etc. The roadway was not closed during the visual inspection.

**SUPERSTRUCTURE CONDITION****DECK**

The existing composite, reinforced concrete deck was visually inspected from the shoulder since the roadway wasn't closed. A majority of the existing deck was in good condition (Figure 4) except at the closure pours on the two end spans of the southbound bridge. The closure pour for the interior span was

in good condition. There are several areas at the end spans where a portion of the concrete deck was missing and the reinforcing steel was exposed (See Figures 5 and 6). It was also noticed during the inspection of the underside of the deck (which had efflorescence) that water has been penetrating the deck of the southbound side (Figures 10 and 11) and eroding the earthen embankment below. Images of the earthen embankments can be found in subsequent figures located in the “Substructure Condition” section of this report. The closure pour areas of the southbound bridge are to be repaired per the details in Part III below. The concrete end walls are generally in good condition, except there is water penetration occurring at the closure pour locations (Figures 7 and 8). Only one area is experiencing water penetration at the end walls in between the plate girders and away from the closure pours (Figure 9). The end walls are generally in good condition except in locations stated above. The end wall at Bent 4 shall have epoxy repair of the crack as listed in Part III. Some minor repair of the asphalt roadway is necessary at the southbound deflection joint at End Bent 1 (Figure 13) as listed in Part III.



**Figure 4 – Existing Concrete Deck**



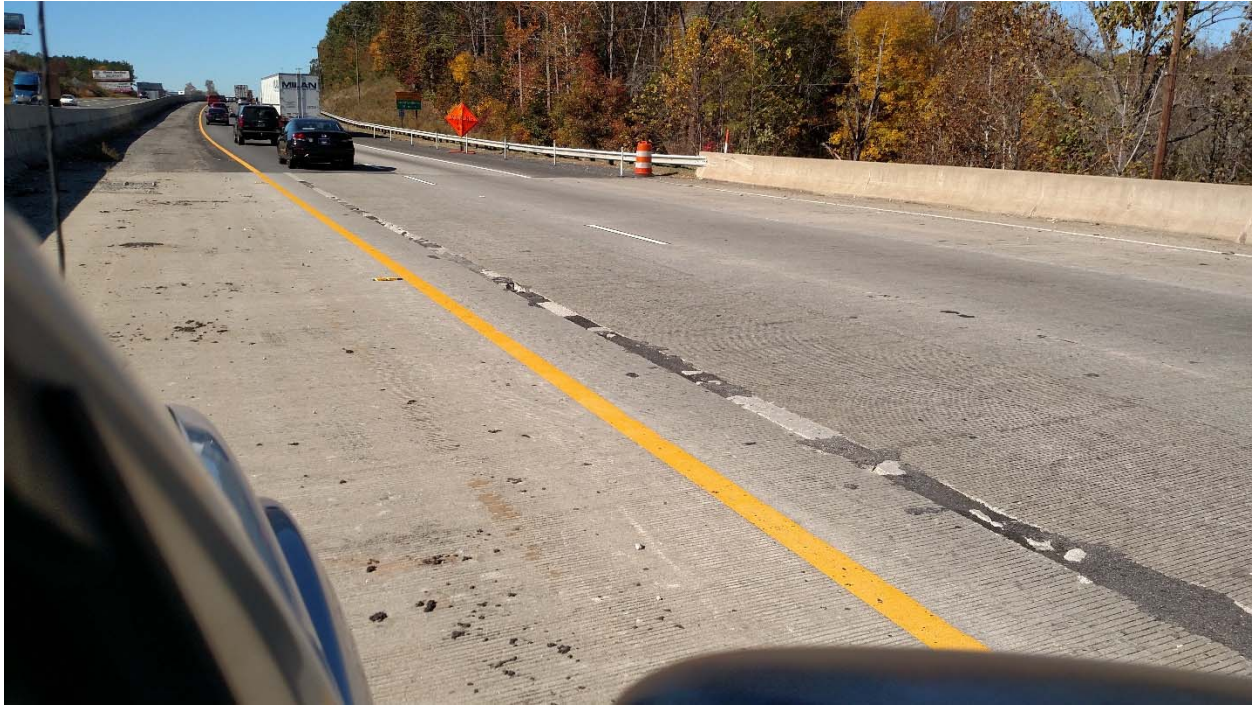


Figure 5 – Closure Pour (Southbound)



Figure 6 – Closure Pour (Southbound)





Figure 7 – End Wall at Closure Pour (Northbound)



**Figure 8 – Bent 4 End Wall at Closure Pour (Southbound)**



**Figure 9 – Water Penetration at End Wall (Southbound)**





Figure 10 – Closure Pour (Southbound)



Figure 11 – Closure Pour (Southbound)



Figure 12 – Closure Pour (Southbound)





Figure 13 – Deflection Joint (Southbound)

### WELDED PLATE GIRDERS

The existing welded plate girders were visually inspected in accessible areas at the end bents or from the ground for deterioration, section loss of built-up members, and cracks along all weld locations and stiffeners. The overall condition of the girders is very good. Only very minor surface rust is occurring near the closure pours where the water is penetrating the concrete deck.



Figure 14 – Superstructure

### CROSS FRAMES

The interior and end support cross frames were visually inspected in accessible areas and were found to be in good condition with no noticeable surface rust or weld cracks or missing bolts.



Figure 15 – Cross Frame



## BEARINGS

The end and interior bearings were not accessible and were not inspected. Only some of the outer faces of the load plates at the end bent bearings were visible due to the concrete end walls (integral end bents). A few areas have minor spalling of concrete and it appears the original contractor did not block out the bearings as directed in the original bridge construction plans. No work is anticipated at the bearing locations.



**Figure 16 – Bearing at End Bent**

## EXPANSION JOINTS

There are two deck expansion joints located within the bridge. They are located at Bent 2 (strip seal) and at Bent 3 (compression seal). Both expansion joints were visually inspected from the shoulders due to the roadway not being closed. The strip seal expansion joint at Bent 2 has debris lodged in it at several locations (Figures 17 and 18). The visible and accessible portions of the steel extrusion and the strip seal appear to be in fair condition. It is recommended that the strip seal gland be replaced. The compression seal joint at Bent 3 also has debris lodged in it at several locations (primarily on the shoulders) and the seal on the southbound bridge has dropped and water is penetrating the joint and falling onto the substructure below (Figures 19 and 20). The visible and accessible portions of the steel armor plates appear to be in fair condition. It is recommended that the compression seals glands be replaced. Refer to Part III below for the full summary of work.





Figure 17 – Strip Seal Expansion Joint (Northbound)

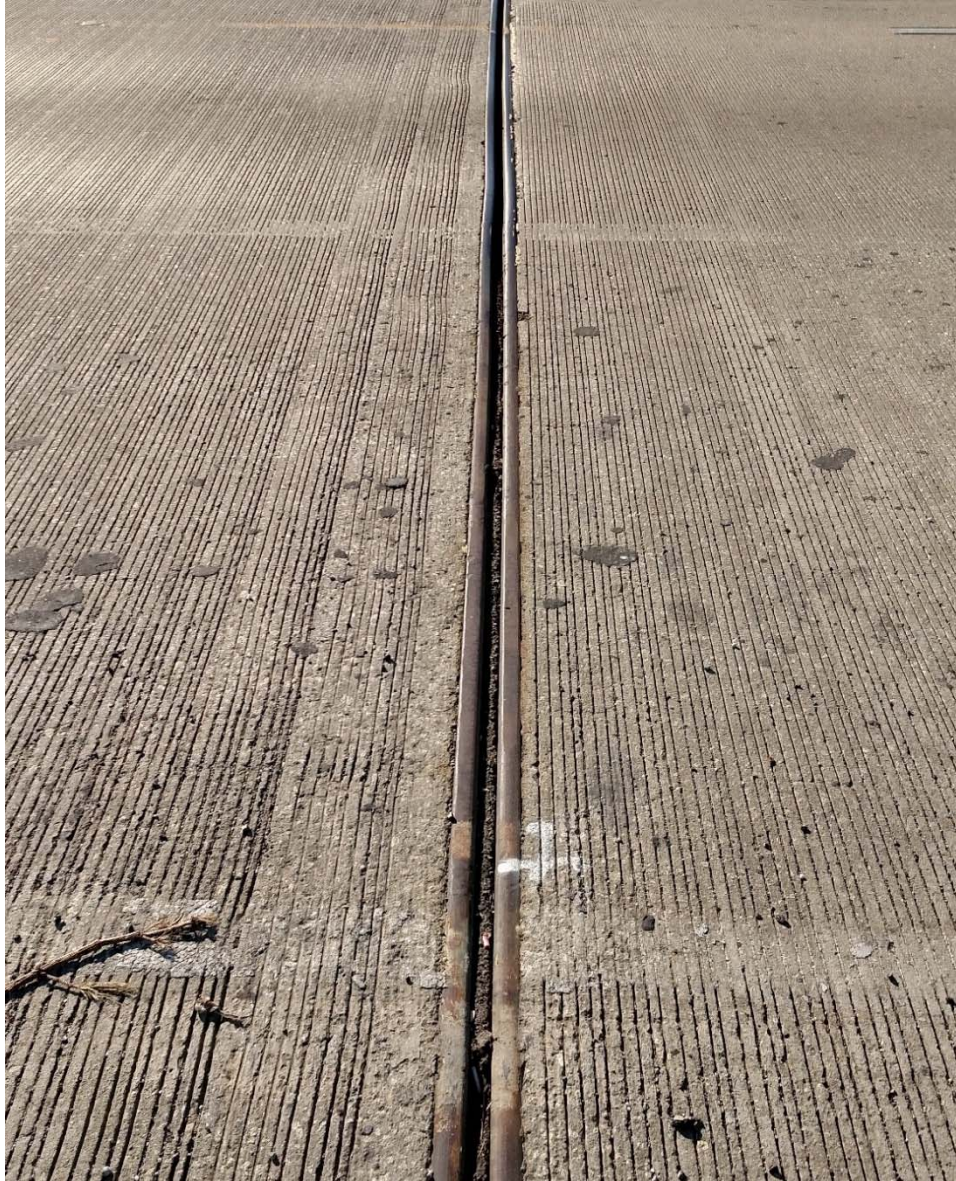


Figure 18 – Strip Seal Expansion Joint (Southbound)



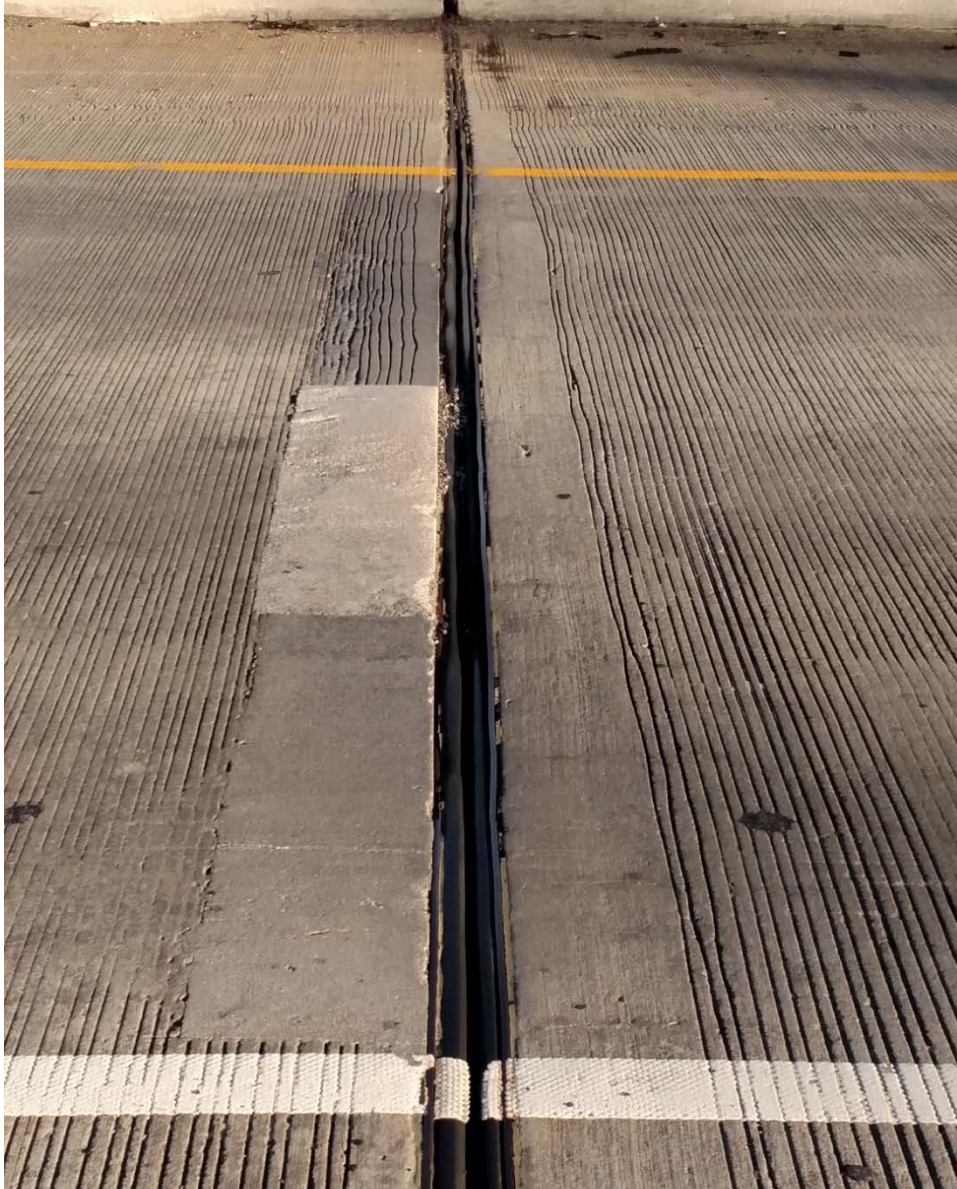


Figure 19 – Compression Seal (Northbound)



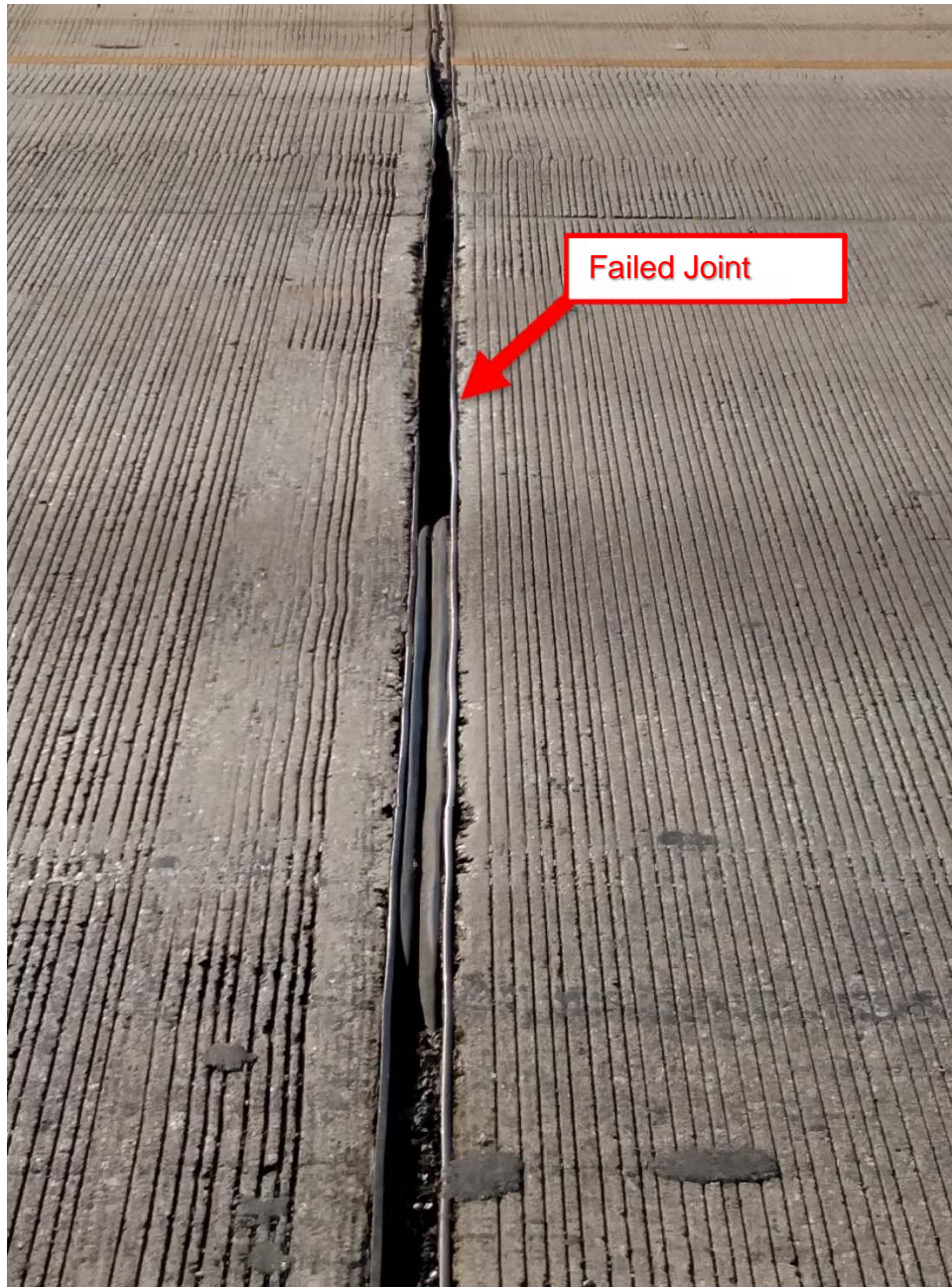


Figure 20 – Compression Seal (Southbound)

### PROTECTIVE COATING SYSTEM

The paint is in excellent condition. There are two locations where paint is peeling (Figures 21 and 22) at cross frame locations. No evidence of warping of the cross frames or girder flanges was noticed.



Figure 21 – Paint Peeling at Cross Frame



Figure 22 – Paint Peeling at Cross Frame



**UTILITIES**

Two utility lines occur on the northern side of the bridge. Most of the anchors attaching the utility lines to the bridge appear to be in good condition. It was noted that one utility line appears to have become detached from the bridge near Bent 3 (Figure 23). No work required to the utility lines.



**Figure 23 – Utility Line detached from Bridge**



**SUBSTRUCTURE CONDITION****PIERS**

The existing piers are in good condition. The concrete caps for all piers have no noticeable deficiencies. Some staining of the pier caps has occurred and this is the result of the water penetration occurring at the failed expansion joints or the concrete deck closure pours (Figure 24). No delamination or spalling of the pier caps or columns was noticed. No work required at the interior bents.



Figure 24 – Staining at Pier Cap (Southbound)



Figure 25 – Bent 2 (Looking North)



Figure 26 – Bent 3 (Looking Northeast)



**EMBANKMENTS**

Each embankment at the end bents is experiencing significant erosion, apparently from the water penetrating the concrete deck and from the deck drains. The most severe erosion is occurring at End Bent 4 (Figure 31). The depth of erosion is approximately 5-6 ft deep and several feet wide. It is recommended that the end bent grading and existing riprap be repaired. A large tree growing was also noted at End Bent 1 which needs to be removed (Figure 29). At the bent cap for End Bent 4 (southbound) water infiltration is causing minor erosion at the face of the bent cap and the top of the fill slope. This is occurring on the underside of the bent cap (Figure 32). Refer to Part III below for the full summary of work.



**Figure 27 – Embankment Erosion at I-85 Northbound Closure Pour  
(End Bent 1)**





Figure 28 – Erosion at Deck Drains (End Bent 1)



Figure 29 – Tree Growth at End Bent 1





Figure 30 – Embankment Erosion at End Bent 4



Figure 31 – Embankment Erosion at End Bent 4





Figure 32 – Water Infiltration under End Bent 4



### **III. BRIDGE REPAIR REQUIREMENTS**

The following repair items are required to the I-85 Bridge over Thicketty Creek during the I-85 Interstate Widening improvements:

#### **JOINTS**

- The existing strip seal gland at Bent 2 shall be replaced. The seal shall be sized based on the existing opening and conform to the requirements of SCDOT Bridge Drawings & Details.
- The existing compression seal gland at Bent 3 shall be replaced. The seal shall be sized based on the existing opening and conform to the requirements of SCDOT Bridge Drawings & Details.
- The asphalt on the approach slab at the deflection joint of the Southbound Lanes at End Bent 1 shall be repaired/patched as directed by the RCE.

#### **DECK**

- The existing closure pour shall be repaired per the details and notes provided in the attached "Deck Repair Details". The closure pour shall be repaired for the entire length of the bridge between end bent deflection joints. The southbound traffic shall be maintained at all times along the outside of the bridge as shown in the attached details.

#### **END BENTS**

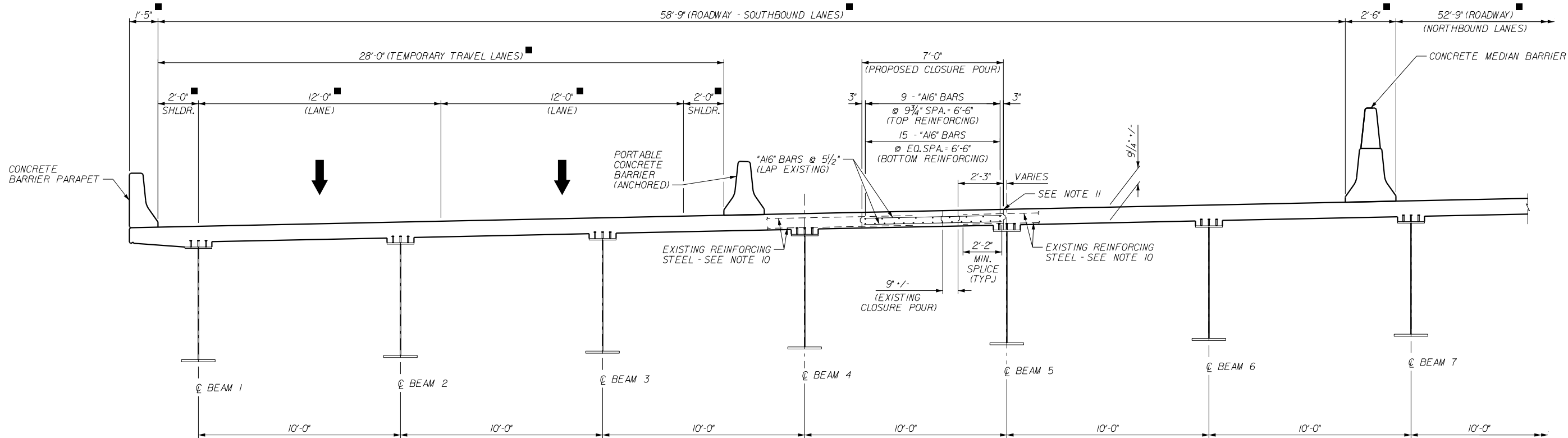
- At the existing stage construction joint at End Bent 4 (southbound side), after the repair of the closure pour, the crack in the end wall shall be filled with an epoxy compound.
- The existing joint is to be cleaned and all loose concrete removed. Immediately after cleaning, while the vertical edge surface is dry, and the air temperature and concrete surface temperature are between 50°F and 80°F, apply an approved moisture resilient epoxy bonding compound meeting the requirements of ASTM C 881 or AASHTO M 235 in accordance with the manufacturer's recommendations to all vertical edges of the repair area.

#### **GRADING**

- The end bent fill slopes shall be repaired to the grade established in the original bridge construction drawings and as indicated in the attached "I-85 over Thicketty Creek Southbound Section".
- All tree/shrub vegetation within 5' of the bridge edge shall be removed.

#### **DRAINAGE**

- A closed drainage system shall be added to capture the water of the 3 deck drain pipes nearest to each end bent. The closed drainage system shall conform to the notes and schematic details shown in the attached "Deck Drainage Modifications".



## TYPICAL SECTION - SOUTHBOUND LANES

(LOOKING OPPOSITE DIRECTION OF TRAFFIC)

### NOTES:

1. THE CLOSURE POUR SHALL BE REPAIRED FOR THE ENTIRE LENGTH OF THE BRIDGE.
2. THE CONTRACTOR SHALL USE EXTREME CAUTION CUTTING THE EXISTING DECK OVER THE EXISTING BEAMS TO ENSURE THE BEAMS ARE NOT DAMAGED. ANY DAMAGE CAUSED BY REMOVAL OPERATIONS SHALL BE REPAIRED OR REPLACED AS DIRECTED BY THE RCE.
3. THE REINFORCING STEEL USED IN THE CLOSURE POUR REPAIR SHALL BE GALVANIZED.
4. FOR ANY EXISTING REINFORCING STEEL EXPOSED DURING REMOVAL OPERATIONS, AT THE DISCRETION OF THE RCE, THE CONTRACTOR SHALL REPAIR OR REPLACE ANY REINFORCING STEEL THAT IS DAMAGED DURING CONSTRUCTION ACTIVITIES OR EXHIBITS MODERATE OR SEVERE SECTION LOSS.
5. WHEN CASTING NEW CONCRETE AGAINST EXISTING CONCRETE, CLEAN THE CONTACT SURFACE OF THE EXISTING CONCRETE OF ALL LOOSE CONCRETE, DIRT, OIL, GREASE, AND ANY OTHER DELETERIOUS MATERIAL TO THE SATISFACTION OF THE RCE. IN ADDITION, BEFORE PLACING THE NEW DECK SLAB CONCRETE, SAWCUT THE EDGE OF THE EXISTING DECK SLAB (1 INCH MINIMUM) TO GIVE A STRAIGHT LINE TO TIE INTO. THOROUGHLY ROUGHEN TO AN AMPLITUDE OF 1/4" INCH JUST BEFORE CASTING THE NEW CONCRETE. ALSO, JUST PRIOR TO CASTING THE NEW DECK CONCRETE, COAT THE PORTION OF THE EXISTING SLAB FROM THE TOP SURFACE DOWN TO THE TOP LAYER OF REINFORCING STEEL WITH A BONDING EPOXY CONFORMING TO ASTM C 881, TYPE II, APPLY BONDING EPOXY IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.
6. IMBED ALL REINFORCING STEEL PROTRUDING BEYOND THE SURFACE AFTER REMOVAL OF CONCRETE IN THE NEW CONCRETE IF FEASIBLE. CLEAN REINFORCING STEEL OF ANY DIRT, OIL, GREASE, OR ANY OTHER DELETERIOUS MATERIAL PRIOR TO PLACEMENT OF CONCRETE.

7. REPAIR OR REPLACE, AT THE CONTRACTOR'S EXPENSE, ANY PORTION OF THE EXISTING STRUCTURE DAMAGED AS A RESULT OF THE CONTRACTOR'S WORK ACTIVITY IN A MANNER SATISFACTORY TO THE RCE.
8. ALL DIMENSIONS OF NEW CONSTRUCTION ARE SUBJECT TO EXISTING CONDITIONS. IT IS REQUIRED THAT ALL DIMENSIONS WHICH MAY AFFECT MATERIALS AND QUANTITIES AS SHOWN ON THESE PLANS BE VERIFIED BY THE CONTRACTOR.
9. A TRANSVERSE GROOVED FINISH SURFACE SHALL BE APPLIED TO THE PROPOSED CLOSURE POUR FOR THE FULL LENGTH OF THE BRIDGE.
10. RETAIN EXISTING TRANSVERSE SLAB REINFORCING STEEL IF LONGER THAN 2'-6", THE CONTRACTOR MAY ELECT TO CUT THE EXISTING STEEL AT A POINT 2'-6" OR MORE FROM THE EDGE OF THE EXISTING SLAB, LEAVING A MINIMUM 2'-6" OF THE EXISTING REINFORCING TO BE EMBEDDED INTO THE NEW SLAB.
11. THE CUT LINE OF THE PROPOSED CLOSURE POUR SHALL BE 2'-3" FROM THE EDGE OF THE EXISTING CLOSURE POUR. PRIOR TO CUTTING THE EXISTING DECK, THE CONTRACTOR SHALL LOCATE THE EXISTING BEAM AND VERIFY THAT THE CUT LINE DOES NOT CROSS THE CENTERLINE OF THE EXISTING BEAM. THE CUT LINE SHALL BE APPROVED BY THE RCE PRIOR TO BEGINNING REMOVAL OPERATIONS.

### LEGEND:

■ - MEASURED RADIALLY

PLANS PREPARED BY:  
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878 SOUTH LAKE DR.  
LEXINGTON, SC 29072  
(803) 996-2900

**Mead & Hunt**

**SOUTH CAROLINA  
DEPARTMENT OF TRANSPORTATION**

**DECK REPAIR DETAILS**

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	CGB	AJS	02/16
DES.			
BY	CHK.	DATE	

COUNTY  
CHEROKEE

ROUTE  
I-85

1. THE CLOSED DRAINAGE SYSTEM SHOWN IS SCHEMATIC ONLY. THE CONTRACTOR SHALL DETERMINE THE PROPER PIPE SIZES, FITTINGS, PIPE LENGTHS, COUPLINGS, AND PIPE BRACKETS REQUIRED TO CARRY THE WATER FROM THE DECK DRAINS TO THE OUTFALLS.
2. ALL COLLECTOR PIPES, ELBOWS, COUPLERS, AND TEES SHALL BE FIBERGLASS PIPE MEETING THE REQUIREMENTS OF ASTM D 2996 AND THE ACCELERATED UV WEATHERING PERFORMANCE REQUIREMENTS OF ASTM G 154.
3. PROVIDE PIPE THAT HAS PIGMENTED RESIN THROUGHOUT THE WALL. PAINT, GEL-COAT, OR EXTERIOR COATING WILL NOT BE ACCEPTED. COLOR SHALL BE LIGHT GRAY (FEDERAL SHADE NO. 26622).
4. GALVANIZE ALL HARDWARE (BOLTS, WASHERS, BRACKETS, ETC.) IN ACCORDANCE WITH AASHTO M 111, AASHTO M 232, OR ASTM F 2329 AS APPLICABLE. PAINT HARDWARE ASSEMBLIES THE APPROPRIATE FEDERAL SHADE NO. TO MATCH THE PIPE.
5. THE ENTIRE COST FOR THE LABOR AND MATERIALS NECESSARY TO DESIGN, FABRICATE, AND INSTALL THE CLOSED DRAINAGE SYSTEM AND REPAIR THE END BENT SLOPES SHALL BE INCLUDED IN THE CONTRACTOR'S BID.

