Underwater Inspection Report

South Carolina Department of Transportation

US 701

Over

Pee Dee River

No Significant Action Required

Georgetown County, South Carolina

April 25, 2013

Developed by:

INFRASTRUCTURE ENGINEERS, INC.

Job No. 12264SC00.00 - 4

This Underwater Inspection Report was Developed for:

Bridge No. 2220070100500

carrying

US 701 over Pee Dee River

in

Georgetown County, South Carolina

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

2013 UNDERWATER INSPECTION REPORT EXECUTIVE SUMMARY

Inspection Date: April 25, 2013

NBIS Rating:

- The bridge's submerged components are in **fair** condition.

Significant Conditions Observed:

- Seal exposure up to 8 ft on Piers E, F, and G.
- Intermittent voiding in footing/seal interface up to 2 ft high with 4 in. of penetration on Piers E, F, and G.

Repair Recommendations:

- None

1.0 INTRODUCTION

1.1 Purpose and Scope

SCDOT Bridge No. 2220070100500 carries US 701 over the Pee Dee River in Georgetown County. On April 25, 2013, 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 bridge portion over the waterway consists of seven simple steel girder spans and two reinforced concrete flat slab spans. The superstructure over the waterway is supported by nine intermediate piers. Pier C consists of two reinforced concrete columns connected by a reinforced concrete webwall and is founded on independent reinforced concrete footings supported by 25 untreated timber piles each. Piers D, G, and H consist of two reinforced concrete footings connected by a reinforced concrete webwall and are founded on a single reinforced concrete footing supported by 60 untreated timber piles. Piers E and F consist of two reinforced concrete columns connected by a reinforced concrete webwall and are founded on a single reinforced

concrete footing supported by 100 untreated timber piles. Piers EE and FF consist of two steel encased reinforced concrete drilled shafts. Refer to Photographs 2 and 3 in Appendix B for views of typical piers.

The report's labeling convention designates the piers following the SCDOT design drawings dated April 1996 and December 1952. The piers are labeled alphabetically from north to south. The columns and drilled shafts are labeled alphabetically from east to west. Refer to Figure 1 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 by boat, which was launched from the boat ramp on Gator Alley.

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 sounder.

2.0 INSPECTION FINDINGS

At the time of inspection, the waterline was located 41.9 ft below the top of the deck at Pier D. Based on available SCDOT drawings dated December 1952, this translates to a waterline elevation of 3.5. The Pee Dee River flowed with a maximum velocity of 1.5 fps during the inspection. Bridge soundings indicate that the maximum water depth was 29 ft at the downstream fascia at Pier FF. Refer to Table 1 in Appendix A for a listing of the sounding measurements relative to the bridge deck.

The banks along the Pee Dee River in the bridge vicinity are in stable condition. Embankment protection in the form of vegetation is present on the north and south banks. There is no sign of active erosion. Refer to Photographs 4 and 5 in Appendix B for a view of the north and south embankments, respectively. The channel bottom in the bridge vicinity primarily consists of sand.

The SSUs located in water at the time of inspection included Piers C through H. All inspected piers have light, up to 1/4-in. penetration scaling. Refer to Photograph 8 for a view of the typical scaling below water. The seal is exposed up to 8 ft on Piers E, F, and G. Piers E, F, and G all have intermittent voids in the footing/seal interface up to 2 ft high with 4 in. of penetration. Refer to Table 2 in Appendix A for a detailed listing of footing and seal exposure measurements.

Pier G has a void 1 ft high by 3 ft wide with 1 ft of penetration on the west face at the footing/seal interface. Pier G has a void 8 in. high by 1 ft along the north face by 8 in. along the west face with 5 in. of penetration, 2 ft below the top of the footing. Pier H has an area of poor consolidation 1 ft high by 1 ft wide with 1 in. of penetration, 2 ft below the waterline on the north face of the webwall, 2 ft west of Column A.

Piers EE and FF have light surface corrosion with up to 1/16-in. deep pitting from 15 ft below the waterline to the channel bottom. There is up to 5% coating loss on the steel encasements surrounding the columns extending from 4 ft above the waterline to

5 ft below the waterline. Refer to Figure 1 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 **satisfactory** condition. The seal is exposed up to 8 ft at Pier F; however, no undermining is present. The light scaling observed is typical of in-service concrete of this age and does not affect the bridge. The light surface corrosion and coating loss on Piers EE and FF do not affect the bridge.

Piers F and G are in **fair** condition due to the extensive deterioration at the footing/seal interface.

The inspected SSUs are rated as **satisfactory**, **Code 6**, and Piers F and G are rated as **fair**, **Code 5**, 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 future inspections, detailed measurements of seal exposure should be taken to monitor further channel degradation or undermining. 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

Pier	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)
3/4	Dry	Dry	35.7	Dry	Dry	35.7
C	6.0	40.3	46.3	3.0	40.3	43.3
1/4	10.8	40.7	51.5	8.1	40.7	48.8
1/2	11.8	41.1	52.9	10.2	41.1	51.3
3/4	11.9	41.5	53.4	16.5	41.5	58.0
D	18.8	41.9	60.7	15.5	41.9	57.4
1/4	14.3	42.1	56.4	14.1	42.1	56.2
1/2	14.0	42.3	56.3	20.1	42.3	62.4
3/4	15.0	42.5	57.5	21.1	42.5	63.6
E	30.3	42.7	73.0	28.3	42.7	71.0
EE	20.0	42.9	62.9	20.0	42.9	62.9
1/4	18.8	42.9	61.7	17.2	42.9	60.1
1/2	19.0	43.0	62.0	18.3	43.0	61.3
3/4	18.1	42.9	61.0	19.0	42.9	61.9
FF	29.0	42.9	71.9	29.0	42.9	71.9
F	34.3	42.7	77.0	34.3	42.7	77.0
1/4	26.2	42.5	68.7	23.2	42.5	65.7
1/2	25.5	42.3	67.8	25.0	42.5	67.5
3/4	23.8	42.1	65.9	26.3	42.3	68.6
G	25.5	41.9	67.4	29.2	42.1	71.3
1/4	26.5	41.5	68.0	22.9	41.5	64.4
1/2	24.2	41.1	65.3	23.8	41.1	64.9
3/4	20.1	40.7	60.8	17.0	40.7	57.7
H	2.0	40.3	42.3	3.0	40.3	43.3
1/4	Dry	Dry	36.7	Dry	Dry	35.7

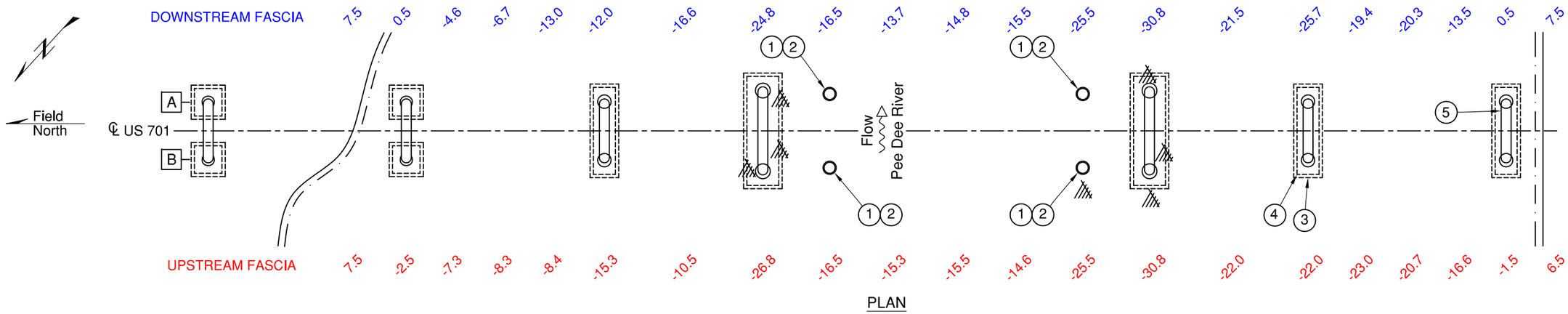
NOTE: The numbers listed in this table represent distances and not elevations. The waterline elevation at the time of the readings was 3.5 based on measurements taken in the field and calculations using the existing plans.

Table 2

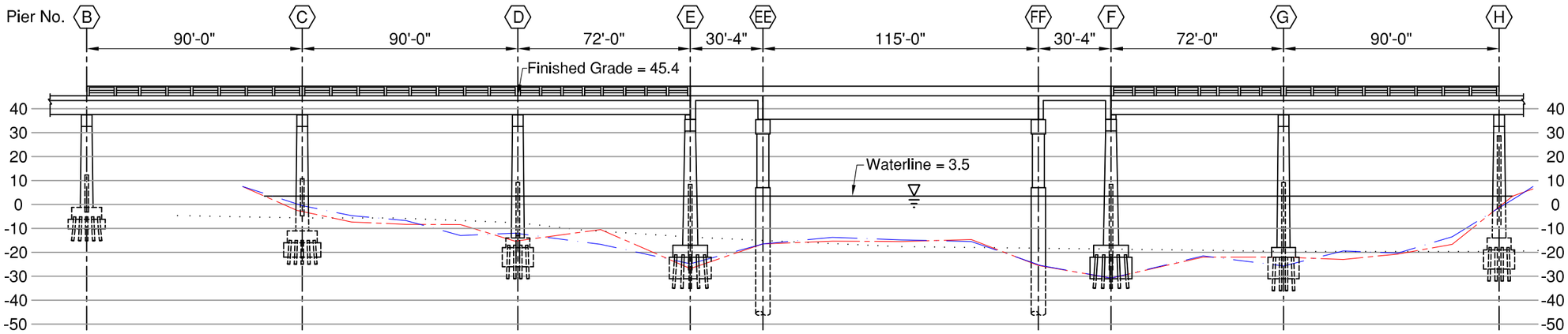
Vertical Footing/Seal Exposures

Pier	Northeast Corner (ft)	Northwest Corner (ft)	Southeast Corner (ft)	Southwest Corner (ft)
E	Covered	2.0*	Covered	4.0*
F	8.0*	6.0*	4.0	8.0*
G	3.0*	3.0*	3.0	4.0

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.



PLAN



ELEVATION

Legend

- GN — General Note
- 3 — Inspection Note
- -15.4 — Channel Bottom Elevation
- Original Channel Bottom Profile
- 2013 Upstream Fascia
- 2013 Downstream Fascia
- Timber Debris
- Riprap
- 9 — Photograph

Figure Notes:

1. At the time soundings were taken on April 25, 2013 the waterline was approximately 41.9 ft below the top of the deck at Pier D. This translates to a waterline elevation of 3.5.

2. Soundings across the channel were taken parallel to the bridge at the piers and are actual channel bottom elevations in feet determined on April 25, 2013.

3. This figure was developed from field notes, sketches, and South Carolina Department of Transportation drawings dated December 1952.

Inspection Notes:

- GN — Intermittent voids up to 24-in. high with up to 4 in. of penetration in the footing/seal interface.
- 1 — Light surface corrosion with pitting up to 1/16-in. deep from 15 ft below the waterline to the channel bottom.
- 2 — 5% coating loss between 4 ft above the waterline to 5 ft below the waterline.
- 3 — A void at the footing/seal interface 1 ft high by 3 ft wide with 1 ft of penetration.
- 4 — A void 8-in. high by 12-in. along the north face by 8-in. along the west face with 5 in. of penetration 2 ft below the top of the footing.
- 5 — Honeycombing 1 ft high by 1 ft wide with 1 in. of penetration 2 ft below the waterline.

GRAPHIC SCALE: 0 50' 100'

DATE: April 2010

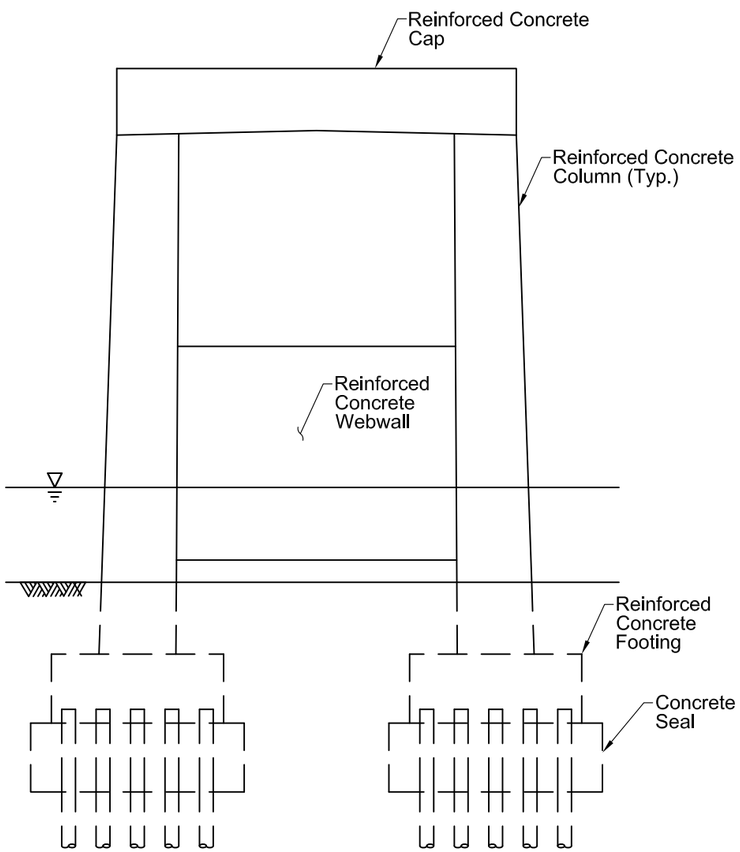
1460 John B. White Sr. Blvd., Ste 1C
Spartanburg, SC 29306
PH: 864.595.8030
FAX: 864.595.8034
INFRASTRUCTURE ENGINEERS, INC.

SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
Bridge ID: 2220070100500

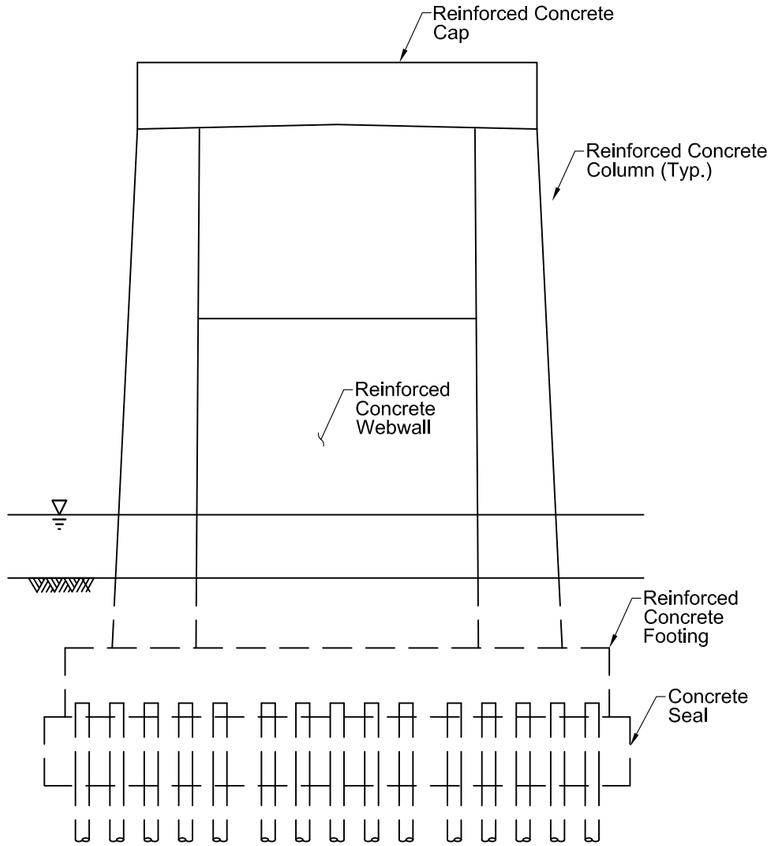
US 701 over Pee Dee River

Plan and Elevation Inspection Notes

FIG NO. 1

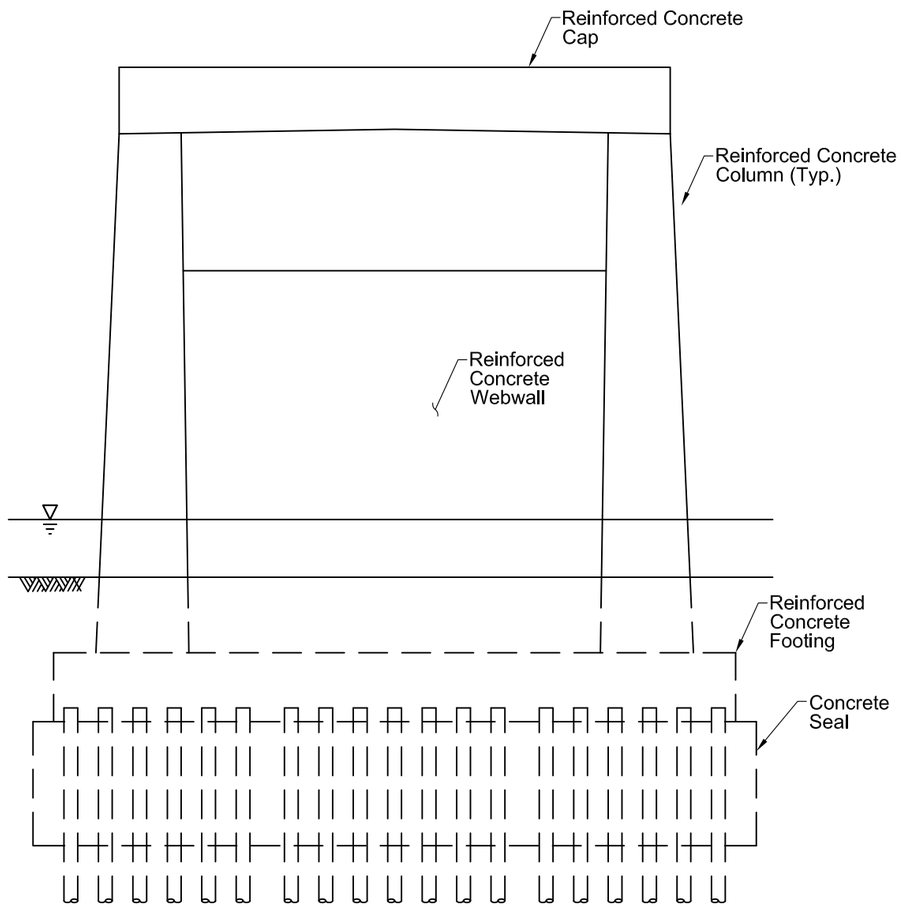


Typical Elevation (Piers B and C)

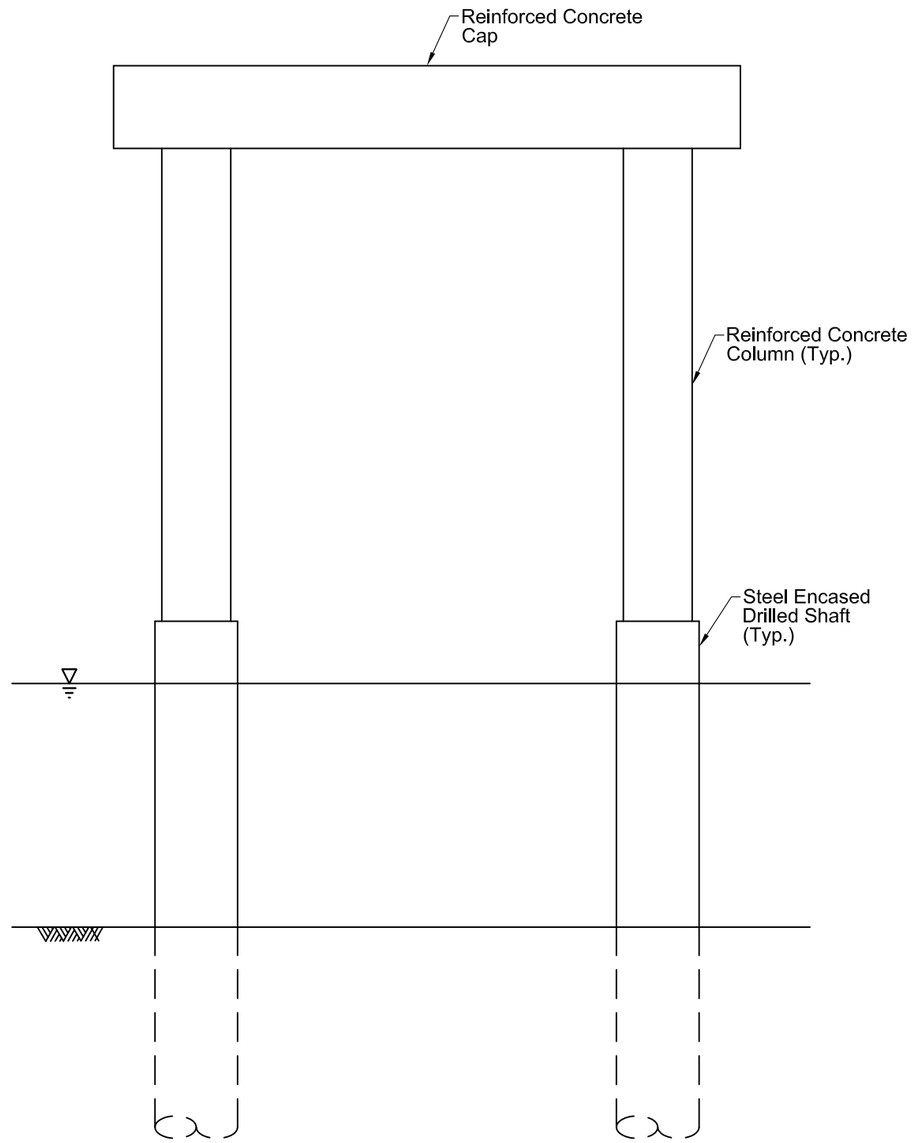


Typical Elevation (Piers D,G, and H)

GRAPHIC SCALE	DATE			
Not to Scale	April 2010	1460 John B. White Sr. Blvd., Ste.1C Spartanburg, SC 29306 PH: 864.595.8030 FAX: 864.595.8034 INFRASTRUCTURE ENGINEERS, INC.	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION Bridge ID: 2220070100500	US 701 over Pee Dee River
			Typical Pier Elevations	FIG NO. 2



Typical Elevation (Piers E and F)



Typical Elevation (Piers EE and FF)

GRAPHIC SCALE	DATE			
Not to Scale	April 2010	1460 John B. White Sr. Blvd., Ste.1C Spartanburg, SC 29306 PH: 864.595.8030 FAX: 864.595.8034 INFRASTRUCTURE ENGINEERS, INC.	SCDOT SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION Bridge ID: 2220070100500	US 701 over Pee Dee River Typical Pier Elevations — FIG NO. 3

Photograph 1. Downstream Fascia.

Photograph 2. View of Pier D Typical of Piers C Through H.

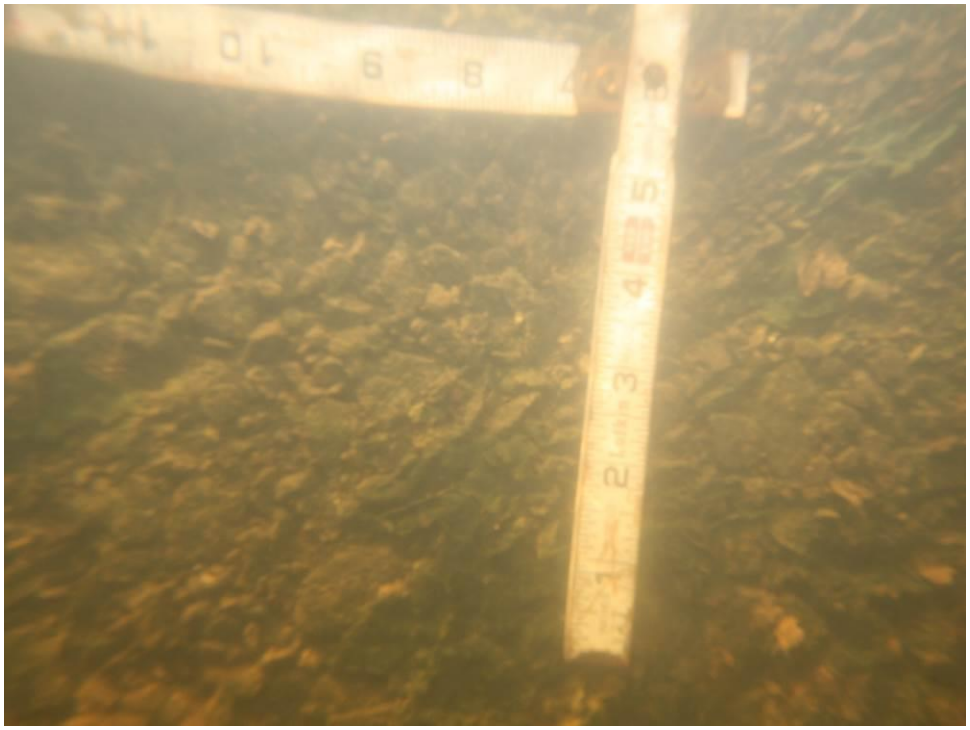
Photograph 3. View of Pier FF (left) and Pier F (right).

Photograph 4. North Embankment.

Photograph 5. South Embankment.

Photograph 6. View Upstream from On Bridge.

Photograph 7. View Downstream from On Bridge.



Photograph 8. Typical Scaling.

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. **2220070100500**
WATERWAY: **Pee Dee River**
INSPECTORS: **INFRASTRUCTURE ENGINEERS, INC.**
INSPECTION DATE: **April 25, 2013**

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)
Pier C	**6**	**8**	**Y60**	**6**
Pier D	**6**	**8**	**Y60**	**6**
Pier E	**6**	**8**	**Y60**	**6**
Pier EE	**6**	**8**	**Y60**	**6**
Pier FF	**6**	**8**	**Y60**	**6**
Pier F	**5**	**8**	**Y60**	**6**
Pier G	**5**	**8**	**Y60**	**6**
Pier H	**6**	**8**	**Y60**	**6**

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site: _____Yes _____X_____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 needs to be the same to reflect the severity of actual scour and resultant damage to the bridge.

UNDERWATER INSPECTION
BRIDGE MANAGEMENT SYSTEM
CONDITION REPORT FORM

BRIDGE NO. **2220070100500**
WATERWAY: **Pee Dee River**
INSPECTORS: **INFRASTRUCTURE ENGINEERS, INC.**
INSPECTION DATE: **April 25, 2013**

NOTE: Element Condition ratings are assigned in accordance with the AASHTO "Guide for Commonly Recognized (CoRe) Structural Elements", dated December 2010.

BMS CONDITION REPORT

Element	Total Quantity	Unit	Quantities in Condition State				
			1	2	3	4	5
CoRe Elements (Deck/Super/Sub)							
205 R/C Column or Pile Extension	**16**	**EA**	**16**				
220 R/C Submerged Pile Cap/Footing	**4**	**EA**	**1**	**3**			
Smart Flags							