

# Underwater Inspection Report



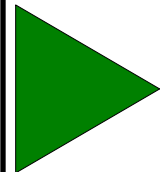
South Carolina Department of Transportation

## I-126 RAMP

Over

## Saluda River

No Significant  
Action Required



Bridge ID No. 4010012620071

Developed by:

Richland County, South Carolina  
September 24, 2012



INFRASTRUCTURE  
ENGINEERS, INC.

consulting engineers | commercial divers

Job No. 10282SC00.02 - 109

This Underwater Inspection Report was Developed for:

**Bridge No. 4010012620071**  
carrying  
**I-126 RAMP over Saluda River**  
in  
**Richland County, South Carolina**

Infrastructure Engineers • 1460 John B White Sr. Blvd, Ste 1C • Spartanburg, SC 29306

---

**2012 UNDERWATER INSPECTION REPORT EXECUTIVE SUMMARY**

Inspection Date: September 24, 2012

NBIS Rating:

- The bridge's submerged components are in **good** condition, except for Pier B which is in **satisfactory** condition.

Significant Conditions Observed:

- None.

Repair Recommendations:

- None.

## 1.0 INTRODUCTION

### 1.1 Purpose and Scope

SCDOT Bridge No. 4010012620071 carries I-126 RAMP over the Saluda River in Richland County. On September 24, 2012, Infrastructure Engineers, Inc. performed a routine underwater investigation at the bridge to evaluate the condition of all substructure units (SSUs) located in the water. This report includes a general description of the structure and the method of investigation, as well as a detailed description of the conditions noted. In addition, this report contains a condition assessment of the evaluated bridge components and presents recommendations for structural repairs.

The scope of the investigation included a visual inspection of all accessible SSUs located in the water from the high water mark to the channel bottom. Depth soundings were also taken along the bridge's upstream and downstream fascias to assist in scour identification and documentation.

### 1.2 General Description of the Structure

The report cover photograph shows an overall view of the bridge's upstream fascia, and Photograph 1 in Appendix B shows a downstream fascia view.

The portion of the bridge over the waterway consists of two continuous steel girder spans. This portion of the superstructure is supported by three piers. Each pier consists of a single reinforced concrete column with a hammerhead cap. Each column is supported by a reinforced concrete spread footing. Refer to Photograph 2 in Appendix B for a view of a typical pier.

SCDOT design drawings were not available; therefore, the piers are labeled alphabetically from south to north. Refer to Figures 1 and 2 in Appendix A for a bridge plan and elevation sketch.

### **1.3 Method of Investigation**

A dive team, led by a South Carolina-registered professional engineer-diver, conducted the underwater inspection. The inspection team accessed the bridge site from shore.

The underwater investigation generally consisted of a Level I “swim-by” visual inspection over 100 percent of the accessible SSU surfaces from the high water mark to the channel bottom. Divers performed a Level II visual/tactile inspection on at least 25 percent of the SSUs, which included cleaning marine growth at the waterline, mid-depth, and channel bottom to facilitate an evaluation of the underlying surfaces. Inspectors paid particular attention to any observed areas of excessive deterioration or apparent distress while noting the condition of any repairs.

The inspection team also assessed the waterway and streambed conditions in the bridge vicinity, noting the type of channel bottom material, as well as the location and extent of any observed scour, riprap, or debris.

Inspectors noted the waterline location with respect to a fixed reference on the bridge at the time of the inspection. Depth soundings were taken along the bridge fascias and around each SSU using a leadline.

## **2.0 INSPECTION FINDINGS**

At the time of inspection, the waterline was located 26.4 ft. below the top of the deck on the upstream side of Pier A. SCDOT drawings were unavailable at the time of inspection, therefore a reference elevation of 100.0 was assigned to the deck at the

upstream side of Pier A. This translates to a waterline elevation of 73.6. The Saluda River flowed with a velocity of up to 0.5 fps during the inspection. Bridge soundings indicate that the maximum water depth was 16.6 ft. on the downstream fascia at Pier B. Refer to Table 1 in Appendix A for a listing of the sounding measurements relative to the bridge deck.

The banks along the Saluda River in the bridge vicinity are in stable condition. Embankment protection in the form of riprap and vegetation is present on the south and north banks. There is no sign of active erosion. Refer to Photographs 3 and 4 in Appendix B for a view of the south and north embankments, respectively. The channel bottom in the bridge vicinity primarily consists of rock.

The SSUs located in water at the time of inspection included Piers A through C. All of the inspected SSUs have 1/4-in. penetration scaling from the channel bottom to 3 ft. above the waterline. There is moderate timber debris on the channel bottom around Pier B. There is a spall on the Pier B Column measuring 12 in. high by 16 in. wide and 3 in. deep with no exposed reinforcing located 11.5 ft. below the waterline on the downstream nose. Refer to Photograph 7 in Appendix B for a view of the spall. The footings of Piers A and B are exposed up to 2 1/2 ft. high. Refer to Table 2 in Appendix A for detailed measurements of the footing exposure. Refer to Figures 1 and 2 in Appendix A for detailed inspection notes and a plan view showing the existing conditions at each of the inspected piers.

### 3.0 EVALUATION AND ASSESSMENT

Overall, the submerged components of the bridge SSUs are in **good** condition, except for Pier B which is in **satisfactory** condition. The light scaling observed is typical of in-service concrete of this age and does not currently affect the bridge. The spall observed on Pier B does not adversely affect the bridge. The exposed footings are likely an as-built condition and do not affect the structure.

The inspected SSUs are rated as **good**, **Code 7**, except for Pier B which is rated **as satisfactory**, **Code 6**, in accordance with the FHWA National Bridge Inspection Standards (NBIS) Coding information. Appendix C contains condition rating forms in both NBIS and Bridge Management System (BMS) formats for this bridge.

#### 4.0 RECOMMENDATIONS

There are no repair recommendations at this time. In accordance with NBIS recommendations, the next routine underwater inspection for this bridge should be conducted on an interval not to exceed 60 months. In addition, bridge soundings should be taken as part of biennial above-water inspections, as well as following significant flooding events.

Respectfully submitted,

**INFRASTRUCTURE ENGINEERS, INC.**



Jeffrey B. Rowe, P.E.

**Table 1**  
**Bridge Soundings**

Bent	Upstream Fascia			Downstream Fascia		
	Waterline to Channel Bottom (ft)	Top of Deck to Waterline (ft)	Top of Deck to Channel Bottom (ft)	Waterline to Channel Bottom (ft)	Top of Deck to Waterline (ft)	Top of Deck to Channel Bottom (ft)
1/2	0.6	24.8	25.4	Dry	Dry	21.6
3/4	4.3	25.6	29.9	2.9	25.6	28.5
<b>A</b>	1.7	26.4	28.1	3.7	27.1	30.8
1/4	0.9	27.2	28.1	3.5	27.7	31.2
1/2	6.6	28.0	34.6	2.9	28.4	31.3
3/4	9.5	28.8	38.3	10.6	29.0	39.6
<b>B</b>	16.3	29.6	45.9	16.6	29.6	46.2
1/4	14.4	31.1	45.5	11.9	30.8	42.7
1/2	12.2	32.5	44.7	13.3	32.0	45.3
3/4	8.7	34.0	42.7	10.5	33.2	43.7
<b>C</b>	3.3	35.4	38.7	5.7	34.4	40.1
1/4	Dry	Dry	31.9	Dry	Dry	35.4
1/2	Dry	Dry	33.5	Dry	Dry	32.7

NOTE: The numbers listed in this table represent distances and not elevations. The referenced waterline elevation at the time of the readings was 73.6 based on a measurement taken in the field.

Table 2

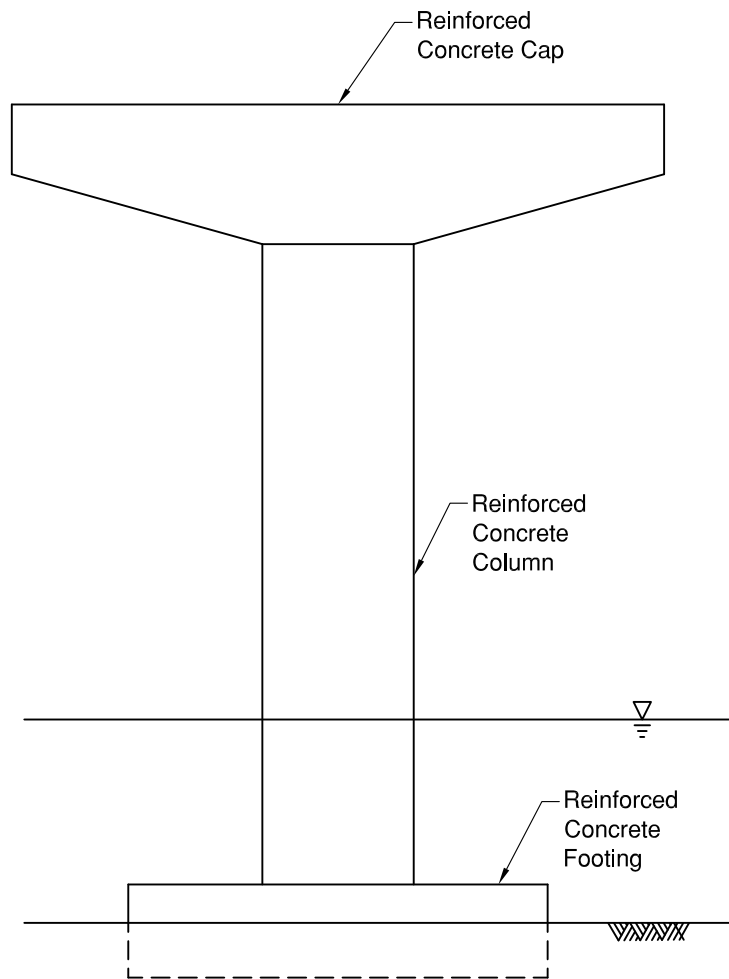
## Vertical Footing/Seal Exposures

Pier	Northeast Corner (ft)	Northwest Corner (ft)	Southeast Corner (ft)	Southwest Corner (ft)
A	2.5	1.5	1.0	0.25
B	0.5	1.0	0.25	0.5
C	Covered	Covered	Covered	Covered

NOTE: Footing exposure measurements are taken from the top of the footing down to the channel bottom. An \* indicates complete footing exposure and partial seal exposure, with measurements taken from the top of the seal to the channel bottom. A † indicates complete seal exposure resulting in undermining, with measurements taken from the bottom of the seal to the channel bottom.







Typical Elevation (Piers A through C)

GRAPHIC SCALE		 <p>1460 John B. White Sr. Blvd. Ste. 1C Spartanburg, SC 29306 PH: 864.595.8030 FAX: 864.595.8034</p> <p><b>INFRASTRUCTURE ENGINEERS, INC.</b> consulting engineers   commercial divers</p>	 <p><b>SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION</b></p> <p>Bridge ID: 4010012620071</p>	<p>I-126 Ramp over Saluda River</p> <p>Typical Pier Elevation</p>	<p>FIG NO.</p> <p>2</p>
Not to Scale	<p>DATE</p> <p>September 2012</p>				

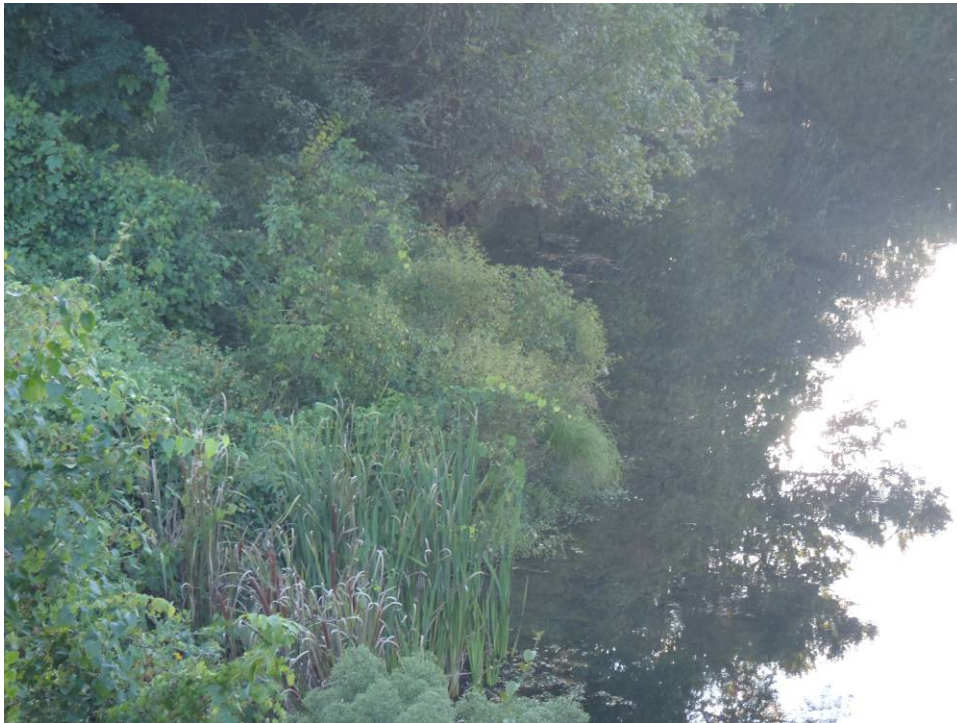


Photograph 1. Downstream Fascia.



Photograph 2. View of Pier C, Typical of Piers A through C.





**Photograph 3. South Embankment.**



**Photograph 4. North Embankment.**

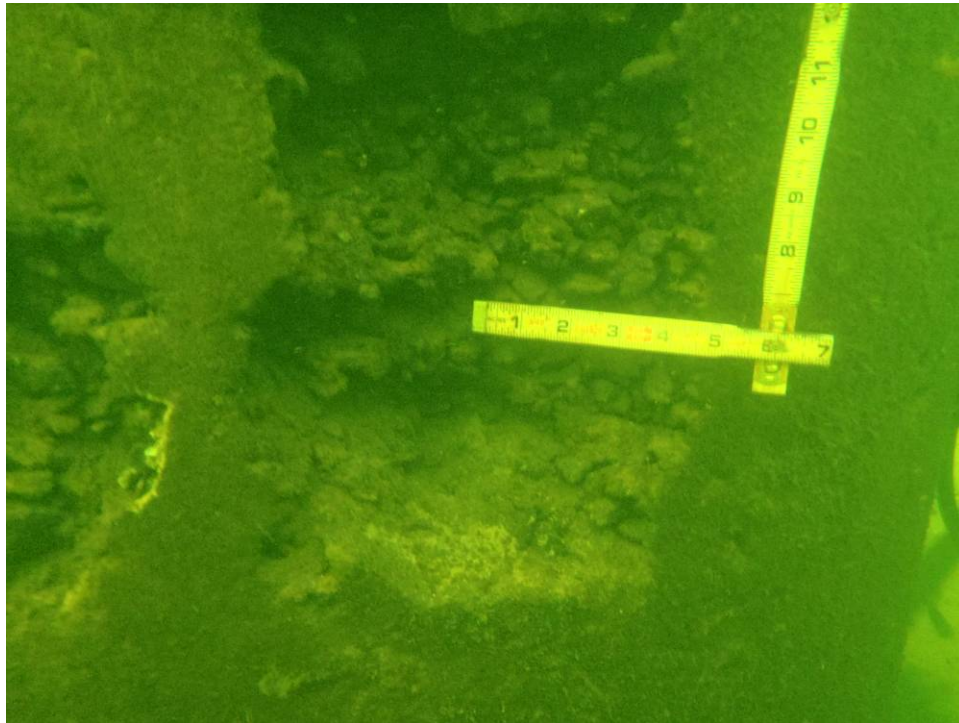


**Photograph 5. View Upstream from Under Bridge.**



**Photograph 6. View Downstream from Under Bridge.**





**Photograph 7. Pier B, spall measuring 12 in. high by 16 in. wide by 3 in. of penetration located 11.5 ft. below the waterline on the downstream nose.**

## UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. **4010012620071**  
WATERWAY: **Saluda River**  
INSPECTORS: **INFRASTRUCTURE ENGINEERS, INC.**  
INSPECTION DATE: **September 24, 2012**

**NOTE:** Condition ratings are assigned in accordance with the National Bridge Inspection Standards (NBIS) Coding Information, as presented in Federal Highway Administration Report No. FHWA-PD-96-001 "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges," dated December 1995 (revised April 27, 2001).

### CONDITION RATING

Unit	Substructure Code (Item 60)	Channel and Channel Protection Code (Item 61)	Underwater Inspection Code (Item 92B)	Scour Critical Bridge Code (Item 113)
<b>Pier A</b>	<b>7</b>	<b>8</b>	<b>Y60</b>	<b>6</b>
<b>Pier B</b>	<b>6</b>	<b>8</b>	<b>Y60</b>	<b>6</b>
<b>Pier C</b>	<b>7</b>	<b>8</b>	<b>Y60</b>	<b>6</b>

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site: \_\_\_\_\_ Yes \_\_\_\_\_ ☒ No

(Note: Bridges may also be scour critical if abutment or pier foundations are rated as unstable due to scour potential as determined by a scour evaluation study)

REMARKS: As the result of an underwater inspection, for Item 113, a structure may only be rated as 0, 1, 2, 4, or 6. Other ratings may be assigned only as the result of a scour analysis.

Whenever a rating factor of 2 or below is determined for Item 113 - Scour, the rating factor for Item 60 – Substructure may need to be revised to reflect the severity of actual scour and resultant damage to the bridge.

## UNDERWATER INSPECTION BRIDGE MANAGEMENT SYSTEM CONDITION REPORT FORM

BRIDGE NO. **4010012620071**  
 WATERWAY: **Saluda River**  
 INSPECTORS: **INFRASTRUCTURE ENGINEERS, INC.**  
 INSPECTION DATE: **September 24, 2012**

**NOTE:** Element Condition ratings are assigned in accordance with the AASHTO "Guide for Commonly Recognized (CoRe) Structural Elements", dated December 1997.

### BMS CONDITION REPORT

Element	Total Quantity	Unit	Quantities in Condition State				
			1	2	3	4	5
205 R/C Column or Pile Extension  220 R/C Submerged Footing	CoRe Elements (Deck/Super/Sub)						
	3	EA	2	1			
	2	EA	2				