Durability Survey of Segmental Concrete Bridges

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This report presents the results of a durability survey conducted by the American Segmental Bridge Institute of segmental concrete bridges in North America. The questionnaire identified 194 structures and evaluated the performance of 96 bridge inspection reports. The bridges had completion dates ranging from 1966 to 1993. The survey concludes that segmental construction performs well over time, with consistently high condition ratings for bridges that have been in use for up to 30 years.

In the early 1990s, the American Segmental Bridge Institute (ASBI) initiated an inventory of segmental concrete bridges (see Fig. 1) built in the United States and Canada. The survey questionnaire identified 194 structures by type and age. To assess their performance over time, ASBI evaluated 96 bridge inspection reports that rated bridge conditions using Federal Highway Administration (FHWA) guidelines.[1]

In the 96 bridge inspection reports, with construction completion dates ranging from 1966 to 1993, all bridges received superstructure condition ratings of "fair" or better. More significantly, 98 percent of the bridges rated "satisfactory" or better; 78 percent rated "good" or better; and 38 percent rated "very good." The findings overwhelmingly indicate that segmental concrete construction performs well over time.

The findings indicate that the performance of post-tensioned segmental concrete construction is similar to that of other prestressed concrete bridges. In their report, "The Performance of Prestressed Concrete Bridges in the United States — The First 40 Years," Dunker and Rabbat[2] conclude that "the percent structural deficiency, with very few exceptions, is lower for prestressed concrete bridges than for steel and timber bridges at all structure ages, spans and average daily traffic counts."

The FHWA classifies a bridge as structurally deficient if the condition rating is 4 or less. All of the 96 bridges surveyed had condition ratings of 5 or better.

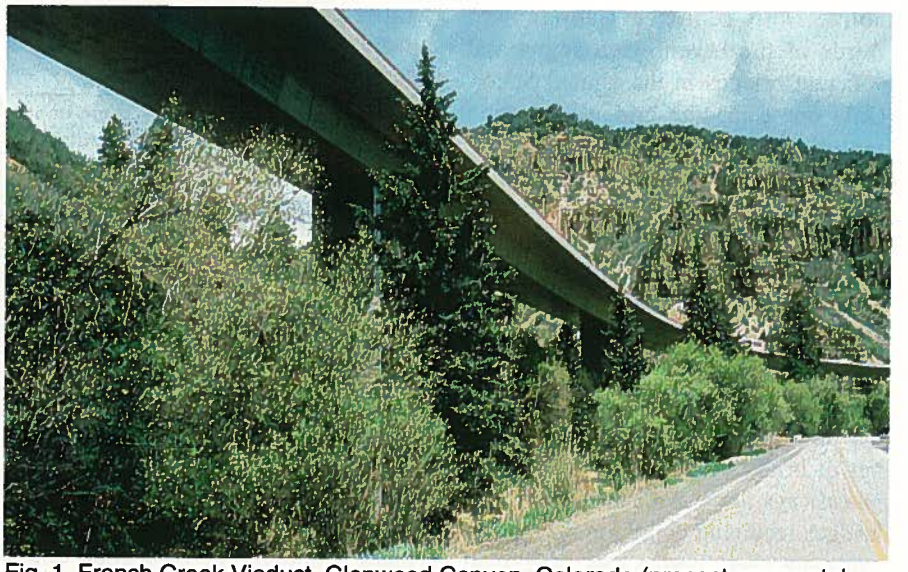

Fig. 1. French Creek Viaduct, Glenwood Canyon, Colorado (precast segmental construction).

Table 1. Significant records in North American segmental concrete construction.*

Statistic	Description
First segmental concrete bridge built in Canada	River of Mules, Ste. Adele, Canada, 1964
First segmental concrete bridge built in the United States	John F. Kennedy Memorial Causeway Corpus Christi, Texas, 1972
First concrete suspension bridge built in Canada	Peace River Bridge Hudson Hope, British Columbia, 1965
First concrete cable-stayed bridge built in the United States	16th Street over I-465 Indianapolis, Indiana, 1966
Longest segmental concrete span	Koror-Babelthuap, Palau Island Chain, 1976 Main span equals 790 ft (241 m)
Longest concrete cable-stayed bridge	Dame Point Bridge, Jacksonville, Florida, 1989 Main span equals 1300 ft (396 m)

* A single-span precast segmental bridge was designed by Jean Muller (working for the Freyssinet Co.) and built in New York state in 1952.

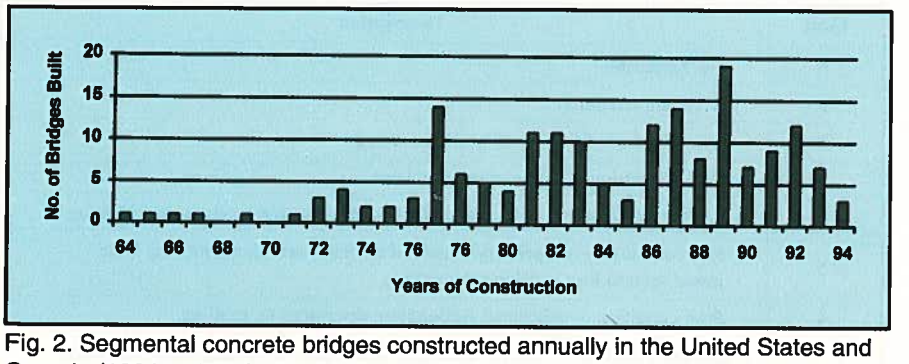

Fig. 2. Segmental concrete bridges constructed annually in the United States and Canada (1964 to 1994).

HISTORY OF SEGMENTAL CONSTRUCTION

Completed in 1930, the first concrete bridge built using segmental construction was a 225 ft (68.5 m) span structure over the Rio de Peixe in Brazil. Twenty years later, German engineers improved the technique of segmental concrete bridge construction by adding post-tensioning to cast-in-place concrete. The Lahn Bridge at Balduinstein, Germany, was completed in 1951 using this technique.[3] Of major importance was the development of cast-in-place cantilever segmental construction, largely pioneered by the German firm Dyckerhoff & Widmann, Inc.

The first cast-in-place, post-tensioned concrete bridge in North America was built in Canada in 1964. This 530 ft (162 m) long bridge spans the River of Mules in Ste. Adele, Quebec.

In the 1960s, French engineers raised segmental construction to an art form with the introduction of precast, balanced cantilever, segmental construction.[4] The first application of segmental construction with precast segments was the Choisy-le-Roi Bridge over the Seine River south of Paris in 1962. The next innovation was the introduction of a launching gantry of which the Oleron Viaduct in France is a good example.

The technique of precast segmental construction was exported to North America in the 1970s.[5] An early balanced cantilever, precast segmental concrete bridge was the Bear River Bridge, near Digby, Nova Scotia, Canada. Built in 1972, the bridge contains six interior spans of 265 ft (81 m) and end spans of 203 ft (62 m).

The first United States precast segmental box girder bridge was built near Corpus Christi, Texas, and was opened to traffic in 1973. The John F. Kennedy Memorial Causeway has a central span of 200 ft (61 m) and end spans of 100 ft (30.5 m).

Since the 1960s, nearly 200 bridges have been built in the United States and Canada using segmental concrete construction. Significant milestones in North American segmental concrete construction are listed in Table 1.

SEGMENTAL CONCRETE BRIDGE INVENTORY

ASBI inventoried segmental concrete bridges in the United States and Canada by sending questionnaires to state, province, and agency transportation authorities. Respondents were asked to identify segmental concrete bridges in their jurisdiction and, for each structure, provide the completion date, type of construction, span lengths, roadway width, and total bridge length. The survey also requested that any available bridge inspection reports be returned with the questionnaire.

All 50 states, two Canadian cities, and one rapid transit authority responded to the ASBI questionnaire. These survey results were augmented with information provided by the FHWA, designers, contractors, and suppliers for the segmental concrete industry to identify a total of 194 segmental concrete bridges. Of these bridges, 165 were constructed in the United States; 27 were constructed in Canada; and two were constructed in U. S. protectorates.

Fig. 2 charts the number of bridges constructed annually since the first Canadian bridge was completed in 1964. A chronological listing of the segmental concrete bridges in both countries is shown in Appendix A.

As requested, survey respondents classified their segmental concrete bridges by construction type. These types included precast segmental span-by-span, precast segmental balanced cantilever, cast-in-place segmental, cable-stayed, and incrementally launched. Table 2 summarizes the inventoried bridges by type of construction.

INSPECTION REPORT SUMMARY

The FHWA specifies bridge condition ratings ranging from 0 to 9 in the report, *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges.* In accordance with these guidelines, concrete decks are inspected for cracking, scaling, spalling, leaching, chloride contamination, potholing, delamination, and depth failures. Superstructures are inspected for signs of distress due to cracking, deterioration, section loss and malfunction or misalignment of bearings.

Although the deck is integral with the superstructure in a segmental concrete bridge, it is rated as a deck only and not as a superstructure member. Ratings of 5 or above for decks, superstructures and substructures indicate conditions ranging from fair to excellent. Table 3 summarizes these ratings as they pertain to concrete bridges.

Of the 101 bridge inspection reports returned with the ASBI questionnaires, 96 evaluated the bridges using the FHWA condition ratings and all of these reported condition ratings of 5 or above. This represents about two-thirds of the inventoried segmental concrete bridges in the United States. Only one Canadian bridge inspection report was received. The bridge inspection reports are summarized in Appendix B.

Table 4 summarizes the inspection report results for deck, superstructure and substructure conditions of bridges built since 1972. No bridge received a rating of less than 5, so the condition ratings are tabulated by year for condition ratings of 5 through 9. The number of bridges built in each year does not always agree with the sum of the bridges receiving condition ratings because not every bridge was rated in all three categories.

OVERALL BRIDGE CONDITIONS

Because the deck is integral to the bridge superstructure, the overall condition of segmental concrete bridges is best evaluated by the superstructure ratings. The inspection reports indicate that these superstructures are performing very well over time, with condition ratings of 5 or above for all bridges built since 1966. More importantly, 98 percent of the bridges rated 6 or better, indicating satisfactory conditions. A full 78 percent rated 7, indicating good condition, and 38 percent rated 8, indicating very good condition. Fig. 3 illustrates these reported superstructure condition ratings.

The best evidence of the durability of segmental concrete construction is the condition ratings for two of the oldest bridges of this type in the United States. The John F. Kennedy Causeway, completed in 1972, has deck and superstructure ratings of 7, indicating that this 22-year-old bridge is in good condition. The California Pine Valley Bridge, completed in 1974, has a deck condition rating of 7 and a superstructure condition rating of 8, indicating that this 20-year-old bridge is in very good condition.

Table 2. Segmental concrete bridges in the United States and Canada classifed by construction type.

Type of construction	Number of bridges
Precast segmental, span-by-span	41
Precast segmental, balanced cantilever	68
Cast-in-place segmental	69
Cable-stayed	14
Incrementally launched	2

Table 3. Federal Highway Administration (FHWA) condition ratings for concrete bridges.

Code	Description
N	Not applicable
9	Excellent condition
8	Very good condition — no problems noted
7	Good condition — some minor problems
6	Satisfactory condition — structural elements show some minor deterioration
5	Fair condition — all primary structural elements are sound but may have minor section loss, cracking, or spalling
4	Poor condition — advanced section loss, deterioration, spalling
3	Serious condition — loss of section, deterioration, or spalling have seriously affected primary structural components. Local failures are possible. Shear cracks in concrete may be present.
2	Critical condition — advanced deterioration of primary structural elements. Shear cracks in concrete may be present. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.
1	"Imminent" failure condition — major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	Failed condition — out of service; beyond corrective action

Table 4. Segmental concrete bridge inspection report summary (1972 to 1993).

Year built	Number of bridges	Condition rating														
		Deck					Superstructure					Substructure				
		5	6	7	8	9	5	6	7	8	9	5	6	7	8	9
1972	1		1						1					1		
1973	1		1						1						1	
1974	2			2						2					2	
1975	1	1		1						1					1	
1976	3				3				1	2			1		2	
1977	12		7	3	2			3	6	3			3	7	2	
1978	5				3	2			2	1				1	2	
1979	2			2					1	1				1	1	
1980	3		1		1			1		1			1		1	
1981	6			3	2		1	2	2				1	3	1	
1982	5		1	2	2		1	1	3				1	2	2	
1983	8			3	5			1	2	4	1		1	1	4	2
1984	6		3	1	1			1		2			1		2	
1985	1				1					1					1	
1986	16		3	8	5			3	11	1	1			4	10	1
1987	5			2	3				3	2					5	
1988	8			4	3	1			1	6	1			1	6	1
1989	4		1	2		1		1	1		2			1	1	1
1990	2				2					2					2	
1991	1				1				1					1		
1992	2				2					2					2	
1993	1			1					1					1		

BRIDGE CONDITION CASE STUDIES

Further evidence of the quality of segmental concrete construction appeared in inspection reports from four states. These reports stood out from the rest because they included (1) the only bridge that was in need of retrofitting, in Indiana; (2) four bridges that underwent in-depth inspections, two each in Illinois and Michigan; and (3) the largest number of segmental concrete bridges in one state, a total of 36 in Florida.

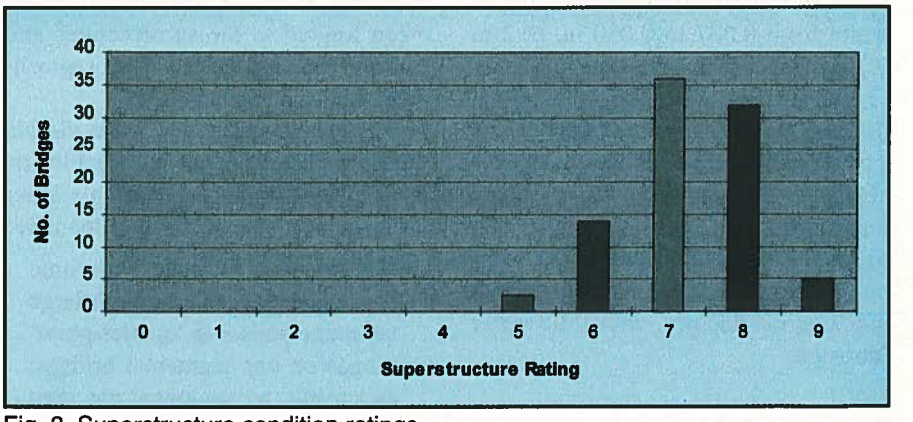

Fig. 3. Superstructure condition ratings.

Wabash River Bridge Rehabilitation

Built in 1978, the Wabash River Bridge (Indiana Bridge No. 136-86-6086) carries U. S. Route 136 over the Wabash River near Covington, Indiana. With two 93.5 ft (28.5 m) spans and four 187 ft (57 m) spans, the 943 ft (287.4 m) long structure is the only incrementally launched segmental bridge in the United States.

The 1991 bridge inspection report rated the deck in very good condition and the girders in satisfactory condition. The report recommended that vehicles be slowed to 30 miles per hour (50 km/hr) across the bridge due to shear cracking that had occurred in the webs of the girders. In 1992, the girder condition was downgraded to fair and the bridge was rehabilitated. Post-tensioning was added and cracks greater than 0.004 in. (0.1 mm) were injected with epoxy. The bridge is scheduled for an in-depth inspection in 1996.

Kishwaukee Bridges In-Depth Inspections

The Kishwaukee Bridges (Illinois Bridge Nos. 101-0133 and 101-0134) carry U.S. Route 51 and Interstate 39 across the Kishwaukee River in Win-

nebago County, Illinois. Both bridges were built in 1980 and are 1090 ft (322.2 m) long, with two 170 ft (51.8 m) spans and three 250 ft (76.2 m) spans each. Each bridge has a 41 ft (12.5 m) roadway supported by a single cell box girder.

The bridges were built with precast concrete segments, erected in balanced cantilever by an overhead truss. During construction of the southbound lanes, two segments slipped vertically at the single large-key match cast surfaces due to improper mix proportions of the epoxy. When the substandard bonded joints were discovered, all constructed joints were inspected and strengthened as required. A modal analysis conducted in 1986 determined the structural response of the bridges to be normal for their age and configuration. The measured modes of vibration in the repaired joint areas compared favorably to those in non-repaired areas.

The bridges underwent in-depth inspections in 1983 and 1989. The 1989 inspection gave the decks of both bridges a condition rating of 7 (good) and the superstructures of both bridges a condition rating of 8 (very good). Minor problems noted included cracks found in southbound spans ranging in width from 0.007 to 0.030 in. (0.2 to 0.7 mm). Leaching was present in 51 segments, mostly at plugged segment lifting holes and a few segment joints. The northbound spans had considerably less cracking, but 73 segments had signs of leaching, mostly at plugged segment lifting holes. The epoxy bond between segments was noted as satisfactory, with little water intrusion.

Zilwaukee Bridges In-depth Inspection

The 1.5 mile (2.4 km) long Zilwaukee Bridges (Michigan Bridges B03-1 of 73112 and B03-2 of 73112) carry I-75 traffic over the Saginaw River near Zilwaukee, Michigan. Each 72 ft (21.9 m) roadway is supported by a single-cell box girder. The 25 spans of the northbound structure and the 26 spans of the southbound structure were constructed of precast concrete segments erected by the balanced cantilever method of construction using an overhead erection gantry. The 392 ft (119.5 m) spans over the river are the longest precast concrete spans erected by the balanced cantilever method in the United States.

In 1991, construction of the southbound lanes was stopped when a footing at Pier 11, northbound, failed. The footing cracked extensively when a temporarily "fixed" expansion joint rotated, which allowed the cantilever on the pier to rotate downward and deflect the top of the pier horizontally. The footing was rebuilt and construction resumed without incident.

In 1991, the decks of both structures received a condition rating of 7 (good) and in-depth inspections in 1989 and 1993 found both bridges to be structurally sound.

Florida Bridge Performance

With 36 segmental concrete bridges, Florida has used this type of construction more than any other state. Corrosion of the reinforcing steel, especially in the Florida Keys, has caused some concern; however, the corrosion has been limited to the substructures and has not been a problem in the segmental concrete superstructures.

The overall condition of the Florida bridges is best stated by the Florida Department of Transportation's letter of response to the ASBI questionnaire:

> "In general, we have had some maintenance problems with large neoprene pads and 'quarter-point' hinges on our segmental bridges; as a result, we no longer use span hinges or extremely large neoprene pads. Otherwise, our segmentals are working beautifully."

CONCLUSIONS

Based on the ASBI segmental concrete bridge condition survey, the following observations and conclusions can be drawn:

1. The survey indicates that segmental concrete construction performs well over time, with consistently high condition ratings for bridges that have been in use for up to 30 years.

2. A total of 194 segmental concrete bridges have been built in the United States and Canada.

3. The majority of the segmental concrete bridges, 109, are built with precast concrete; 69 are built with cast-in-place construction.

4. Over the past 10 years, an average of nine bridges per year are being constructed using segmental concrete box girder design.

5. The bridge condition survey indicates that segmental concrete construction is performing well. All of the 96 bridge inspection reports received had a condition rating of 5 or better, indicating that none of the bridges are structurally deficient. Ratings of 6 (satisfactory), or better, were given to 98 percent of the bridges.

6. Two of the oldest segmental concrete bridges in the United States, with service lives of 20 and 22 years, have superstructure condition ratings of good and very good, respectively.

REFERENCES

1. *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*, Federal Highway Administration, Washington, D.C., December 1988.
2. Dunker, Kenneth F., and Rabbat, Basile G., "Performance of Prestressed Concrete Highway Bridges in the United States — The First 40 Years," PCI JOURNAL, V. 37, No. 3, May-June 1992, pp. 48-64.
3. Wittfoht, Hans, *Building Bridges, History-Technology-Construction,* Beton-Verlag, Dusseldorf, Germany, 1984.
4. Muller, Jean, "Ten Years of Experience in Precast Segmental Construction," PCI JOURNAL, V. 20, No. 1, January-February 1975, pp. 28-61.
5. *Precast Segmental Box Girder Bridge Manual,* Published jointly by the Post-Tensioning Institute, Phoenix, Arizona, and the Precast/Prestressed Concrete Institute, Chicago, Illinois, 1978, 116 pp.

APPENDIX A — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
Ste. Adele, Quebec	QMOT	River of the Mules	1964	Cast-in-place	2 @ 41'	530'	132.5'-365'-132.5'
Hudson Hope, Br. Columbia	BCDH	Hudson Hope Bridge over Peace River	1965	Precast, Suspension	37'	680'	680'
Indiana	INDOT*	16th Street/I-465 Br I-465-117-4499A	1966	Cable-stayed	30.3'	279'	99.5'-2@67.5'-40.75'
Notre Dame du Laus	Quebec	Quebec Highway 35 over Lievre River	1967	Precast	36'	520'	130'-260'-130'
West Sacramento, California	CALTRANS	Harbor Boulevard Overcrossing	1969	Precast, Span-by-span	80.0'	278'	139'-139'
Ontario, California	CALTRANS	Milliken Avenue Overcrossing	1971	Precast, Span-by-span	75.0'	330'	135'-106'-89'
Matagmi, Quebec	QUE HYDR	Bell River Bridge	1972	Precast, Bal. Cantilever	35'	1,030'	140'-3@250'-140'
Digby, Nova Scotia	NSDH	Bear River Bridge	1972	Precast, Bal. Cantilever	39'-6"	1,997.5'	2@203.75'-6@265'
Calgary, Alberta	Calgary	Prince's Island/Bow River	1972	Cable-Stayed	12'	612'	
Corpus Christi, Texas	TXDOT*	JFK Memorial Causeway	1973	Precast, Bal. Cantilever	2 @ 26'-11"	400'	100'-200'-100'
New York DOT	NYDOT*	I-88 over Grand St. Arterial No 1095239	1973	Precast, Span-by-span	95'-0"	135'	130'
Vancouver, British Columbia	BCDH	Knight Street over S. Branch Fraser River	1973	C-I-P Balanced Cantilever	2@37'-0"	700	170'-360'-170'
Vancouver, British Columbia	BCDH	Knight Street over N. Branch Fraser River	1973	C-I-P Balanced Cantilever	2@49'-0"	530'	135'-260'-135'
40 mile east San Diego	CALTRANS*	Pine Valley Bridge No 57-692 R	1974	C-I-P Balanced Cantilever	42'	1741'	285'-340'-450'-380'-286'
40 mile east San Diego	CALTRANS*	Pine Valley Bridge N0 57-692 L	1974	C-I-P Balanced Cantilever	42'	1691'	255'-340'-450'-380'-266'
Middleport, Pennsylvania	PENNDOT	Route 209 over Schuykill River	1974	Precast, Span-by-span	80'	132'	132'
Hawaii	HIDOT*	Kipapa Stream Br. No 00300H200100425	1975	C-I-P Balanced Cantilever	2 @ 58'	1,990'	205.5'-6@250'-205'
Park County, Indiana	INDOT*	SR 1620 over Sugar Creek Br 00232	1975	Precast, Bal. Cantilever	26'-0"	370'	90.5'-180.5'-90.5'
Palau Island Chain	US P TR TERR	Koror-Babelthuap	1976	C-I-P Balanced Cantilever	31'-7"	1,142'	176'-790'-176'
Rio Dell, California	CALTRANS*	Eel River Right Bridge No 4-221-R	1976	C-I-P on Falsework	41'	1,427'	24'-262'-290'-255'-298'-298'
Rio Dell, California	CALTRANS*	Eel River Left Bridge No 4-221-L	1976	C-I-P on Falsework	41'	1,387'	24'-202'-310'-255'-298'
Parke Co. Indiana	INDOT*	SR 47/Turkey Run Br 047-61-06570	1977	Precast, Bal. Cantilever	44.1'	325'	158.5'-158.5'
Indiana	INDOT*	Ramp I-465/I-465 Br _465-117-6463	1977	Cast-in-place	40.3'	746'	116'-3@170'-116'
Penn State U.	PADOT	Penn DOT Test Track	1977	Precast on falsework	40'	124'	124'
Meridian, California	CALTRAN*	Sacramento River Bridge No 18-08	1977	Cable-Stayed	45.0'	678'	94'-2@180'-2@110'
Vail Pass, Colorado	CODOT*	Bridge F-11-AV	1977	Precast, Bal. Cantilever	38'	724'	145'-2@200'-143'
Vail Pass, Colorado	CODOT*	WB I-70/Miller Creek Bridge F-11-AL	1977	C-I-P, Balanced Cantilever	38'	518'	101.5'-2@155'-101.5'
Vail Pass, Colorado	CODOT*	EB I-70/Miller Creek Bridge F-11-AK	1977	C-I-P, Balanced Cantilever	38'	455'	127.5'195'-127.5'
Vail Pass, Colorado	CODOT*	WB I-70/Black Gore Cr. Br. F-11-AM	1977	C-I-P, Balanced Cantilever	38'	748'	146.25'-2@225'-146.25'
Vail Pass, Colorado	CODOT*	EB I-70/Black Gore Cr. Br. F-11-AN	1977	C-I-P, Balanced Cantilever	38'	748'	146.25'-2@225'-146.25'
Vail Pass, Colorado	CODOT*	I-70 Sidehill Bridge F-11-AW	1977	Precast, Bal. Cantilever	38'	922'	151'-154.5'-210.08'-210'-154'

Note: 1 ft = 0.3048 m.

* Inspection record on file.

APPENDIX A (cont.) — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
Vail Pass, Colorado	CODOT*	I-70 Sidehill Bridge F-11-AX	1977	Precast, Bal. Cantilever	38'	727'	153.25'-209.75'-210'-154'
Vail Pass, Colorado	CODOT*	I-70 Bridge F-11-AU	1977	Precast, Bal. Cantilever	38'	701'	133.5'-200'-200'-133.5'
Napa, California	CALTRANS*	Highway 29 over Napa River No 21-49	1977	C-I-P Balanced Cantilever	66'	2,230'	150'-175'-230'-250'-230'-175'-6@150'-120'
Maryland	MDDOT*	John J. McMullen Memorial Br. No AC01	1977	Cast-in-place	2 @ 36'-0"	240'	90'-80'-70'
Grand'Mere, Quebec	QMOT	Quebec Rte 55 over St. Maurice River	1978	Cast-in-place	42'	935'	40'-130'-595'-130'-40'
Pasco-Kennewick, Wa.	WADOT*	Columbia R. Br. (Gum Street) No 397/20	1978	Precast, Cable-stayed	79'-10"	2,488'	406.5'-981'-406.5
California	CALTRANS*	El Camino Ave. Overcrossing No 24-116	1978	Precast, Span-by-span	91.6'	279'	137'-141'
South Maitland, N. S.	NSDH	Shubenacadie River	1978	C-I-P, Balanced Cantilever	32'	1,444'	372'-700'-372'
Covington, Indiana	INDOT*	US 136/Wabash River Br 136-86-6086	1978	Incremental Launching	44'-0"	943'	93.5'-4@187'-93.5'
New York DOT	NYDOT*	Rtes 29 & 40 /The Batterkill No 1020720	1978	Precast, Span-by-span	38.6'	182'	178' 3@148'-124'
Sonora, California	Corps of Eng.	Parrot's Ferry	1979	C-I-P Balanced Cantilever	40'-3"	1,290'	325'-640'-325'
Toronto, Ontaria	Toronto	Islington Avenue Extension	1979	Precast	2 @ 46'	1,610'	2@161'-200'-5@272'
Frankfort, Kentucky	KYTC*	Kentucky River Bridge	1979	Precast, Bal. Cantilever	2 @ 42'-4"	784'	228.5'-323'-228.5'
Lycoming Co., Penn	PADOT*	Pedestrian Bridge	1979	Cast-in-place	10'-6"	152'	150'
Milnikek, Quebec	QMOT	Que. Rte 132 over River of Matapedia	1979	Cast-in-place	43'	800'	200'-400'-200'
Snoqualmie Pass, Wa.	WADOT*	Denny Creek Bridge No 90/97.2N	1980	C-I-P, span-by-span	53'-101/2"	3,619.75	153.5'-16@188'-166'-144'-131.4'
Elora, Ontario	OMOT	Elora Gorge Crossing	1980	Cantilever	45'-6"	210'	20'-200'-90'
North Vernon, Indiana	INDOT*	WB US 50/Vernon Fork Br 50-40-0917B	1980	Precast, BAl. Cantilever	44.0'	386'	95'-190'-95'
Minneapolis, Minnesota	Minneapolis*	Plymouth Ave over the Miss. R. No 27611	1980	C-I-P Balanced Cantilever	55'	944'	120'-217'-260'0217'-120'
St. Catherines, Ont.	OMOT	NB Twelve Mile Creek	1981	Precast, Bal. Cantilever	47' to 44'	594'	172'-250'-172'
St. Catherines, Ont.	OMOT	SB Twelve Mile Creek	1981	Precast, Bal. Cantilever	53' to 47'	1,310'	155'-4@250'-155'
Winnebago Co., Ill.	ILDOT*	Kishwaukee River Bridge No 101-0134	1981	Precast, Bal. Cantilever	41'	1,090'	170'-3@250'-170'
Winnebago Co., Ill.	ILDOT*	Kishwaukee River Bridge No 101-0133	1981	Precast, Bal. Cantilever	41'	1,090'	170'-3@250'-170'
Mississauga, Ont.	Mississauga	Mullet Creek Bridge	1981	Precast	2 @ 32'	442'	113'-216'-113'
Natchez Trace Parkway	Park Service	Natchez Trace Pkwy/Tombigbee Wtrway	1981	Cast-in-place	37'-6"	945'	200'-420'-200'
Juneau, Alaska	AKDOT*	Gastineau Channel Bridge	1981	C-I-P Balanced Cantilever	43'	1,286.3'	330'-620'-330'
Portland, Oregon	ORDOT*	I-205/Columbia G. Jackson Br No 09555	1981	Balanced Cantilever	2 @ 68'-0"	7,434'	245'-3@242'-272'-4@300'-330'-3@360' 480'-600'-480'-360'-290'-3@288'-263'-244'
Alberta, Canada	Alberta*	Int'l. Airport Grade Seperation	1981	Precast, Span-by-span	18.9m	180m	4@45m
Mississauga, Ont.	Mississauga	Credit River Bridge	1981	Precast	2 @ 32'	1,280'	190'-3@300'-190'
Rochester, New York	NYDOT*	I-390 over Genesee River No 4070541	1981	Cast-in-place	56'-2"	2,010'	180'-270'-430'-270'-182' 97'-3@145'-140'-46'

Note: 1 ft = 0.3048 m.

* Inspection record on file.

APPENDIX A (cont.) — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
Rochester, New York	NYDOT*	I-390 over Genesee River No 4070542	1981	Cast-in-place	56'-2"	2,010'	180'-270'-430'-270'-182' 97'-3@145'-140'-46'
Hull, Quebec	Quebec	Autoroute 550 over Autoroute 50	1981	Cast-in-place	84'	940'	140'-3@220'-140'
Big Rapids, Michigan	MIDOT*	US 131/ Muskegon R. NoBO2 of 54014	1982	C-I-P, Span-by-span	2 @ 42'-0"	580'	135'-270'-175'
Big Rapids, Michigan	MIDOT*	US 131/ Muskegon R. NoBO1of 54014	1982	C-I-P, Span-by-span	2 @ 42'-0"	580'	135'-270'-175'
Calgary, Alberta	Calgary	Carburn Park/Bow River	1982	C-I-P, Cable-Stayed	3.1m	120m	20m-80m-20m
Clarkson, Washington	WADOT	Snake River Bridge	1982	C-I-P, Balanced Cantilever	70'	1,750'	610'-4@285'
Mobile Co., Alabama	ALDOT*	Dauphin Island Bridge No 193-49-0.6	1982	Precast, Bal. Cantilever	42'-31/2"	822'	211'-400'-211'
Mobile Co., Alabama	ALDOT*	Dauphin Island Br. App. No 193-49-0.6	1982	Precast, Span-by-span	42'-31/2"	3,068'	13@118'-MS-13@118'
Houston, Texas	TXTPA	Beltway 8 over Houston Ship Channel	1982	C-I-P, Balanced Cantilever	59'-3"	1,500'	375'-750'-375'
Florida Keys	FLDOT*	Channel No. 5 No 900098	1982	Precast, Span-by-span	38'-41/2"	4,924'	99.4'-35@135'-99.4'
Quebec	Quebec	Route 117 over Kinojevis river	1982	Cast-in-place	2 @ 42'	770'	172'-426'-172'
Florida Keys	FLDOT*	Long Key Bridge No 900094	1982	Precast, Span-by-span	38'-91/2"	12,144'	113'-101@118'-113'
Florida Keys	FLDOT*	Seven Mile Bridge No 900101	1982	Precast, Span-by-span	38'-41/2"	35,863'	81.6'-264@135'-141.75'
Calgary, Alberta	Calgary	Bow River at 4st E	1982	Cast-in-place	2 lane	430m	40m-7@50m-40m
Blue Ridge Prkwy, N. C.	Park Service	Linn Cove Viaduct	1983	Precast, Progressive Place	37'-6"	1,243'	98.5'-163'-4@180'
Lake County, Indiana	INDOT*	Cline Ave./Harbor Canal No912-45-2546	1983	C-I-P, Balanced Cantilever	2 @ 55'-6"	6,260'	28 Spans
Lake County, Indiana	INDOT*	WB 912 to Riley Rd. Br912-45-2546 RWX	1983	Cast-in-place	25'	1,163'	108.25'-2@175'-2@195'-210.58'
Lake County, Indiana	INDOT*	EB Riley Rd. to 912 Br. 912-45-2546 REN	1983	Cast-in-place	25'	1,481'	72'-2@120'-2@160'-4@180'-126.08'
Lake County, Indiana	INDOT*	WB Riley Rd to 912 Br 912-45-2546 RWN	1983	Cast-in-place	25'	400'	100'-197'-98'
Lake County, Indiana	INDOT*	WB Riley Rd to 912 Br 912-45-2546 REX	1983	Cast-in-place	25'	610'	164'-195'-160'-86'
New York DOT	NYDOT*	Rte. 203 over Kinderhook Cr. No 1040200	1983	Precast, Span-by-span	31.7'	355'	175'-175'
Quebec	Quebec	Autoroute 20 over Rimouski River	1983	Cast-in-place	2 @ 43'	800'	'200'-400'200'
Wiscasset, Maine	MEDOT*	Wiscasset-Edgecomb Bridge No 2262	1983	Precast, Span-by-span	44'-8"	2,719.17	90.83'-21@120.83'-90.83'
Florida Keys	FLDOT*	Niles Channel No 900117	1983	Precast, Span-by-span	38'-9"	4,557'	95.5'-37@118'-95.5'
Seattle, Washington	Seattle	West Seattle Freeway over Duwamish R.	1983	C-I-P, Balanced Cantilever	106'	1,340'	'375'-590'-375'
Allen Park, Michigan	MIDOT*	M-39 S B Ramp/I 94 No S43-6 of 82022	1984	Cast-in-place	44'	256.7'	
Boyce, Lousiana	LADOT*	Route 8 over Red River No 151-02-0000-1	1984	C-I-P, Balanced Cantilever	42'-10"	1,795'	227.5'-300'-310'-370'-360'-227.5'
Dade County, Florida	FLDOT	Ramp "I" over I-75 @ Turnpike	1984	Precast, Bal. Cantilever	40'	2,135'	116' to 224'
Atlanta, MARTA	MARTA*	CS360	1984	Precast, Span-by-span	30'-3"	5,230'	70' to 100'
Richland, Washington	WADOT*	Columbia River WB Bridge No 182/16N	1984	C-I-P, Balanced Cantilever	63'-3"	1,950'	260'-3@450'-260'
Richland, Washington	WADOT*	Columbia River EB Bridge No 182/16S	1984	C-I-P, Balanced Cantilever	63'-3"	1,950'	260'-3@450'-260'
Atlanta, MARTA	MARTA*	CN480	1985	Precast, Span-by-span	30'-3"	1,874'	75' to 144'

Note: 1 ft = 0.3048 m.

* Inspection record on file.

APPENDIX A (cont.) — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
East Huntington, W. Va.	WVDOT*	Ohio River Bridge	1985	C-I-P, Cable-stayed	30'	1,993'	158'-300'-900' 608'-27'
Hamilton, Ontario	OMOT	Burlington Skyway	1985	Cast-in-place	69'-6"	1,065'	272'-495'-272'
Otoe County, Nebraska	NEDOT	Nebraska City Bridge over Missouri River	1986	C-I-P, Balanced Cantilever	67'-6"	1,180'	224'-416'-360'-160'
Glenwood Canyon, Colo.	CODOT*	Bridge F-07-AL	1986	Precast, Span-by-span	37'-9"	613'	106.1'-3@131.7'-106.1'
Glenwood Canyon, Colo.	CODOT*	Bridge F-07-AN	1986	Precast, Span-by-span	37'-9"	385'	123.75'-131.67'-123.75'
Glenwood Canyon, Colo.	CODOT*	Bridge F-08-AA	1986	Precast, Span-by-span	37'-9"	428'	88.42'-2@122.83'-88.42'
Glenwood Canyon, Colo.	CODOT*	Bridge F-08-AB	1986	Precast, Span-by-span	36'-6"	428'	88.42'-2@122.83-88.42'
Glenwood Canyon, Colo.	CODOT*	Bridge F-07-AK	1986	Precast, Span-by-span	37'-6"	220'	106.08'-106.08'
Umatilla, Oregon	WADOT*	WB I-82 over the Columbia R. No 82/280	1986	C-I-P, Balanced Cantilever	49'-3"	'3,365	480'-2@660'-480'-330'-251'
Dade County, Florida	FLDOT*	Ramp A S to N/I-75 @ SR-826 No 870643	1986	Precast, Bal. Cantilever	27'-0"	3,016'	
Dade County, Florida	FLDOT*	Ramp B E to S/I-75 @ SR-826 No870644	1986	Precast, Bal. Cantilever	27.1'	1,664'	
Dade County, Florida	FLDOT*	I75 N-E/I-75 @ SR-826 No 870645	1986	Precast, Bal. Cantilever	29.6'	276'	137'-137'
Dade County, Florida	FLDOT*	RAMP NB/I-75 @ SR-826 No 870646	1986	Precast, Bal. Cantilever	64'-0"	390'	
Dade County, Florida	FLDOT*	RAMP NB/I-75 @ SR-826 No 870647	1986	Precast, Bal. Cantilever	56'-0"	397'	
Austin, Texas	TXDOT	Barton Creek Bridge	1986	C-I-P, Bal. Cant. Finback	2 @ 24'	686'	156'-340'-190'
Ft. Lauderdale, Florida	FLDOT*	EBI-595/SR93 & I75 - Br. "C" No860385	1987	Precast, Bal. Cantilever	40'	1,117'	100' min. to 200' max.
Ft. Lauderdale, Florida	FLDOT*	EB 84/SR 93 & I75 - Br. "D" No 860386	1987	Precast, Bal. Cantilever	40'	1,081'	100' to 184'
Ft. Lauderdale, Florida	FLDOT*	I-75EtoS/I-75 - Bridge "E" No 860387	1987	Precast, Bal. Cantilever	40'	2,832'	100' to 198'
Ft. Lauderdale, Florida	FLDOT*	I-75 S-E/SB SR 84 - Br. "H" No 860388	1987	Precast, Bal. Cantilever	40'	407'	110'to 187'
Ft. Lauderdale, Florida	FLDOT*	SW14 St/SR 93 - Br. "N" No 860389	1987	Precast, Bal. Cantilever	40'	464'	170' to 185'
Pikeville, Kentucky	KYTC*	Ramp "B" over US 23 Relocated	1987	Precast, Bal. Cantilever	28'-31/2"	373'	93.5'-185'-93.5'
Ft. Lauderdale, Florida	FLDOT*	Airport over US-1 Interchange No 860436	1987	Precast, Bal. Cantilever	40'	1,282'	85' min to 162' max
Ft. Lauderdale, Florida	FLDOT*	Airport over US-1 Interchange No 860434	1987	Precast, Bal. Cantilever	40'	374'	85' min to 162' max
Ft. Lauderdale, Florida	FLDOT*	Airport over US-1 Interchange No 860435	1987	Precast, Bal. Cantilever	40'	803'	85' min to 162' max
Ft. Lauderdale, Florida	FLDOT*	Airport over US-1 Interchange No 860437	1987	Precast, Bal. Cantilever	40'	453'	85' min to 162' max
Tampa, Florida	FLDOT	Sunshine Skyway Approach Spans	1987	Precast, Span-by-span	2@42'-9"	4,860'	36@135'
Tampa, Florida	FLDOT	Sunshine Skyway Bridge	1987	Precast, Cable-Stayed & Balanced Cantilever	95'-3"	4,000'	140-3@240-540-1200 540-3@240-140
Pascagoula, Mississippi	MSHD	Escatawpa River Bridge Approaches	1987	Precast, Span-by-span	2@ 30'-5"	3,260.8'	95.3'-26@115'-97.6'-77.9'
Pascagoula, Mississippi	MSHD	Escatawpa River Bridge	1987	Precast, Bal. Cantilever	2@ 30'-5"	610'	155'-300'-155'
Alexandria, Virginia	VADOT	WMATA J2e (3 bridges)	1988	PC Span-by-Span	31'to32.4'	770'	100' to 130'
Biloxi, Mississippi	MSHD	I-110 Biloxi Viaduct Mainline	1988	PC Span-by-Span &	28'-10" to	5,349'	80' to 179'-6"
Biloxi, Mississippi	MSHD	I-110 Biloxi Viaduct Ramps	1988	Balanced Cantilever	143'-5"	4,824'	
Virginia	VADOT*	Route 1 over the James River No 1819	1988	C-I-P, Balanced Cantilever	2 @ 48'-81/	3,758'	170'-11@285'-150'-160'-136'
Indiana	INDOT*	Ramp SB I-465/I-70 Br I70-86-6462A	1988	Cast-in-place	40.0'	319'	2@158'-6"

Note: 1 ft = 0.3048 m.

* Inspection record on file.

APPENDIX A (cont.) — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
Pensacola, Florida	CSX RR	CSX RR over Escambia Bay	1988	PC Span/Span & Bal. Cant.	19'	11,368'	100' typ, 170' main
Zilwaukee, Michigan	MIDOT*	S B I-75/ Saginaw R. No BO3-2 of 73112	1988	Precast, Bal. Cantilever	73'-6"	8,100.4'	25 spans 326.7' max
Zilwaukee, Michigan	MIDOT*	N B I-75 /Saginaw R. No BO3-1 of 73112	1988	Precast, Bal. Cantilever	73'-6"	8,075.5	26 spans 392' max
Chicago, Illinois	ISTHA	Illinois Tollway South - East Ramp	1989	PC Span/Span& Bal. Cant.	38-4"	1,998.2'	91.5'-150'-140'-5@130'-90'-130' 162.5'-225'-225'-134.17'
Chicago, Illinois	ISTHA	Illinois Tollway South-West Ramp	1989	PC Span/Span& Bal. Cant.	32.8'to40.8'	**********	73.9'-9@130'-168.9'-2@200'-14
Chicago, Illinois	ISTHA	Illinois Tollway East-North Ramp	1989	PC Span-by-Span		552.8'	57.5'-130'-101.8'-86'-120'-57.5
Chicago, Illinois	ISTHA	Illinois Tollway Finley Road	1989	PC Span-by-Span	33.2'to41.2'	5,545'	57'-6" to 225'
Jacksonville, Florida	JTA	Dame Point	1989	C-I-P, Cable-Stayed	2@43'-6"	2,600'	650'-1300'-650'
Glenwood Canyon, Co.	CODOT	French Creek Viaduct F-08-BH	1989	Precast, Bal. Cantilever	35'-6"	3,133'	143'-3@210'-205'-5@200'-205'-210'-205'-2@200'-135'
Glenwood Canyon, Co.	CODOT*	French Creek Viaduct F-08-AV	1989	Precast, Bal. Cantilever	35'-6"	1,320'	160'-210'-205'-3@200'-145'
Seattle, Washington	WADOT*	App. to 3rd Lake Washington No 90/2SN Bridge L L Line	1989	C-I-P, Balanced Cantilever	64.5' to 94.4'	2452'	175'-2@206'-262'-161' Flt. Br.-111.5'-2@206' 235'-222'-175'
Seattle, Washington	WADOT*	Approaches to 3rd Lake Washington Bridge L M Line	1989	C-I-P, Balanced Cantilever	42'	2,372.9'	175.8'-206.4'-206'-262' 161'-Flt. Br.-111.5' 2@206'-235'-222'-174.8'
Cumberland Gap, Kentucky	KYTC	Skyland Drive over US25E	1989		45'	169'	
Charleston, S. C.	SCDOT*	I526 over the Wando R. No 10105262240	1989	Precast, Span-by-span & Bal. Cantilever	2 @ 47-1"	7,900'	23@150'-300'-400'-300' 23@150'
Fort Lauderdale, Florida	FLDOT	I-75/I-595 Intchg - Bridge "B"	1989	Precast, Bal Cantilever	40'	3,939'	85' to 206'
Fort Lauderdale, Florida	FLDOT*	I-75/I-595 Intchg - Bridge "F1" No 860515	1989	Precast, Bal Cantilever	56'	414'	100' to 182.5'
Fort Lauderdale, Florida	FLDOT*	I-75/I-595 Intchg - Bridge "F2" No 860516	1989	Precast, Bal Cantilever	56'	1,071'	82' to 170'
Fort Lauderdale, Florida	FLDOT*	I-75/I-595 Intchg - Bridge "F3" No 860517	1989	Precast, Bal Cantilever	56'	388'	60'-140
Fort Lauderdale, Florida	FLDOT	I-75/I-595 Interchange - Bridge "G1"	1989	Precast, Bal Cantilever	56'	1,046'	80' to 132'
Fort Lauderdale, Florida	FLDOT	I-75/I-595 Interchange - Bridge "G2"	1989	Precast, Bal Cantilever	56'	388'	60' to 140'
Fort Lauderdale, Florida	FLDOT	I-75/I-595 Interchange - Bridge "J"	1989	Precast, Bal Cantilever	40'	3,113'	90' to 195.17'
Fort Lauderdale, Florida	FLDOT*	I-75/I-595 Intchg - Bridge "K" No 860510	1989	Precast, Bal Cantilever	40'	499'	70' to 182'
Fort Lauderdale, Florida	FLDOT*	I-75/I-595 Intchg - Bridge "L" No 860509	1989	Precast, Bal Cantilever	40'	460'	60' to 172'
Broward County, Florida	FLDOT	Ramp "A" over I-595 No 860477	1989	Precast, Bal. Cantilever	40'-0"	2,187'	124' to 224'
Broward County, Florida	FLDOT*	Ramp "T" over I-595 No 860476	1989	Precast, Bal. Cantilever	40'-0"	1898	124' to 224'
Dade County, Florida	FLTP	Ramp I/I-75 and Florida Turnpike	1990	Precast, Bal. Cantilever	42'-9"	2,133'	121'-212'-2@213'-166' -2@224'3@213'-121'

Note: 1 ft = 0.3048 m.

* Inspection record on file.

APPENDIX A (cont.) — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
Hyattsville, Maryland	WMATA	WMATA E6f	1990	Precast Span-by-span	14'-8" & 17'-7"	1,923'	108'-11@109'-2@99'-118'-133'-118'-49.25'
Idaho	IDDOT	Bennet Bay Bridge	1990	C-I-P, Balanced Cantilever	83'-8"	1,730'	340'-520'-520'-340'
Las Vegas, Nevada	Bur Rec*	US 93 at Hoover Dam No B-1868	1990	C-I-P, Balanced Cantilever	34'	534'	265'-265'
Richmond, Virginia	VADOT	Varina-Emon Br. Rte. 295 over James R.	1990	Cable-Styd, PC Span/Span	2 @ 57'-10"	4,680'	15@150'-630'-12@150'
Edonton, North Carolina	NCDOT*	Albermarle Sound Bridge No 15	1990	Precast,span-by-span	34'-3"	4,159'	225 to 255, 131.1, 224
Vancouver, British Columbia	Vancouver	Transit Crossing of Fraser River	1990	Precast, Cable-Stayed	12.5m	616m	138m,340m,138m
Waldport, Oregon	ORDOT	US 101 over Alsea Bay	1991	Cast-in-place	64'	2,910'	195-264-236-230-225
Port Arthur, Texas	TXDOT	SH 87 over Neches River	1991	Cable-Stayed	56'	1,480'	140-280-640-280-140
Valley City, Illinois	ILDOT	EB US 36 over the Illinois River	1991	C-I-P, Balanced Cantilever	42'	3,329.5'	
Valley City, Illinois	ILDOT	WB US 36 over the Illinois River	1991	C-I-P, Balanced Cantilever	42'	3,203.5'	
Savanah, Georgia	GDOT	Talmadge Memorial Bridge	1991	C-I-P, Cable-Stayed	79'-0"	2,040'	470'-1100'-470'
Glenwood Canyon, Co.	CODOT	I-70-Hanging Lake Viaduct F-08-AR	1991	Precast, Bal. Cantilever &	35'-6"	1,307.8'	184.13-300-225-216-216-156.63
Dade County, Florida	FLDOT	Port of Miami Bridge & Dodge Island	1991	Precast, Bal. Cantilever	2 @ 53'-2"	2,521'	96' min. to 195' max.
Dallas, Texas	Dallas	Westmoreland Rd. over Trinity River	1991	C-I-P, Balanced Cantilever	2@45'-0"	680'	180'-320'-180'
Seattle, Washington	WADOT	SouthWest Spokane St. Swing Span	1991	C-I-P, Balanced Cantilever	51'	836'	198'-440'-198'
Mobile, Alabama	ADOT	Cochrane Bridge	1992	C-I-P, Cable-Stayed	2@40'-0"	1,500'	360'-780'-360'
Mobile, Alabama	ADOT	Approaches to Cochrane Bridge	1992	Precast Lift Spans	2@40'-0"	5,791'	12@195'-200'-206'-187' 167'-13@195'-156'
Jamestown, Rhode Island	RIDOT	Narragansett Bay Crossing	1992	C-I-P, Balanced Cantilever	2@36'-0"	1392'	359'-674'-359'
Jamestown, Rhode Island	RIDOT	Narragansett Bay Crossing Approaches	1992	Precast, span-by-span	2@36'-0"	2,976'	11@186'-5@186'
San Antonio, Texas	TXDOT	San Antonio Downtown Y	1992	Precast, Span-by-span	26'-58'	54,000'	80' to 100'
Glenwood Canyon, Co.	CODOT	Hanging Lake Viaduct F-08-BJ	1992	Precast, Bal. Cantilever	35'-6"	6,293.37	8@200-2@208-200-3@208-200-2@192-184 5@192-7@200-192-133.37
Glenwood Canyon, Co.	CODOT	Hanging Lake Viaduct F-08--AS	1992	Precast, Bal. Cantilever	35'-6"	817.5'	176.6'-300'-180'-160'9'
Lafayette, Indiana	INDOT*	EB SR 26/Wabash River Br 26-79-6961	1992	C-I-P, Span-by-span	32'-3"	827'	183'-249'-250'-167'
Lafayette, Indiana	INDOT*	WB SR 26/Wabash River Br 26-79-6961	1992	C-I-P, Span-by-span	32'-3"	850'	170'-246'-248'-162'
Glenwood Canyon, Colo.	CODOT	I-70/Colorado River Bridge F-08-AS	1992	Precast, Bal. Cantilever	2@33'-6"	772'	184.17-300'-225'
Los Angeles, California	LA METRO	Metro Green Line	1992	Balanced Cantilever	27'	670'	175'-160'-160'-175'
Los Angeles, California	LA METRO	Metro Green Line	1992	Balanced Cantilever	27'	620'	125'-185'-185'-125'
Puerto Rico	PR Hwy Auth.	Caguana River Bridge	1992	Incrementally Launched	16.95m	385m	52.5m-4@70m-52.5m
Destin, Florida	Mid Bay Br A.*	Choctawhatchee Bay Bridge No 570091	1993	PC Span/Span & Bal. Cant.	42'-9"	19,265'	136' Typ, 225' Main

Note: 1 ft = 0.3048 m.

* Inspection record on file.

APPENDIX A (cont.) — SEGMENTAL CONCRETE BRIDGES CONSTRUCTED IN NORTH AMERICA (1964-1995)

Location	Owner	Name	Date	Type of Construction	Width	Length	Span Length
Hawaii	HIDOT	Windward Viaduct	1993	Precast, Bal. Cantilever	2 @ 41'-0"	6,660'	24 spans 170' to 300'
Nashville, Tennessee	Park Service	Natchez Trace Parkway	1993	Precast, Cantilever	35'-6"	1,572'	204'-246'-90'-2@246' 90'-246'-204'
San Antonio, Texas	TXDOT	San Antonio Downtown Y	1993	Precast, Span-by-span	26',47',58'	10,000'	90 to 110'
Seattle, Washington	WADOT	Lacey V. Murrow	1993	C-I-P before floating	60'	7,200'	20 @ 360'
Oakville, Ontario	OMOT	Upper Middle Road/Sixteen Mile Creek	1993	C-I-P, Balanced Cantilever	2@17.72m	335m	45m-60m-75m-100m-55m
Richmond, British Columbia	Richmond	#2 Road over Fraser River	1993	Precast, Bal. Cantilever	25-32m	566m	36m-47m-59m-4@60m 2@64m-56m
Hawaii	HIDOT	North Halawa Valley Viaduct	1994	C-I-P, Balanced Cantilever	2 @ 41'-0"	6,225'	23 spans 135' to 360'
Connecticut	CDOT	I-95 over the Connecticut	1994	Precast, Bal. Cantilever	168'	2,522.5'	3@177.5'-5@240'-2@275'-240'
Jacksonville, Florida	FLDOT*	Acosta Bridge over St Johns R. No 72057	1994	C-I-P, Balanced Cantilever	2 @ 72'-0 '	1,645'	220-360-630-275-160
Delaware	DEDOT	C & D Canal Bridge	1995	Cable-Stayed Precast	2 @ 58'-8"	1,650'	3@150'-750'-3@150'
Delaware	DEDOT	C & D Canal Bridge Approaches	1995	Precast, Span-by-span	2 @ 58'-8"	3,000'	9@150'-11@150'
Hobucken, North Carolina	NCDOT	Intercoastal Waterway Bridge		C-I-P, Balanced Cantilever			210'-380'-210'

Note: 1 ft = 0.3048 m.
* Inspection record on file.

APPENDIX B — CONDITION REPORTS OF SEGMENTAL BRIDGES (1966-1993)

State	Bridge	Year built	Condition report		
			Deck	Superstructure	Substructure
Indiana	No. I-465-117-4499A	1966	7	6	6
Texas	John F. Kennedy Causeway	1972	6	7	7
New York	No. 1095239	1973	6	7	8
California	No. 57-692-R	1974	7	8	8
California	No. 57-692-L	1974	7	8	8
Indiana	No. 00232	1975	7	8	8
Hawaii	No. 00300H200100425	1975	8	7	6
California	No. 4-221-L	1976	8	8	8
California	No. 4-221-R	1976	8	8	8
Colorado	No. F-11-AX	1977	7	8	8
California	No. 21-49	1977	8	8	8
California	No. 18-08	1977	8	8	8
Indiana	No. 47-61-6570	1977	7	7	7
Indiana	No. I-465-117-6463	1977	6	7	7
Colorado	No. F-11-AV	1977	6	7	7
Maryland	No. AC01	1977	7	7	7
Colorado	No. F-11-AU	1977	7	7	7
Colorado	No. F-11-AK	1977	6	7	7
Colorado	No. F-11-AW	1977	7	7	7
Colorado	No. F-11-AN	1977	6	6	6
Colorado	No. F-11-AL	1977	7	6	6
Colorado	No. F-11-AM	1977	6	6	6
California	No. 24-116	1978	8	8	8
New York	No. 1020720	1978	6	6	8
Indiana	No. 136-86-6086	1978		Rehabilitated in 1992	
Washington	No. 397/20	1978			
Pennsylvania	Pedestrian bridge	1979	7	8	8
Kentucky	E-W connector	1979	7	7	8
Illinois	No. 101-0134	1980	7	8	8
Illinois	No. 101-0133	1980	7	8	8
Minnesota	No. 27611	1980	8	8	8
Indiana	No. 50-40-917B	1980	6	6	6
Washington	No. 90/97.2N	1980			
Alberta	International airport	1981	7	7	8
Oregon	No. 09555	1981	7	7	8
Florida	No. 900094	1981	7	6	6
New York	No. 4070541	1981	5	6	6
New York	No. 4070542	1981	6	6	7
Alaska	Douglas Bridge	1981			
Michigan	No. B02 of 54014	1982	7	7	8
Michigan	No. B01 of 54014	1982	7	7	8
Alabama	No. 193-49-0.6	1982	7	7	7
Florida	No. 900098	1982	7	6	7
Florida	No. 900101	1982	6	5	6
Indiana	No. 912-45-2546	1983	8	9	9
Indiana	No. 912-45-2546-RWN	1983	8	8	8
Indiana	No. 912-45-2546-RWX	1983	8	8	9
Indiana	No. 912-45-2546-REN	1983	8	8	8
Indiana	No. 912-45-2546-REX	1983	8	8	8

APPENDIX B (cont.) — CONDITION REPORTS OF SEGMENTAL BRIDGES (1966-1993)

State	Bridge	Year built	Condition report		
			Deck	Superstructure	Substructure
Maine	No. 2262	1983	7	7	8
New York	No. 1040200	1983	6	7	8
Florida	No. 900117	1983	7	6	6
Michigan	No. S43-6 of 82022	1984	7	8	8
Marta	No. S360	1984	8	8	8
Louisiana	No. 151-02-0000-1	1984	6	6	6
Michigan	No. BO3-1 of 73112	1984	7		7
Michigan	No. BO3-2 of 73112	1984	7		7
Washington	No. 182/16N	1984	6		
Washington	No. 182/16S	1984	6		
Marta	No. N480	1985	8	8	8
Washington	No. 82/280N	1986	7	9	
Florida	No. 870647	1986	7	8	8
Colorado	No. F-08-AB	1986	7	7	7
Colorado	No. F-07-AN	1986	7	7	7
Colorado	No. F-07-AL	1986	7	7	7
Colorado	No. F-07-AK	1986	7	7	8
Florida	No. 860388	1986	6	7	8
Florida	No. 870646	1986	7	7	8
Florida	No. 870644	1986	7	7	8
Colorado	No. F-08-AA	1986	8	7	7
Florida	No. 870643	1986	8	7	8
Florida	No. 870645	1986	7	7	8
Florida	No. 860389	1986	8	7	8
Florida	No. 860387	1986	8	6	9
Florida	No. 860386	1986	8	6	8
Florida	No. 860385	1986	8	6	8
Florida	No. 860436	1987	8	8	8
Kentucky	Ramp B over U. S. 23	1987	8	8	8
Florida	No. 860437	1987	8	7	8
Florida	No. 860435	1987	7	7	8
Florida	No. 860434	1987	7	7	8
Virginia	No. 1819	1988	9	9	9
Florida	No. 860515	1988	8	8	8
Florida	No. 860516	1988	8	8	8
Florida	No. 860517	1988	8	8	8
Florida	No. 860477	1988	7	7	8
Florida	No. 860510	1988	7	6	8
Florida	No. 860476	1988	7	6	8
Indiana	No. I-70-86-6462A	1988	7	5	7
South Carolina	No. 101052622400	1989	9	9	9
Washington	No. 90/2SN	1989	6	9	
Colorado	No. F-08-AV	1989	7	7	7
Florida	No. 850509	1989	7	6	8
North Carolina	No. 15	1990	8	8	8
Nevada	No. B-1868	1990	8	8	7
Florida	No. 720571	1991	8	7	7
Indiana	No. 26-79-6961 WB	1992	8	8	8
Indiana	No. 26-79-6961 EB	1992	8	8	8
Florida	No. 570091	1993	7	7	7