EXHIBIT R

LEE COUNTY
SOUTHWEST FLORIDA

Miscellaneous Structural Engineering Services
Sanibel Bridge Beam Inspections

Bridge No. 124116 - Structure A Sanibel Causeway over San Carlos Bay

1st Structure South of Toll Plaza

Prepared For:

Lee County

Prepared By:

T.Y. Lin International

January 2013

This report evaluates and makes recommendations of bridge maintenance for Bridge No. 124116 Sanibel Causeway over San Carlos Bay 1st structure from toll plaza.
Solicit No.: CN-11-17 Contract No.: 5850

BRIDGE INSPECTION REPORT

PREPARED FOR: Lee County

SUBMITTED BY: T. Y. Lin International

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REPORT IDENTIFICATION

Bridge No. 124116

Bridge Name: Structure A Sanibel Causeway over San Carlos Bay

Location: 1st Bridge South of Toll Plaza

NO	YES	
X		This bridge contains fracture critical components.
X		This bridge is scour critical.
X		This report identifies deficiencies which require prompt corrective action.

Type of Inspection: ☐ Routine ☐ Interim ☒ Special Evaluation – Beams Only

Field Inspection Date: Above Water 01/31/2013 Under Water N/A

Name of Inspector/Diver	Initials	PE Number	Certified Bridge Inspector Number
Charles W. Elliott (Lead)	CWE		00363
Kenneth F. Ulrich	KU		00288
Farszin Zafaranian	FZ	59558	
Emir Modarres	EMM	74130	

Reviewing Bridge Inspection Supervisor

Name Boon Chong P.E PE Number 48156 Initials BKC

Confirming Registered Professional Engineer

Name Boon Chong P.E 48156 Signature

BOON KIM CHONG LICENSE No. 48156 STATE OF FLORIDA PROFESSIONAL ENGINEER

3/6/2013

Lee County Condensed Bridge Inspection Report

Structure Name: Structure A Sanibel Causeway over San Carlos Bay

Location: 1st Structure South of Toll Plaza

Prepared For: Lee County Transportation Department

Prepared By: T.Y. Lin International

Overall NBI Ratings

Note: The following ratings are from the Routine Inspection Report dated 11/18/2011.
Only the Superstructure was evaluated during this inspection. No deficiencies were observed to warrant a change of the overall Rating of 7.

DECK = 8 Very Good
SUPERSTRUCTURE = 7 Good
SUBSTRUCTURE = 7 Good
CHANNEL = 7 Good
PERF. RATING: Good
SUFF. RATING: 79.0
HEALTH INDEX: 98.94

Note: Refer to chart on next page for Numerical Condition Rating Definitions

Scope:
The purpose of this Special Evaluation Inspection was to review and document deficiencies in the Beams/Girders of the Superstructure. The beam evaluations were performed over four days using the 50ft. Under Bridge Inspection truck by two CBI or PE qualified inspectors.

Summary:
The beams are in overall good condition. Several cracks which have a shear direction appearance were observed in the beams. These cracks primarily extend from the bearing areas and/or near the beam ends. The general appearances of the cracks in the exterior beams which are painted make the condition look worse than the cracks in the interior faces. The more significant lengths of cracking were marked with a permanent marker and dated 01/13.

Recommendations:
T. Y. Lin. recommends continuing to monitor the cracks in 6 months for any increase or growth in crack size. If findings show an increase in severity in the next inspection then a repair recommendation would most likely be warranted.

NUMERICAL CONDITION RATING DEFINITIONS

Rating	Condition Category	Description
9	Excellent	
8	Very Good	No problems noted.
7	Good	Some minor problems. Minor maintenance may be needed.
6	Satisfactory	Structural elements show some minor deterioration. Major maintenance is needed.
5	Fair	All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour. Minor rehabilitation may be needed.
4	Poor	Advanced section loss, deterioration, spalling, or scour. Major rehabilitation may be needed.
3	Serious	Loss of section, deterioration, spalling, or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present. Repair or rehabilitation required immediately.
2	Critical	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.
1	Imminent Failure	Major deterioration or section loss present in critical structural components, or obvious loss present in critical structural components, or obvious vertical or horizontal movement affecting structural stability. Bridge is closed to traffic, but corrective action may be sufficient to put the bridge back in light service.
0	Failed	Bridge is out of service and is beyond corrective action. Replacement necessary.

CONDENSED INSPECTION REPORT

Pontis Element 109 - PS Concrete Girders:

The poured beam end diaphragms have cracks up to 0.020in. wide with some spalling. No exposed steel was evident.

The exterior face of Beams 1 and 4 have a paint system. There are some isolated areas of peeling paint, mostly adjacent to the cracks along the bottom flanges. The worst conditions appear to be on Beam 17-4 near the south end of the west face and Beam 18-4 at the north end of the east face. Refer to Photo 1.

The underside face of the top flange has isolated areas of transverse and longitudinal cracks less than 0.010in. wide and lengths up to full flange width (24in. long) with some having light efflorescence.

Random beams have horizontal cracks less than 0.010in. wide x up to 20in. long extending from the beam ends and typically are located near mid-height.

The bottom flanges of nearly all beams in all spans have intermittent longitudinal cracks that are less than 0.010in. wide throughout. These cracks are most evident in the exterior beams possibly from exposure to adverse weather conditions. Refer to Photos 2, 3 and 6.

A few beams have a single diagonal crack up to 30in. long x less than 0.010in. wide in the upper web and top flange areas. These cracks begin near the beam end and extend down and away from the top flange. Refer to Photo 4. Also refer to the chart on Page 5 for list of beams with this type cracking and locations.

Several beam webs have vertical cracks up to 61in. long x less than 0.010in. wide with-in 24in. of the beam ends. Most of these cracks extend from the bottom flange/bearing area up to and across the underside of the top flange. Refer to Photo 5. Also refer to the chart on Page 5 for list of beams with this type cracking.

The beam webs typically have intersecting diagonal cracks which begin in or near the bearing area of the bottom flange extending up and away giving them a shear crack appearance. These cracks are less than 0.010in. wide and typically are less than 4ft. long with a few beams having longer more evident diagonal/shear cracks up to 10ft. long x less than 0.010in. wide. Adjacent to these cracks are multiple shorter length diagonal, horizontal and some pattern/map style cracks, all being less than 0.010in. wide. Several cracks throughout all spans were marked with a permanent black marker and dated 01/13 for future reference. Refer to Photo 6. Also refer to the charts on Pages 6 and 7 for crack quantities and the sketch on Page 8 for locations.

Non-Typical findings:

Beam 11-2 east face, at north end has intersecting diagonal cracks less than 0.010in. wide. One is 61in. long and extends from with-in the bottom flange up and across underside of the top flange. The second crack is 18in. long and extends down and away from the beam end. Refer to Photo 7.

Beam 12-4 west face, 20ft. from south end along the top flange to web juncture has a longitudinal crack 51in. long x less than 0.010in. wide. Refer to Photo 8.

Beam 13-1 east face, 20ft. from north end along the top flange to web juncture has a longitudinal crack 57in. long x less than 0.010in. wide.

Pontis Element 109 - PS Concrete Girders (continued):

The following chart is provided for future reference to track any length increases in the "diagonal" cracks which extend down and away from the top flanges, in the upper portions of the webs near the beam ends:

BEAM	SOUTH END		NORTH END	
	WEST FACE	EAST FACE	WEST FACE	EAST FACE
6-4	24in.			
6-2			24in.	24in.
8-1				27in.
8-2			12in.	
9-2	27in.			
9-4	28in.			
10-1		30in.		
11-2			20in.	
12-3	28in.			
13-4	18in.			
15-1		16in.		

The following chart is provided for future reference to track any length increases in the "vertical" cracks located in the webs with-in 24in. of the beam ends:

BEAM	SOUTH END		NORTH END	
	WEST FACE	EAST FACE	WEST FACE	EAST FACE
13-3			34in.	36in. & 18in.
17-2				48in.
17-3	24in.	28in.	48in.	45in.
18-2	48in.			
18-3	40in.			
19-3				3 crks up to 56in.
9-4	28in.			
10-1		30in.		
11-2			20in.	
12-3	28in.			
13-4	18in.			
15-1		16in.		

Pontis Element 109 - PS Concrete Girders (continued):

The following charts are provided for future reference to track any increase in quantities of the diagonal/shear cracks up to 61in. long in the beam webs which typically extend up and away from the bottom flange and or bearing areas. The beams identified with an (*) have one or more cracks which extend up to and across the entire underside of the top flanges. Only the cracks which were well defined in direction were quantified.

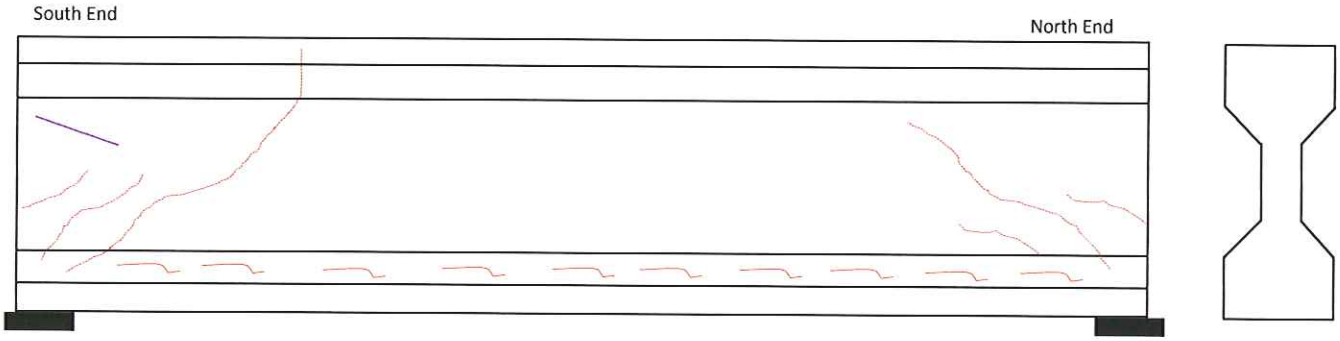
BEAM	SOUTH END		NORTH END	
	WEST FACE	EAST FACE	WEST FACE	EAST FACE
1-1	4	3	1	6
1-2	3	2	8	8
1-3	2	2	5	8
1-4	3	4	3	2
2-1	4	3	5	1
2-2	2	2	3	3
2-3	2	2	3	3
2-4	2	3	2	3
3-1	3	2	4	4
3-2	1	1	1	3
3-3	3	3	3	3
3-4	4	4	3	3
4-1	2	2	3	3
4-2	3	2	4	4
4-3	2	2	4	2
4-4	4	3	3	3
5-1	3	5	5	4
5-2	2	3	7	6
5-3	5	3	2	2
5-4	3	3	4	3
6-1	3	3	4	4
6-2	4	3	2	1
6-3	4	3	3	5
6-4	3	4	3	5
7-1	4	4	3	3
7-2	4	4	4	3
7-3	3	3	4	4
7-4	4	6	2	3
8-1	7	5	2	7
8-2	4	3	3	2
8-3	4	3	4	4
8-4	3	3	5	5
9-1	3	5	3	6
9-2	6	4	3	3
9-3	2	2	4	3
9-4	6	6	3	4
10-1	3	1	3	3
10-2	3	2	2	2
10-3	3	2	3	3
10-4	2	3	3	2

Pontis Element 109 PS Concrete Girders (continued):

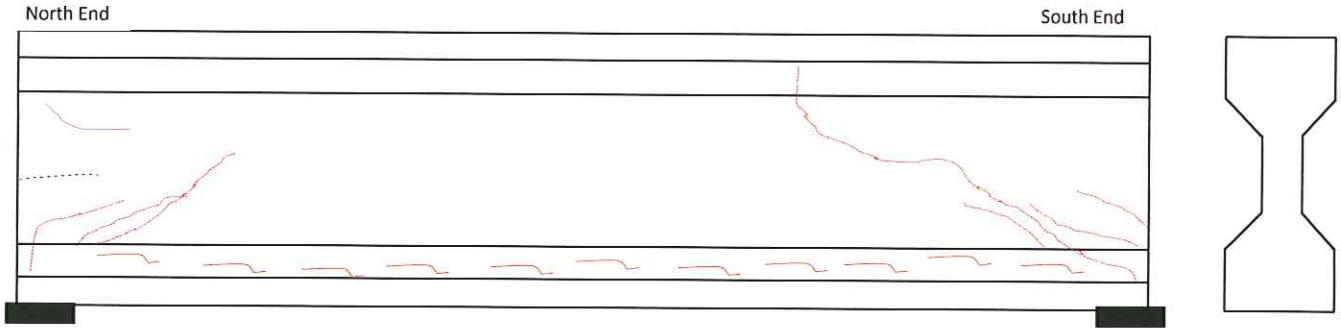
BEAM	SOUTH END		NORTH END	
	WEST FACE	EAST FACE	WEST FACE	EAST FACE
11-1	2	2	2	3
11-2 *	4	3	3	3
11-3 *	3	3	2	2
11-4 *	1	3	3	3
12-1 *	1	1	2	0
12-2 *	3	3	2	1
12-3 *	2	4	2	2
12-4	2	2	1	3
13-1	5	2	5	4
13-2 *	3	3	4	5
13-3 *	5	4	5	3
13-4	4	5	5	4
14-1	3	2	3	3
14-2	1	1	2	3
14-3 *	5	5	3	2
14-4 *	5	5	4	4
15-1	1	2	1	2
15-2 *	4	5	2	3
15-3 *	3	3	3	3
15-4	4	4	0	3
16-1	2	0	1	1
16-2 *	3	2	3	2
16-3 *	2	1	3	3
16-4	3	3	4	4
17-1	4	3	4	4
17-2 *	2	3	4	4
17-3 *	3	3	3	3
17-4	3	5	1	3
18-1	4	3	3	1
18-2	4	3	3	3
18-3 *	3	5	3	2
18-4	3	5	3	3
19-1	4	3	2	4
19-2 *	3	3	3	3
19-3 *	4	4	3	3
19-4	2	3	3	4
20-1	3	3	4	3
20-2 *	5	5	4	4
20-3 *	4	3	5	6
20-4	4	4	3	4
21-1	6	2	4	1
21-2 *	2	1	2	1
21-3 *	5	4	2	3
21-4	4	3	3	4

BEAM SKETCHES

Note: The following shows the general direction and locations of the cracks in the beam webs and flanges:



East Elevation



West Elevation

Legend:

Blue line (-·-·-·-·-) indicates horizontal crack extending from beam end near mid height of web.

Gold line (solid) indicates short longitudinal cracks along bottom flanges.

Purple line (———) indicates diagonal cracks from top of web down and away.

Red Line (----------) indicate diagonal/shear cracks in beam webs extending from bearing areas or beam ends.

PHOTOS

Photo 1 – Typical areas of peeling paint (east face of Beam 18-4 at north end shown)

Photo 2 – Typical crack width in the bottom flanges and beam webs

PHOTOS

Photo 3 – Typical longitudinal cracks in the bottom flanges of the exterior faces

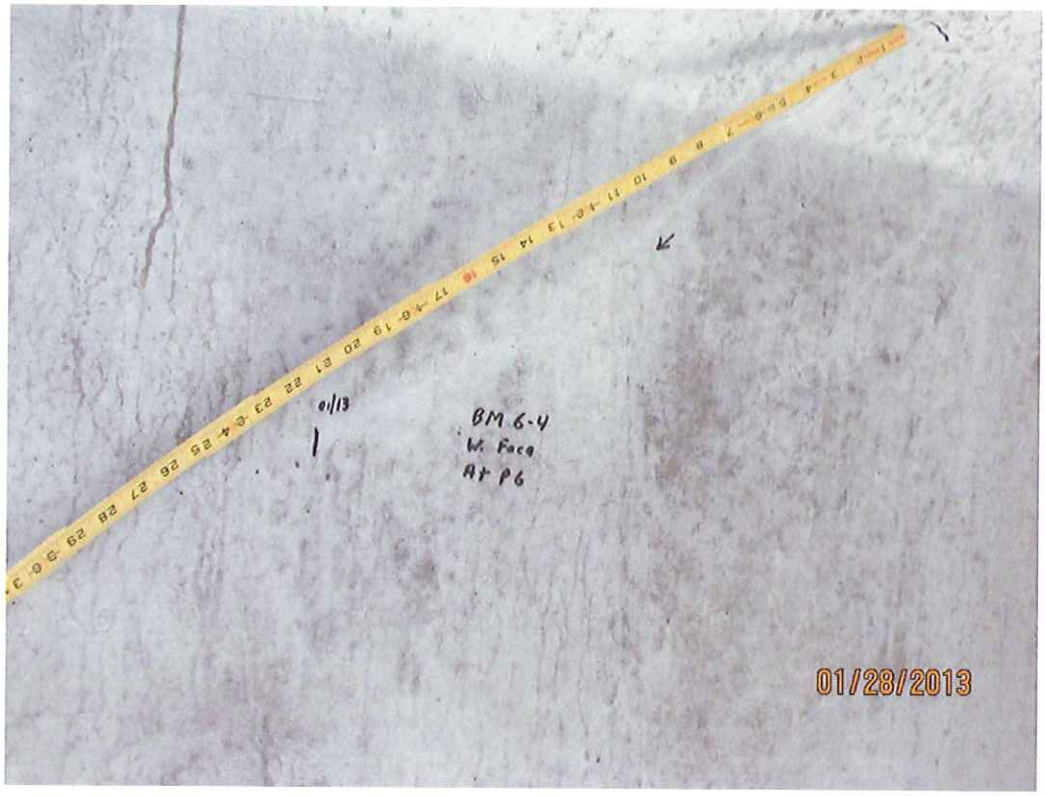


Photo 4 – Typical diagonal crack in beam web extending down and away from top flange

PHOTOS

Photo 5 – Typical vertical cracks in web and across the top flange at the beam ends

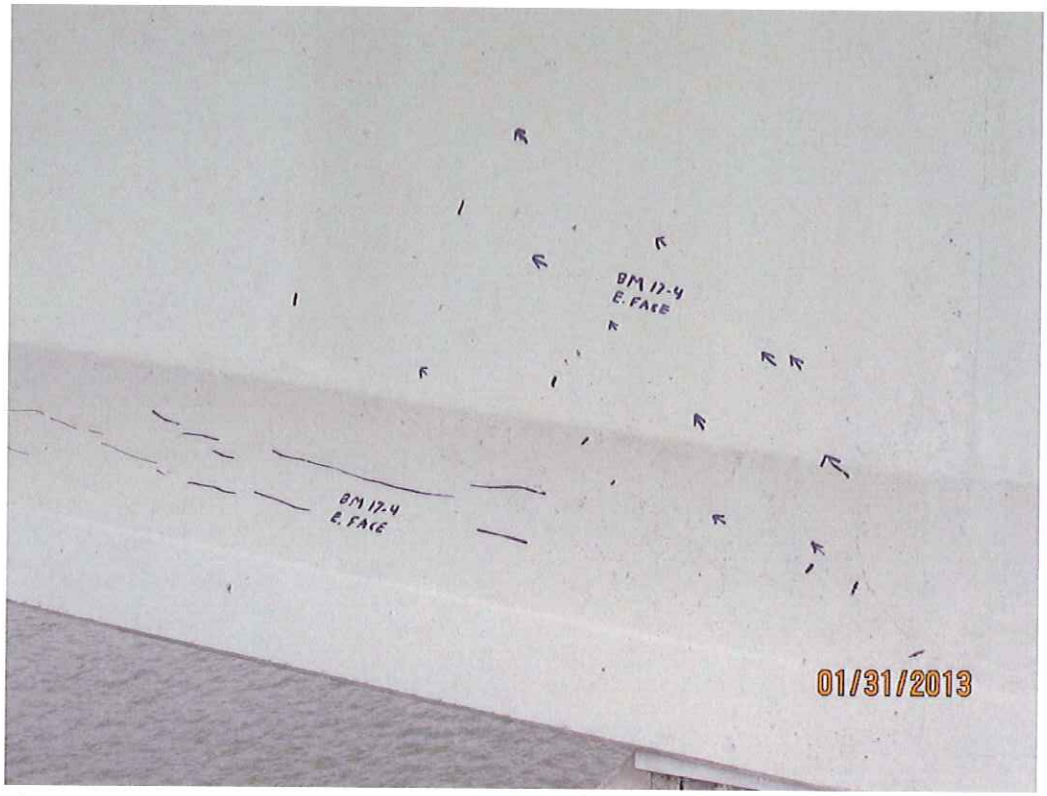


Photo 6 – Typical diagonal crack in beam web and horizontal cracks in bottom flange

PHOTOS

Photo 7 – Intersecting cracks on east face at north end of Beam 11-2

Photo 8 – Longitudinal crack along west face of Beam 12-4 at top flange juncture

RECOMMENDED MAINTENANCE REPAIR AND REHABILITATION

Based on the findings of the bridge inspection from 1/27/2013 to 01/31/2013, the following actions are recommended:

(1) Continue to monitor cracks in the beams for any increase in severity by performing a follow up inspection in six months.
(2) Apply a protective coating over all cracks in the beam webs extending from beam ends.
(3) Repair 51in. longitudinal crack in west face of Beam 12-4 beginning 20ft. from south end along the top flange to web juncture.
(4) Repair 57in. longitudinal crack in east face of Beam 13-1 beginning 20ft. from north end along the top flange to web juncture.