CONDITION SURVEY OF CONTINUOUS BRIDGE DECKS

by

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and

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Condition Survey of Continuous Bridge Decks

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College Station, Texas

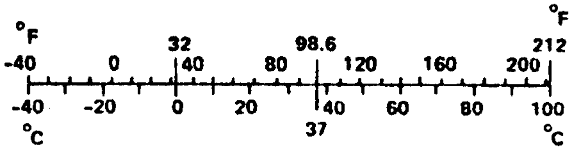
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

ACKNOWLEDGMENTS

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The valuable contributions of each of these are gratefully acknowledged with sincere thanks and appreciation.

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the opinions, findings and conclusions presented therein. The contents do not necessarily reflect the official views or policies of the Texas State Department of Highways and Public Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

KEY WORDS

Bridge decks, continuous decks, deck condition, concrete decks, deck deterioration, deck life.

ABSTRACT

A field survey was conducted to evaluate the performances of Texas highway bridges with continuous decks and to compare those performances with comparable bridges with noncontinuous decks. The visual inspections were geographically distributed over the entire state to account for different climatic conditions found in the state. Bridges with continuous steel girders, reinforced concrete pan formed girded, prestressed concrete simple girders, and prestressed concrete girders made continuous for live load made up the sample of 257 bridges.

The most common defects found are: (1) transverse deck cracks, (2) longitudinal cracks in pan formed girder bridges, (3) spalls and cracks at ends of closure pours in prestressed concrete girders made continuous for live loads, (4) bent cap and beam end spalls in simple pan formed girder bridges, and (5) damaged joint seals in simple spans. Less common are (1) deicing salt damage over bents in continuous slabs and (2) cracks at dowel ends of doweled pan formed girder bridges.

It is concluded that the service lives of continuous deck and simple deck bridges should be comparable if all are well maintained and if the steel is protected from deicing salt. It is recommended that special precautions be made to protect reinforcing steel in cracked regions over bents.

SUMMARY

A field survey was conducted to evaluate the performance of Texas highway bridges with continuous decks, and to compare those performances with comparable bridges with noncontinuous decks. Steel and precast prestressed concrete girder bridges and reinforced concrete pan girder bridges comprised the sample for visual inspection. These bridges were distributed graphically over the entire state in 15 of the 25 highway districts.

The sample consisted of the following bridges: six simple pan girder, 11 doweled pan girder, 32 simple prestressed concrete girder with continuous slab, 77 prestressed concrete girder and reinforced slab made continuous for live load, and 22 continuous steel girder.

The most common types of deterioration are:

1. Transverse cracks in deck slab of continuous deck bridges
2. Longitudinal cracks at top of arch in pan girder bridges
3. Spalls and cracks at ends of closure pours for prestressed concrete made continuous for live load
4. Bent cap and beam spalls in simple pan girder bridges
5. Damaged joint seals in simple span bridges

Less common occurrences of deterioration are:

1. Deicing salt spalling over bents of continuous for live load prestressed concrete and steel girder bridges
2. Transverse deck cracks at ends of dowels in doweled pan girder bridges

It was observed that transverse cracking, the most common type of deterioration, does not generally reduce the serviceability of the bridge, and does not appear to seriously affect the service life of the bridges not subject to use of deicing salt. The service life of a bridge with a continuous deck should be about the same as that of one with a simple deck provided that it is well maintained and protected from salt intrusion.

It is recommended that: (1) reinforcing steel be protected from deicing salt, (2) design details be made to prevent end-of-closure pour in prestressed girder continuous for live load bridges, and (3) design detail modifications be made to prevent transverse cracking of doweled pan girder bridges. (These modifications are currently being made.)

Research Implementation:

This research has made an overall evaluation of the condition of continuous decks and has compared them with the condition of simple decks. It has found that except for transverse cracking of the slab, continuous decks are in comparable condition as simple decks. The former do not have the service life history of the latter, but no reason is seen that the service lives of the two types will not be about the same if they are maintained well.

Design detail modifications, some of which are currently under way, should be made to prevent transverse cracking at dowel ends in the doweled pan girder bridge, and to prevent cracking and spalling at ends of closure pours of prestressed concrete girder bridges made continuous for live load.

It is very important that reinforcing steel be protected from deicing salt. Current practices of using dense concrete, deeper cover, and epoxy coated reinforcing steel have proved to be very effective in providing that protection. In areas of transverse cracks over bents in the continuous slabs, water finds its way through the slab by way of at least some of these cracks. The steel in this area is particularly vulnerable to salt that might be applied, and its need for protection is greater than that in other areas of the slab. If this steel is not protected by coating or other effective means, the cracks should be sealed against entry of the salt.

TABLE OF CONTENTS

I. INTRODUCTION

The highway bridge deck exposed to severe weather and heavy traffic is probably the most deterioration prone major element of a bridge. Beginning in the early 1970's, the Texas State Department of Highways and Public Transportation (SDHPT) began promoting continuity in new decks to eliminate a number of serious deck problems. Since that time, continuous decks have been installed on many prestressed concrete (PC) girder, pan-formed girder, and steel girder bridges. These decks eliminate a number of joints and sometimes they do not require deck-bearing diaphragms at abutments and bents. Stains and damage to bridge elements below the deck surface are also eliminated or reduced by the continuous decks.

1. The Problem:

An evaluation of continuous decks as compared to jointed decks has not been made, although the records in the Bridge Inventory, Inspection and Appraisal Program (BRINSAP) (1)* provides valuable information on their conditions. Field inspections of typical bridges of the two deck types are needed to provide information from which the evaluation and subsequent decisions on installations may be made. This program was initiated to meet that requirement.

2. Objectives:

The overall objective of the study was to evaluate the performance of continuous deck bridges as compared with decks having simple joints at bents. Specifically, the study proposed the following:

1. Determine the general state of deterioration of continuous decks on
    - (a) steel girders,
    - (b) precast prestressed concrete (PC) girders, and
    - (c) pan-formed (PF) girders.

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*Underscored numbers in parentheses correspond to the references listed at the end of this report.

2. Compare the state of deterioration of these continuous decks with that of otherwise comparable simple decks.

3. Determine if the continuous decks show deterioration more serious, less serious, or comparable to that of simple decks.

4. Record potentially significant factors of geography, climate, traffic, design, and construction that might influence deterioration.

3. Background:

Alarming deterioration of concrete bridge decks in the United States resulted from the heavy use of deicing salt which began about the close of World War II. The problem became so serious that a nationwide survey was made and reported in 1965-1968. It was shown that, among other things, chloride laden ice melt was carried into the concrete through pores and cracks. When the chloride reached the steel in the deck, corrosion set in, spalls in the concrete followed, and general deterioration became serious (2). Transverse cracks in these decks were attributed to concrete subsidence while in the plastic state, curing and drying shrinkage, response to thermal changes, and live load stresses.

In 1969 a study of nine-year-old bridges in Pennsylvania (3) showed that the number of deck cracks increased almost linearly with age. The report indicated that all deck cracks that might be expected would have developed by the end of nine years of bridge life. No estimate was made of the detrimental effects of the cracks.

The SDHPT published a report in 1970 on bridge deck condition throughout the State of Texas (4). The report summarized inspection records of some 5300 bridges. Simple and continuous span types were among 45 structural characteristics that were studied for their influences on deck conditions. At that time, most continuous bridges were made with steel beams, and these showed a higher degree of deterioration, which included deck cracking, than did the simple span bridges. The report made no reference to the contribution of joints to the condition of the decks, nor did it deal with continuous decks on simple beams.

II. BRIDGE INSPECTION

1. The Sample:

The different climatic and geographic regions of Texas are covered in the 14 SDHPT districts selected for the study. Lists of the candidate bridges to be studied were solicited from each of the 14 districts. Selections were made from those lists with consideration for bridge type, location, age, and traffic. No limit was placed on the number of any one type that would be studied. Later, a few bridges were selected from one more district.

In this report all PC girders are precast, prestressed, AASHTO or Texas section, and the bridges are referred to as PC girder bridges. The steel beams are wide flange or I section and the bridges are referred to as steel I-beam bridges. The pan girder type is a reinforced concrete, recessed curved soffit slab type cast on removable steel pan forms. It is referred to here as the pan girder bridge. The various types are further broken down, listed, and given symbols below.

Type	Symbol
1. Pan girder	
(a) Simple	PFS
(b) Tied	PFT
2. Prestressed concrete girder	
(a) Simple beam, jointed slab	PCS
(b) Simple beam, continuous slab	PCS-C
(c) Beam and slab continuous for live load	PCC-C
3. Continuous steel I-bm	S-Ibm

These symbols will be used for the different bridge types in the sections that follow.

The PFS span is tied to the bent cap at one end with vertical dowels and is free to move longitudinally on the other bent cap. Multiple span units of the PFT are tied across bents with longitudinal dowels from span to span to prevent the joint between spans from opening. No live load continuity is provided by this detail. The ends of all spans of a unit, except for the expansion end, are tied to the bent cap with vertical dowels.

The slab on the PCS bridge is composite with its precast PC simple girders, and moves longitudinally with the girders.

The slab on the PCS-C bridge is cast continuously over at least two spans on PC simple girders and an expansion joint is provided at each end of a continuous unit. The slab reinforcing is carried continuously across all intermediate bents of the continuous units. In a few cases the slab steel is stopped at the intermediate bents, and the continuity of slab is provided at bents by longitudinal dowels extending from one span into the next. No live load continuity is claimed for the PCS-C type of bridge -- the slab is made continuous only to eliminate open or sealed joints at the bents.

Live load continuity is provided in the PCC-C bridge by a connection between steel in the bottom flanges of PC girders in adjacent spans, and by continuing the slab steel, augmented by extra longitudinal steel, across the intermediate bents. Two details are used in connecting bottom flange steel between PC girders. In one of these, two number 10 longitudinal reinforcing bars are embedded in the bottom flange at ends of adjoining beams. Exposed 90 degree hooks in these bars overlap, and a straight bar is threaded through and welded to the exposed hooks. A bearing diaphragm is then cast over the bent to engage these overlapped bars and the ends of the abutting beams.

The other type of detail of the PCC-C bridge leaves a number of the straight prestressing strands extending almost 2 ft from the end of the PC girder. The strands from abutting beams overlap and are embedded in a thick stem of the inverted T bent cap.

Details of these deck types are shown in the appendix, Figure A-1.

Locations of districts from which samples were taken are shown in Figure 1, and the number of each type of bridge is shown by district in Table 1. A far greater number of PCS-C and PCC-C types than other kinds of bridges were selected because they are relatively new in the system and records of their conditions in service do not go back as far as other types. Table A-1 lists all bridges that were inspected.

2. The Field Inspection:

Bridges on the list of prospective structures were discussed in each district office with bridge personnel before the inspection was made. At that time, bridge plans were reviewed to gather information that might be needed

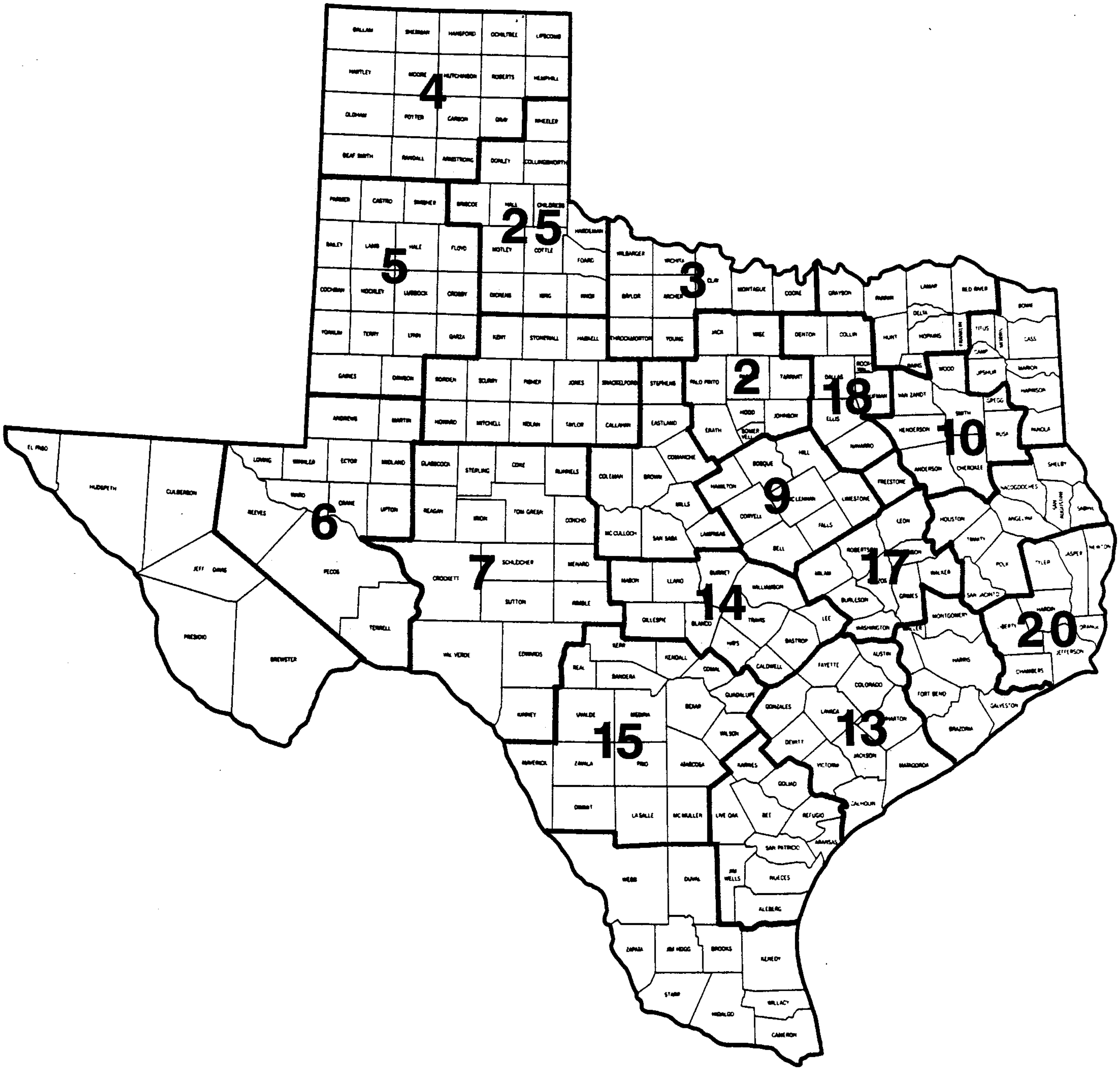


Figure 1. SDHPT districts (numbered) in which bridges were inspected.

Table 1. Number of bridges by type and district.

Bridge Type	District Number															
	2	3	4	5	6	7	9	10	13	14	15	17	18	20	25	Total
Pan Girder																
PFS							6									6
PFT							7	4								11
Prestressed Concrete Girder																
PCS			1			7	6			15		3				32
PCS-C	19	3	4		19	24	1		5	4	9	2	12	3	4	109
PCC-C		1	1	25	9	7	11		11	2			3	6	1	77
Steel I-Beam (S-I bm)			1		11	2						1		5	2	22
Total	19	4	7	25	39	40	31	4	16	21	9	6	15	14	7	257

*See definitions under section II.1.

later, and particular problems and bridge characteristics were discussed with district personnel. An occasional bridge was added to or dropped from the list at this stage. Later, the BRINSAP record for each bridge, where available, was obtained from each district. The condition ratings for the roadway component and ADT contained in those records were of primary interest.

The condition of the bridge deck is the concern of this study, and particular emphasis is given to conditions that might differentiate the performance of one type of bridge from that of another type. A visual inspection of the slab and girders of each bridge was made to meet that concern. The general condition and particular items of deterioration were noted in the inspection. Photographs of unusual defects were taken. Widths and spacing of cracks were measured in some cases. The bottom of the slab was inspected from the ground below, and a ladder was used where close inspection was deemed necessary. A hand-held extensometer was used to test for crack movement in two decks.

The procedure below was followed in the field inspection, but not necessarily in the order listed:

1. Check the top of the slab for cracking, spalling, and condition of joints, giving particular attention to edge wear and spalling of cracks.
2. At abutments, inspect backwalls, bearing pads, ends of girders, and slab.
3. From the ground below, count visible cracks in the bay under the outside traffic lane of each span.
4. Look for cracks, spalls, rust spots and any other item of deterioration in slab, girders, diaphragms, and bent caps that might be seen from the ground below the bridge.

Each bridge was inspected from abutment to abutment wherever traffic and waterways permitted.

3. Findings from the Field Inspection:

A. Types of deterioration

All of the defects found in the inspection fall into the general groups of cracks and spalls in concrete, steel corrosion, and joint seal displacement. Descriptions of these defects are given in general terms below, and their occurrence by bridge types follows.

(1) Joint seals are often used at expansion joints above bents, and portions of these seals are more likely than not displaced, as shown in Figure 2, punctured, or missing. Many were found to be dropped or sagging over all or part of their length, and some were worn through or punctured by traffic and road debris. Both displacement and punctures render the seal partially or wholly ineffective.

Armor plate and finger joints sometimes become loose, but this was seen in only a very few cases.

(2) Steel corrosion is sometimes found in spalled and cracked concrete and in steel girders. A few bridges showed minor isolated reinforcing steel rust stains, as shown in Figure 3 where there is insufficient concrete cover, and some occur at cracks in the concrete. In others, the rust indicates serious problems with corrosion where major spalling could follow, as shown in Figure 4.

(3) Deck cracks, although minor in many cases, are found in most bridges. They are caused by plastic shrinkage, drying shrinkage, settlement of formwork, live load stresses, and corrosion of reinforcing steel (3). Roadway particles of soil and the like, surface texture, and surface overlays make it difficult or impossible to see most cracks on top of the deck because they are usually very narrow. If they are leaking cracks, efflorescence and exudation are deposited on the bottom of the slab where the presence of the crack is easily seen from the ground below. An example of this is shown in Figure 5.

The various types of deck cracks seen in this survey are described below.

(a) Transverse cracks, perpendicular to the direction of traffic, are the most prevalent of the deck cracks. They sometimes run the full width of the roadway, but usually they are much shorter. The short runs characteristic of PC girder bridges are shown in Figure 6. In the PC girder type of bridge, the transverse crack does not usually cross over the girder as it does in steel girder bridges.

(b) Longitudinal cracks run parallel to the direction of traffic, and, except for pan girder bridges, they are not common. They occur in all pan girder bridges where they are usually seen only below the slab. Most of the

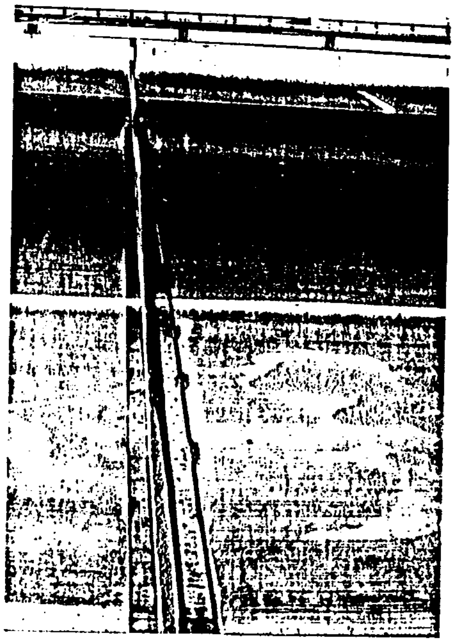


Figure 2. Joint seal.

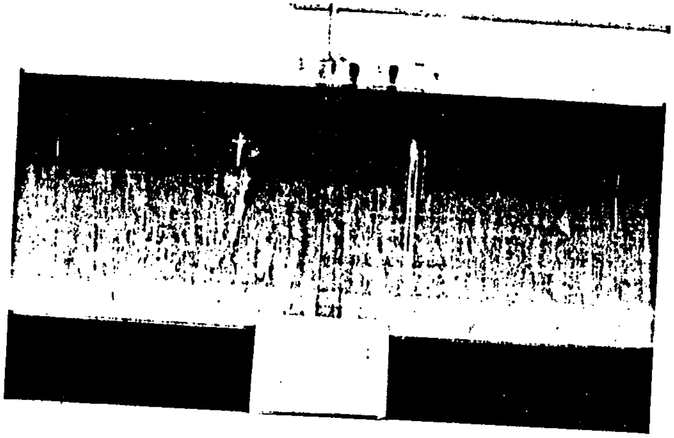
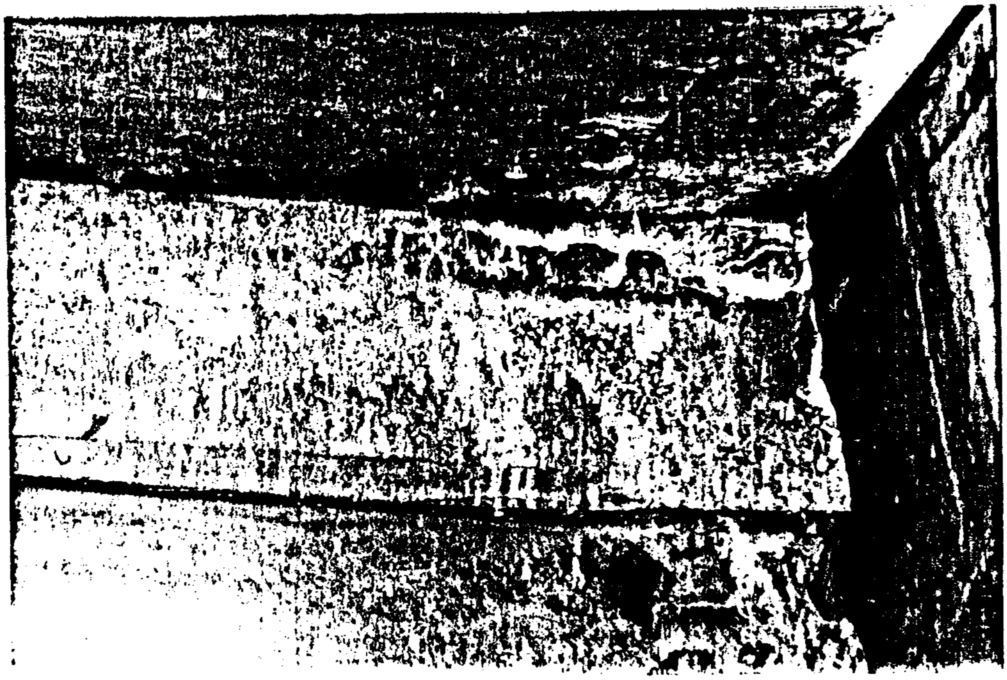


Figure 3. Rust stains.



(a) Rust stains on girder and bottom of slab.

(b) Deck spall patches.

Figure 4. Serious corrosion caused by salt applications.

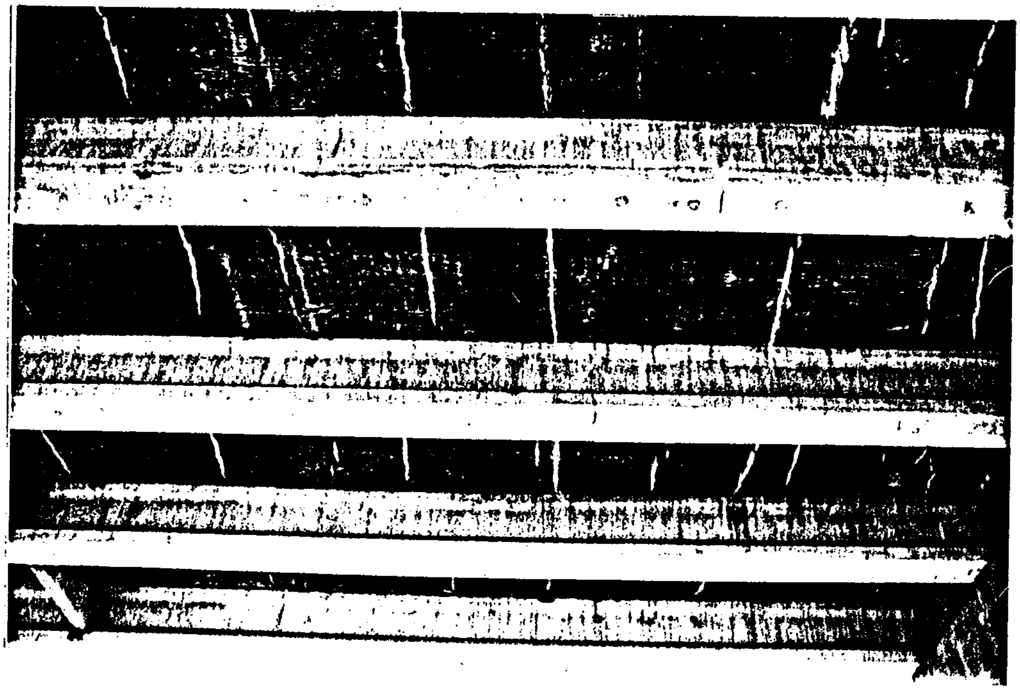


Figure 5. Deck cracks marked by leakage.

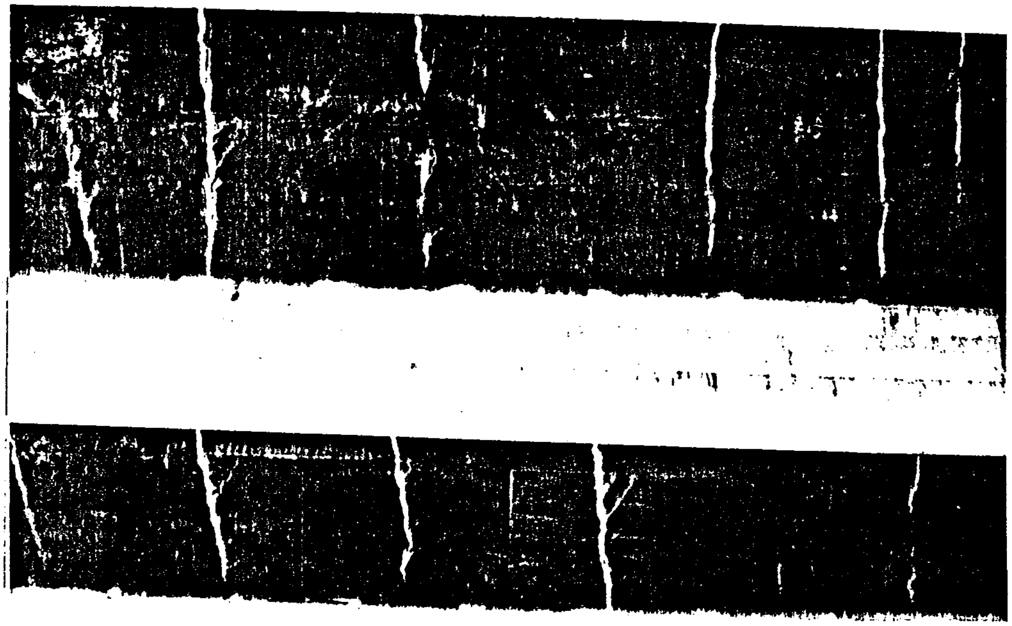


Figure 6. Transverse cracks in deck stopping short of girder.

longitudinal cracks seen below S-Ibm and PC girder bridges were short runs between girders. A few seen only on top of the deck usually ran the length of the span. Few of these, long or short, were seen.

(c) Diagonal cracks, shown in Figure 7, are usually short and occur primarily at bents. In skewed bridges they form across the acute angle and are more transverse than diagonal.

(d) Checkerboard cracks, shown on top of a slab in Figure 8, follow the pattern of slab reinforcing steel, and they usually indicate a condition of serious deterioration. Initially, these cracks might begin with subsidence of plastic concrete leaving a small crack over the reinforcing steel bar, or by steel corrosion, or a combination of these. Live load stresses, concrete shrinkage, and steel corrosion cause the initial cracks to spread. If the pattern is seen in the bottom as well as the top of the slab, the deck has become seriously weakened, and there is danger of rapid deterioration and complete local failure.

(e) A crack pattern on the bottom surface of slabs supported on top of the backwall was found in a number of PC girder bridges. The crack, very narrow and difficult to see in most cases, begins at the face of the top flange about one or two feet from the end of the girders. Although the pattern varies, the crack generally runs diagonally from the girder, gradually becoming transverse. About midway between girders, it meets a corresponding crack from the adjacent girder. Cracking occurs when the slab bends under live load entering or leaving the bridge. The load causes compression in the bearing pad at the end of the girder and also compression of the pad, if any, under the slab resting on the top of the backwall. The differences in these compressions produce bending in the slab, and, in some cases the slab cracks. Figure 9 shows structural details at the abutment and a photograph of one case of this type of cracking in which the crack outline has been marked for clarity.

(4) <u>Spalled concrete</u> consists of fragments broken away from an element when internal tensile stresses exceed the tensile capacity of the concrete. They are commonly caused by pressure from corroding reinforcing steel, and restrained movement of various elements. Tire pressure at edges of deck surface cracks causes the edge to chip away and increases the crack width at the surface.

Figure 7. Diagonal cracks in deck at bent.

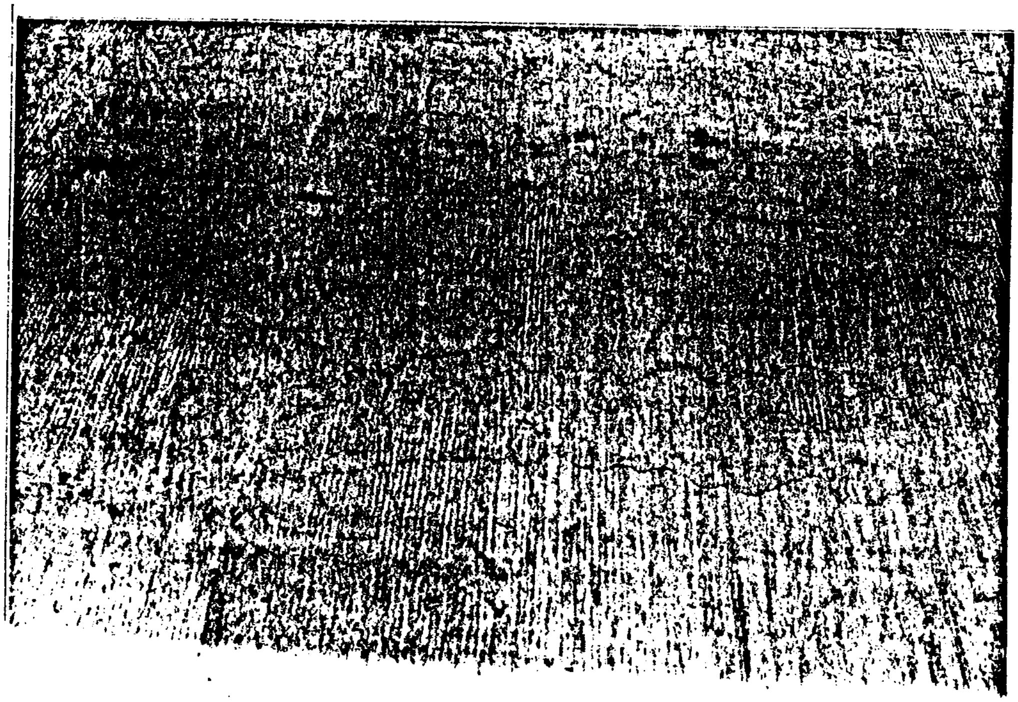
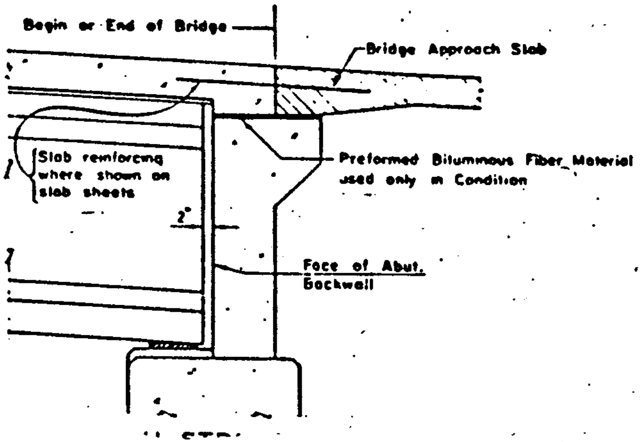
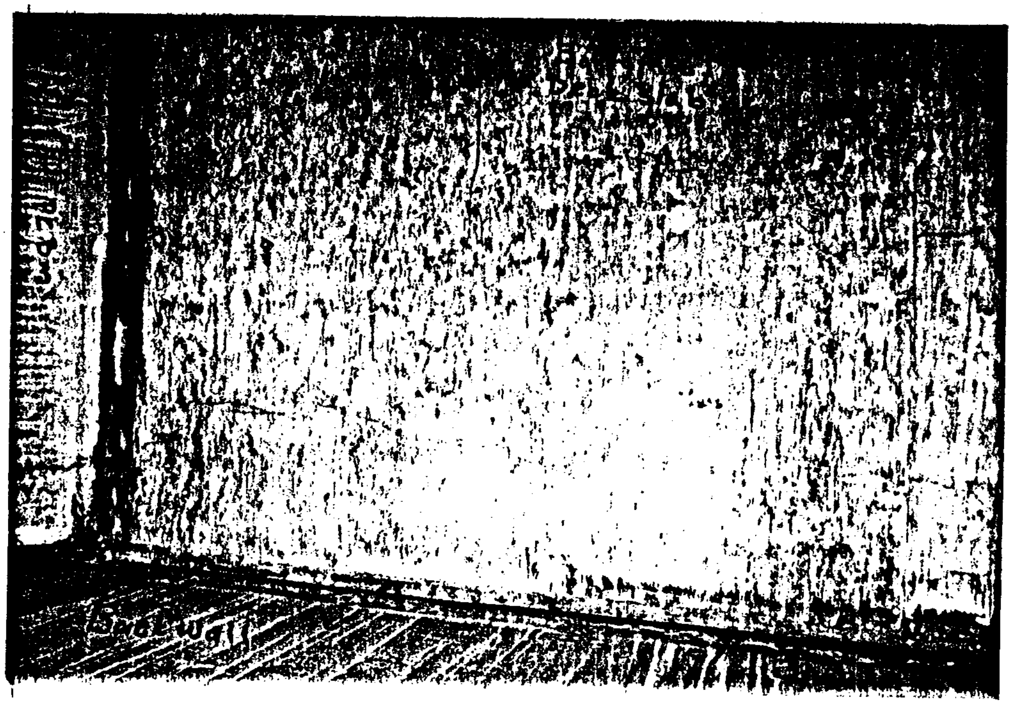


Figure 8. Checkerboard cracking on top of slab.



(a) Details at abutment.



(b) Bottom of slab cracks at abutment.

Figure 9. Deck cracking and details at abutment.

In the 1960's and 1970's, deck spalls were common in bridges treated with deicing salt, but corrective practices in design, construction, and maintenance have drastically reduced the occurrence of this type of deck deterioration. Girders, bent caps, and pier columns that are wet with ice melt contaminated with salt are sometimes spalled by pressure from corroding reinforcing, but none of these were found in this survey.

End spalls at girder bearings sometimes occur from the restraint to longitudinal movement combined with heavy bearing at the support. The bearing area of the beam is reduced by the spall, and in PC girders, ends of prestressing steel strands are exposed as shown in Figure 10.

Bent cap spalls occur at girder bearings when longitudinal shortening of the girder is restrained by friction or by dowels. It is rarely a problem with PC girders resting on elastomeric pads. Figure 11 shows this type of spall in an older pan girder bridge.

(5) Split beam end, Figure 12, is a horizontal crack 12 to 18 inches long beginning at the end of a PC girder. It forms in the top region of the bottom flange, possibly at or near the top layer of prestressing steel. The crack is very thin and is sometimes found on only one side of the girder. It is not limited to any one type of PC girder bridge.

(6) Cracked and spalled beam end closure pours (diaphragms or bent cap stems) are found only in the PCC-C type bridge. The pour joins the ends of PC girders of adjacent spans of a continuous unit. Structural details are shown in Figure A-1, and a photograph of the cracks is shown in Figure 13. The defect occurs at the ends of the pour near bent cap ends.

Transverse deck cracks were found on each side of the tied joints in four of the 11 PFT bridges. The cracks are about 5 ft from the joint at the edge of the overhang. They run at a slight diagonal until they reach some 3 ft from the joint then they parallel the joint in the central region of the roadway. This is shown in Figure 14. They sometimes appear in pairs, and they are always somewhat irregular instead of running uniformly straight. In the 40 ft spans, the crack varies from very narrow to about 0.04 in. wide, extending sometimes up to 6 in. into the web of the girder, as seen in Figure 15. In the outside girder of some 40 ft spans, the crack appears as a diagonal tensile crack, Figure 16, whereas in others it appears as a flexural crack, Figure 17. Corresponding cracks in the 30 ft span bridge are shown below the slab in Figure 18, and in the overhang in Figure 19.

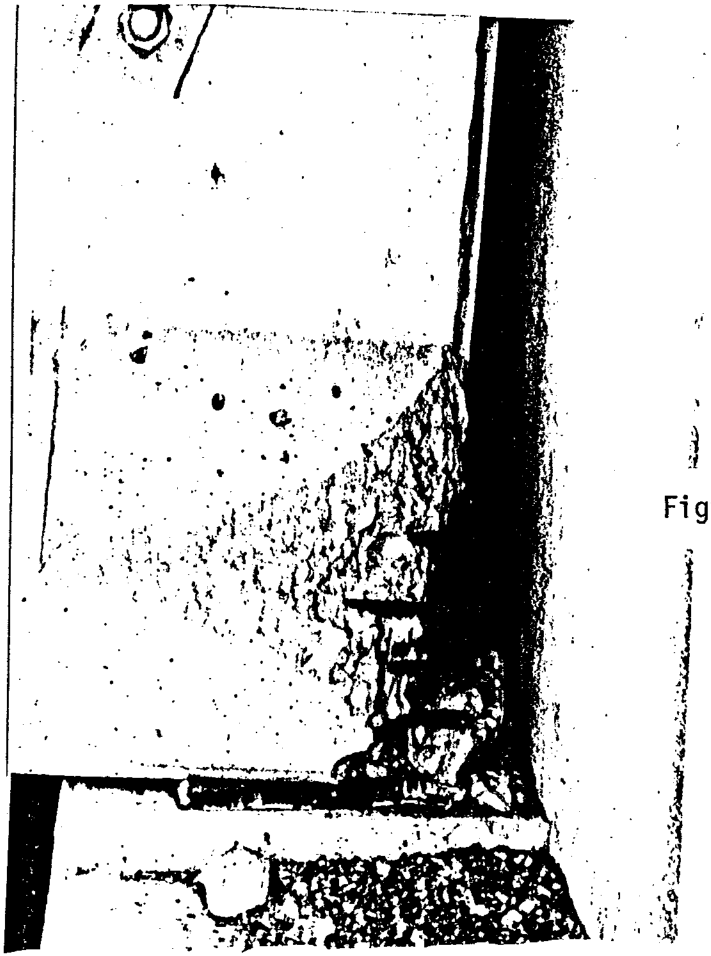


Figure 10. Spalled PC girder end.

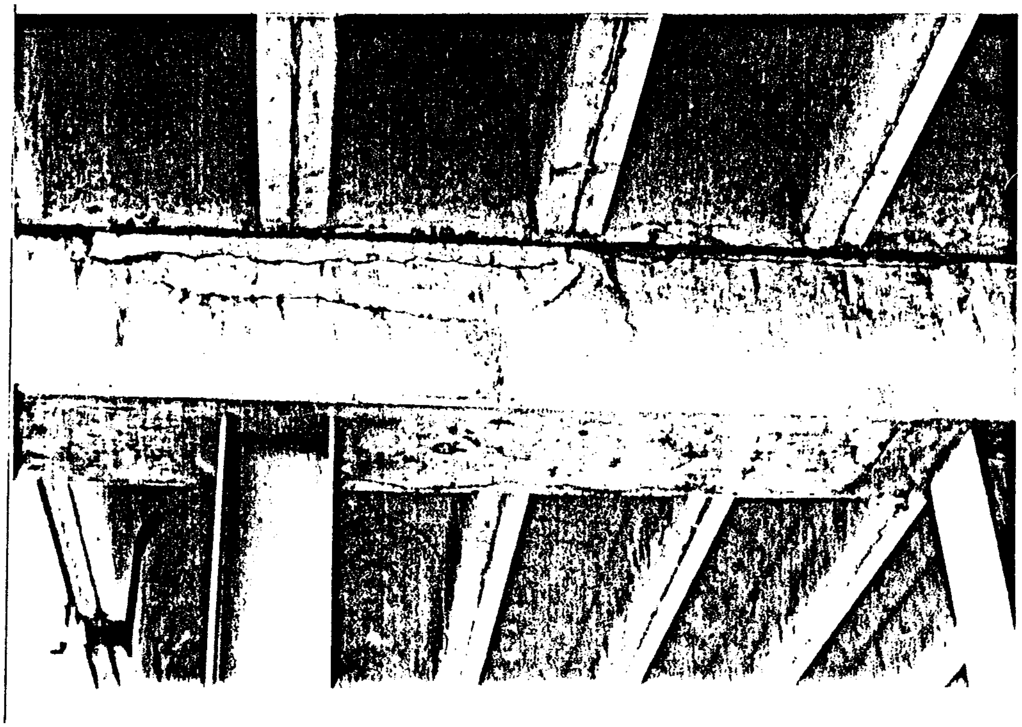


Figure 11. Spalled bent cap, PFS bridge.

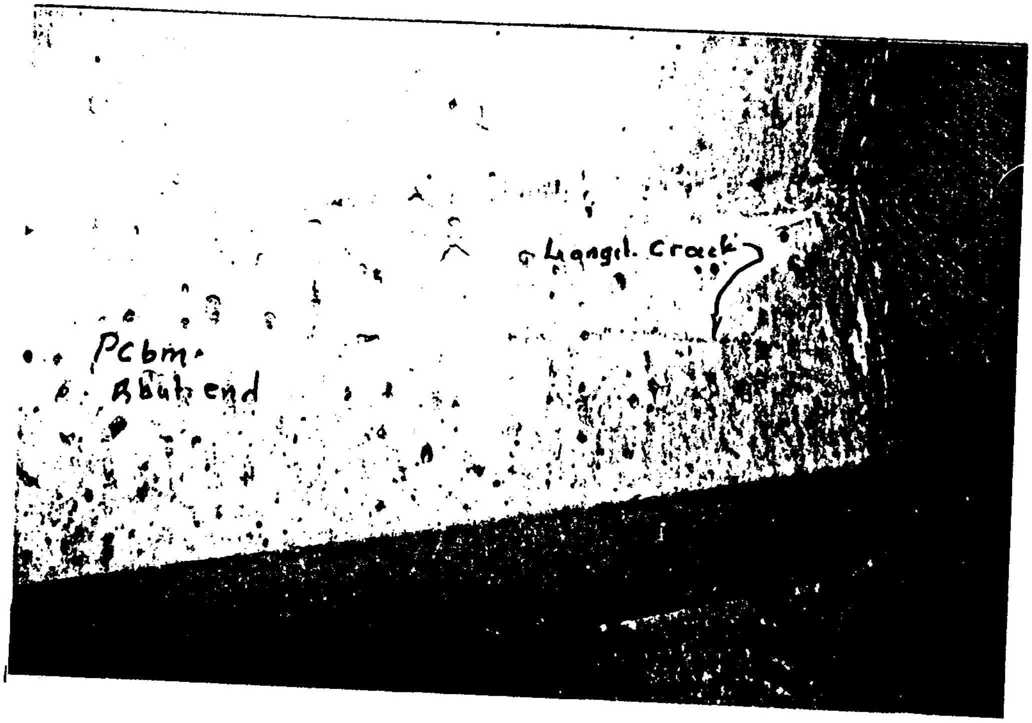


Figure 12. Longitudinal crack in PC girder.

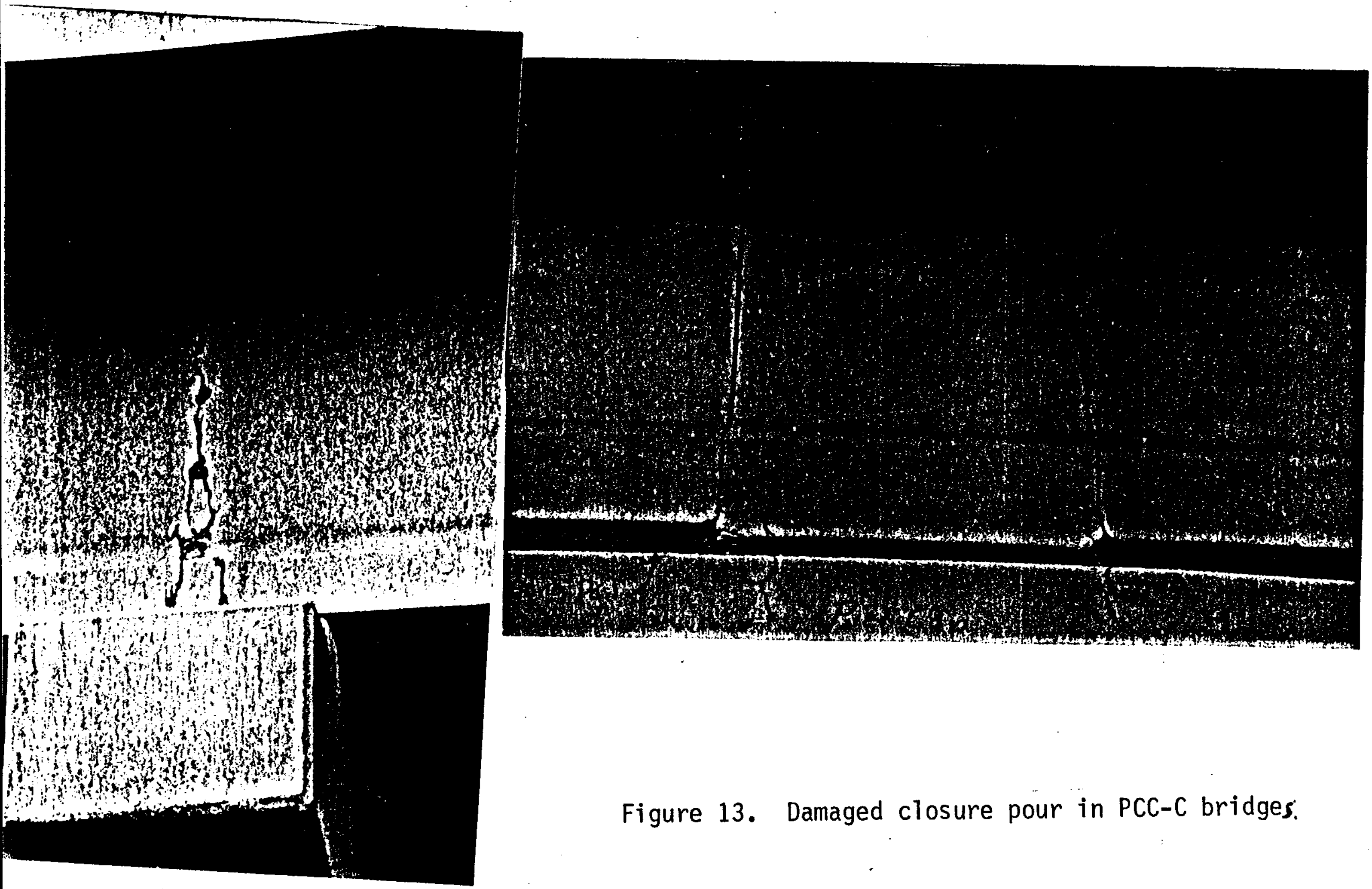


Figure 13. Damaged closure pour in PCC-C bridges.

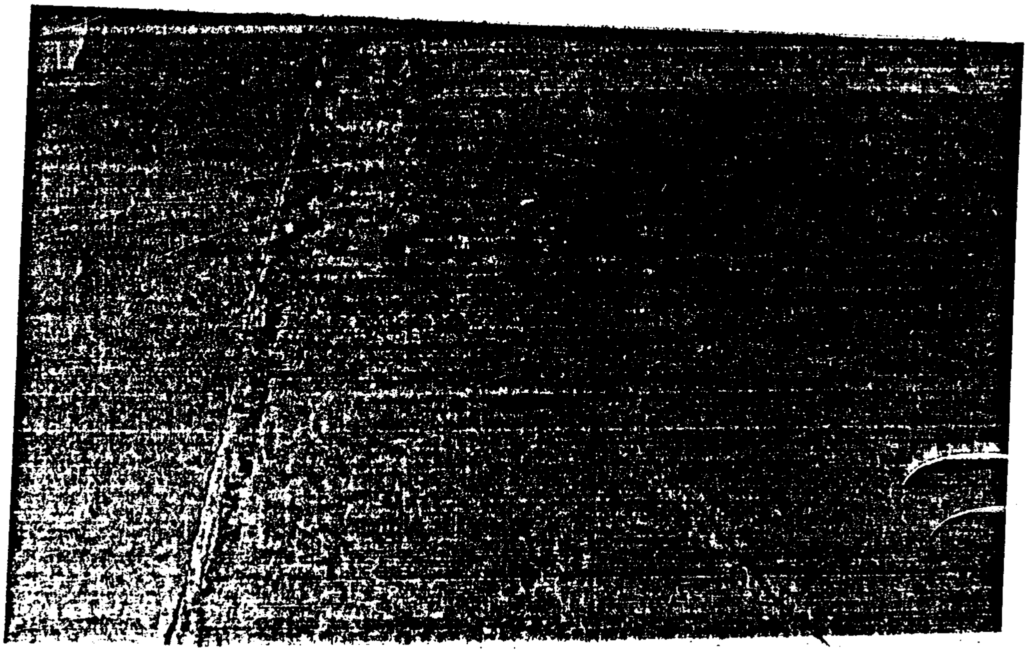


Figure 14. Transverse crack in deck of PFT bridge (item 266).

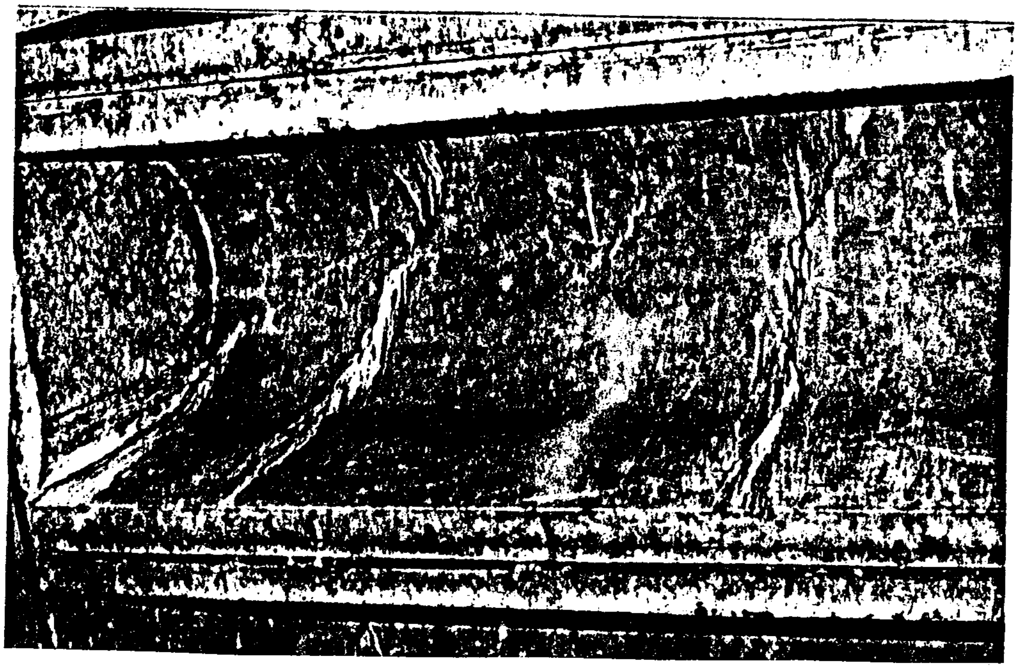


Figure 15. Transverse cracks from bottom of deck - PFT bridge (item 265).

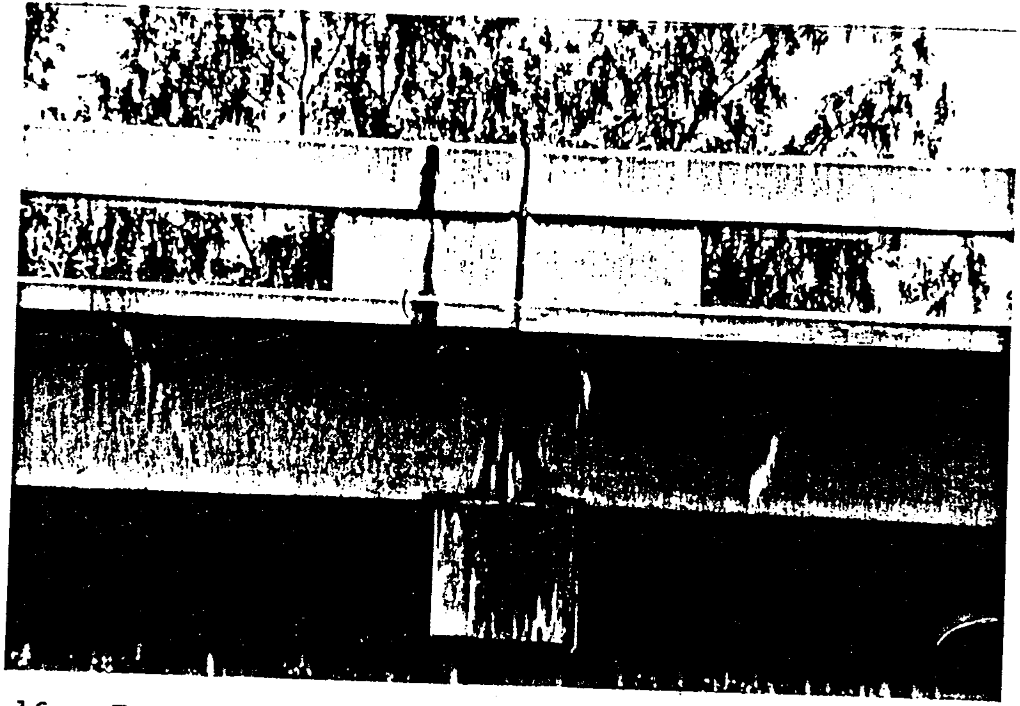


Figure 16. Transverse crack extending into the outside girder as a diagonal tensile type crack - PFT bridge (item 265).

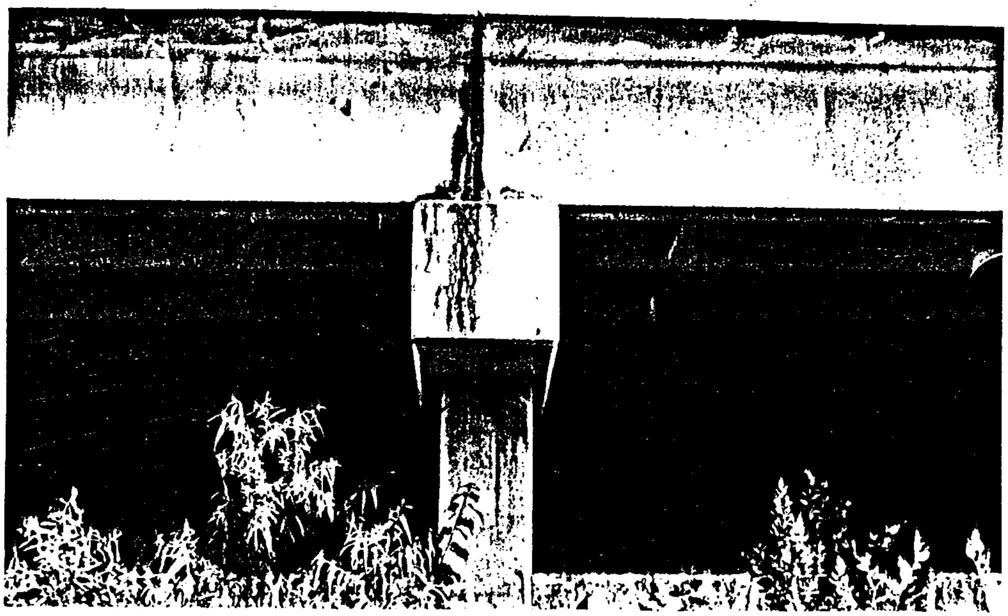


Figure 17. Transverse crack extending into the outside girder as a flexural crack - PFT bridge (item 266).

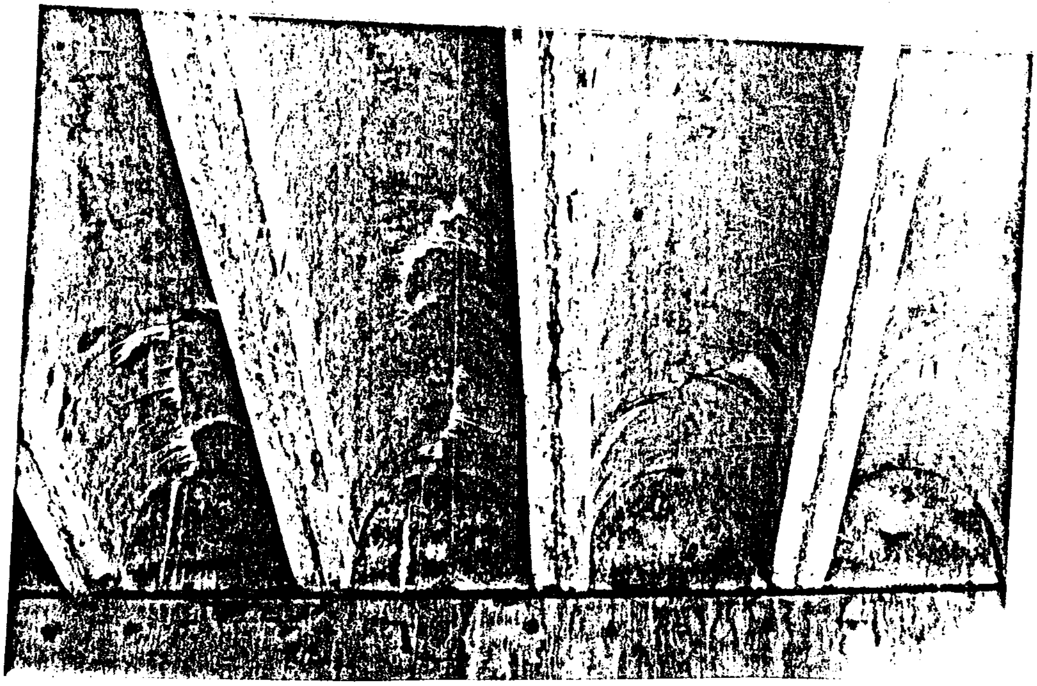


Figure 18. Transverse cracks below the deck of a 30.3 ft span - PFT bridge (item 268).

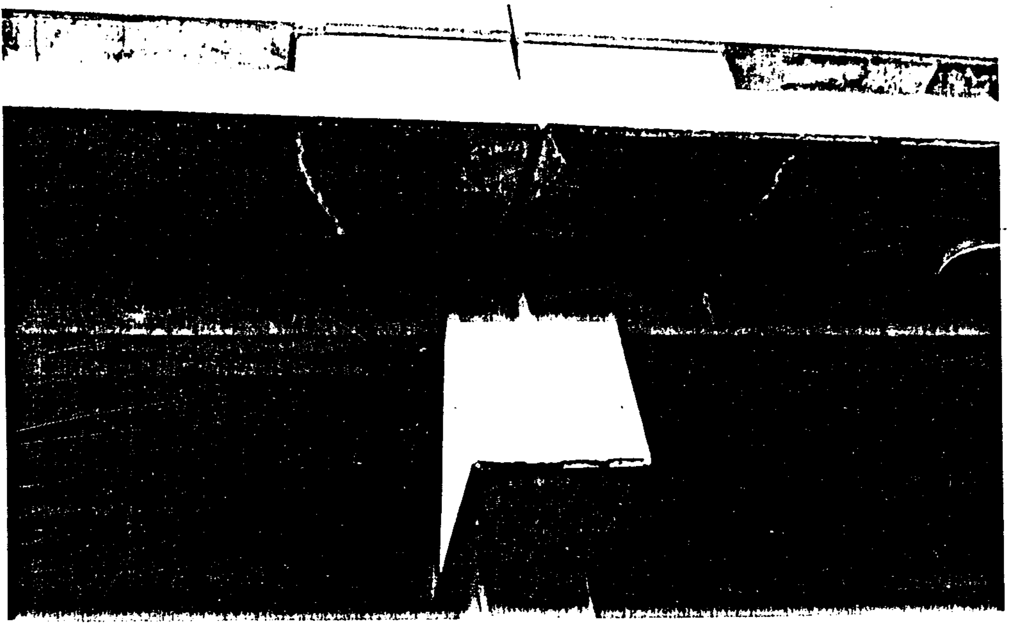


Figure 19. Transverse deck cracks seen in overhang of 30.3 ft span PFT bridge (item 268). Note that no crack is visible in the girder.

B. Defects by Bridge Type

Table 2 gives data on numbers and percentages of bridges with a particular type of defect.

(1) Pan Girder Bridges - The most common defect found in this bridge type is a longitudinal crack at the top of the crown of the curved recessed soffit. The crack, seen from the bottom of the bridge, runs the length of the span, and measurements show it to be some 0.01 in. wide. It was not seen from the top, possibly because of texturing or because it was hidden by an overlay. Figure 20 shows leakage marks on the bottom side of one PFT bridge. These cracks show no wear, and they should cause no problems unless deicing salt runoff penetrates them.

Spalled faces of bent caps, shown in Figure 11, were found in two of the six PFS bridges, and one of these had spalled beam ends as well. One end of each girder is doweled to the cap. Road debris that accumulates in the joint at the end of the span exerts pressure to open the joint. This is resisted by the vertical dowel until the pressure becomes so great that spalling occurs. This can cause spalling of the ends of the girders, too. This condition has been corrected in a late design, the PFT type, by tying the adjacent spans together by longitudinal dowels across the joint. The detail is shown in Figure A-1. It prevents the joint from opening, the debris cannot enter, and the spalling does not occur. Other damage reported at this joint, but not seen in the inspection, is corrosion damage in diaphragms, girders, and bent caps caused by drainage of deicing salt water through the joint.

The transverse cracks on each side of the tied joints of some PFT bridges, discussed above, is not a common defect of this type of bridge. Design changes currently being made should eliminate its occurrence in future installations.

(2) The simple prestressed concrete girder and simple slab (PCS) bridge is widely used throughout Texas, and is the oldest of the PC girder bridge types. In the PCS sample, the oldest bridge is 24 years, the average age is almost 8 years, and one-third of them are overlaid.

Minor deck cracking was detected in five of the 32 PCS bridges. Two were longitudinal, two transverse, and one diagonal. All were very narrow. The major problem found in the group was displaced and damaged joint seals. No concrete deterioration resulting from those leaking joints were found, but

Table 2. Defects by type and by bridge.

Bridge Type	Total No. of Bridges	No. and (%) Over-laid	Number and (%) of Bridges with Defects				
			Transverse Cracking		Beam End Spall	Split Beam End	Diaphragm Spalling & Cracking
			At Bent	Btwn. Bent			
PFS	6	5 (83)	NA	0	2 (33)	0	NA
PFT	11	3 (27)	4	0	0	0	NA
PCS	32	8 (25)	NA	3 (9)	0	0	NA
PCS-C	109	67 (61)	61 (56)	15 (14)	1 (1)	0	NA
PCC-C	77	42 (55)	38 (49)	42 (55)	4 (5)	3 (4)	17 (22)
S-I bm	22	14 (64)	NA	19 (86)	NA	NA	NA

Table 3. Average spacing* of transverse cracks.

Bridge Type	Average Spacing, ft.	
	End Span	Interior Span
PCS-C	16.8	30
PCC-C	10.7	8.5
S-Ibm	11.5	6.9

*Average spacing = (span length, ft) - (number of cracks + 1).

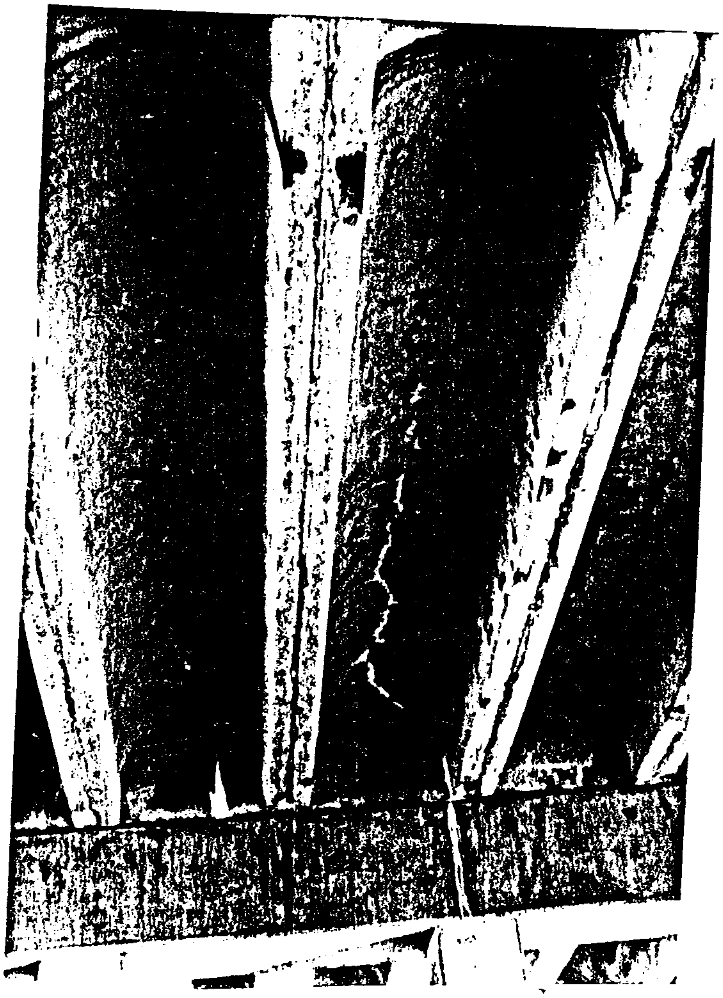


Figure 20. Leakage marking a longitudinal crack in a PFT bridge (item 268).

runoff water stains resulting from open joints or damaged seals, seen in Figure 21, are common.

With the exception of the joint seal problem, the condition of the deck of this bridge type is considered to be excellent.

(3) The simple prestressed concrete girder and continuous reinforced concrete slab (PCS-C) bridge is the newest type of prestressed concrete girder bridge in the state system. At the time of inspection, 67 out of 100 were overlaid, the average age was 4.75 years, and the oldest was 10 years.

The most common defect of this bridge type is the full depth transverse crack across the deck over bents where the slab is continuous. It is likely that this crack was present at all such bents, but it was detected in only 60 percent of the bridges. Transverse cracking between bents was seen in 10 percent of these bridges. Membranes and overlays seal at least some of the deck cracks and these would not be detected by marks left by leaking water. Because of this, it is probable that some cracks were not seen.

Crack widths measured on the bottom of some slabs did not exceed about 0.02 inches, and none showed signs of abrasion. Overlays and the rough texture of the top of the slabs made crack width measurements on top of the slab impractical or impossible. None of the cracks, top or bottom, showed signs of wear or spalls.

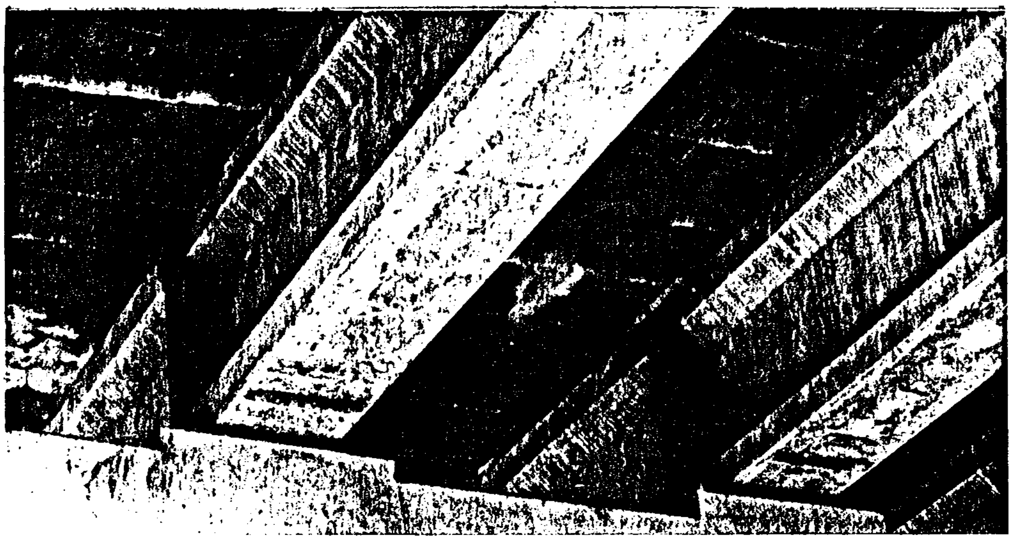
The crack type discussed in section 3A(3)e and shown in Figure 9, was found in some of these bridges, but they did not appear to be wearing. Since the crack is caused by live loads, it should be monitored for further deterioration.

The only other defect seen in the bridges was an end-of-beam spall, section 3A(4), and this is not serious nor is it unique in this bridge type.

(4) Prestressed concrete girder and concrete slab continuous for live load (PCC-C) bridges -- The two defects commonly found in this bridge type are transverse cracks in the slab and cracked and spalled ends of the beam end closure pour. About half of the 77 bridges of this type in the sample are cracked across the deck at either -- or both -- bents or between bents, and 22 percent of them have spalled or cracked closure pour ends at bents.

The transverse crack at bents follows one or both faces of the case-in-place bearing diaphragm at that location. The between-bent cracks are grouped closer together in the approximate quarter span adjacent to the bent than they

Figure 21. Deck runoff stains.



Third interior bent from S end

Figure 22. Beam end closure pour not continuous along bent cap.

are in the central region of the span. Typical spacing in this quarter-span region is approximately three feet. These cracks are much more numerous in this bridge type than in the PCS-C type.

At two bridges, an extensometer was used to determine the movement transverse cracks in the bottom of the slab during truck passage across the span. No movement was detected in the 1/10,000 in. dial gage under this condition, indicating that at least some of the cracks, such as are seen in Figure 5, are not active under load. Such cracks are probably formed by shrinkage of the deck slab.

None of the cracks show wear on the bottom of the slab. Some top slab cracks have edge wear, but since no movement was detected in the extensometer, this wear is probably caused by loose sand under tire pressure.

Evidence of deterioration accelerated by deicing salt treatment is shown in Figure 4. Only two bridges were seen with this type of damage; no evidence of spreading deterioration was seen in any other bridge of this type.

Continuity for live load is attained in girders through a closure pour, seen in Figure A-1, made to join ends of girders longitudinally after they are in place. In all bridges except item 220, Table A-1 and Figure 22, that pour is continuous across the bent. The ends of the pour at the outside faces of edge girders in 22 percent of these bridges are cracked or spalled similar to that shown in Figure 13. It is not known if this defect is only superficial, but it appears to be because no evidence of damage was found except at the ends. The pour is finished off flush with the outside surface of the PC girders in all except two bridges. Those two exceptions had the pour extending beyond the faces of the girders, and no deterioration was found in the closure pours in these.

The cause of the damage in the closure pours is not known, but it probably results from a combination of shrinkage and creep of the girders, thermal movements, and live load stresses. There is no evidence that it is detrimental to the serviceability of the bridge, but it does provide access to contaminants that might initiate corrosion of reinforcing steel.

(5) Continuous steel I-beam bridges are similar to the PCC-C type in that transverse deck cracks are common and numerous. These tend to be spaced somewhat closer and more regularly in the S-Ibm than in the PCC-C bridges. Although the steel girder bridge is considerably older than any of the

prestressed concrete girder types, its effectiveness does not appear to be reduced by these deck cracks. The oldest I-bm bridge of the sample is 29 years old, number 39 of Table A-1, and it is in excellent condition.

Runoff of deicing salt used on some bridges is likely to cause concrete spalls in curbs and decks, and rust in beams beneath spill areas.

(6) The split end of prestressed concrete girders, Figure 12, is not confined to any one type of PC girder bridge. It is probably associated with design details having no relationship to the type of bridge on which it is installed. The very thin crack could permit entry of corrosive elements if such were present, but neither that or any other further damage was seen in the inspection.

5. Discussion

Longitudinal cracks in the deck are characteristic of only pan formed reinforced concrete girder bridges, appearing in both the PFS and PFT types. The PFS bridges in the sample have an average life of 21.8 years, and no serious problem was found that could be attributed to these cracks. Some of these bridges have salt applications for deicing, but district personnel with whom this was discussed had no knowledge of damage resulting from this crack, either with or without salt applications.

Spalling in the PFS bridges, Figure 11, is caused by increased accumulation of road surface sand and fine gravel. The debris entering when the joint is open in cold weather cannot escape, and, in hot weather, it is compressed by the expanding concrete. The pressure is transferred to vertical dowels that tie the girder to the bent cap at bearings, and it sometimes becomes so great that spalling occurs.

A design change at the joint over bents was made to eliminate the spalling. That change is seen in Figure A-1(b) in the PFT type bridge, and it consists of longitudinal dowels across the joint to prevent the joint from opening and collecting surface debris. The dowels are number 6 reinforcing bars that tie to number 4 longitudinal steel bars in the slab. Both 4 ft and 6 ft long dowels have been used, and they are successful in preventing the joint from opening.

Some of the PFT bridges have developed transverse cracks across the deck, Figure 14, that are not found in the PFS type. The cracks do not occur in all

PFT bridges, but they are located at or near the ends of the dowels in bridges where they are found, items 265-268 in Table A-1. One of these bridges has a 30.3 ft span, and three have 40 ft spans. The details of these four bridges differ from those shown in Figure A-1 in that the vertical dowels connecting the beams to the bent cap, dowels Q in the figure, occur on only one side of the joint -- not on each side as shown in the figure. In these bridges the vertical dowels are spaced on 2 ft centers, and the longitudinal dowels across the joints over bents are 6 ft long.

Other PFT bridges, items 7 through 13, use vertical dowels Q at one ft centers on each side of the bent, as shown in Figure A-1, and 4 ft long horizontal dowels across joints. No transverse cracks were found in these bridges.

The cause or causes of these cracks has not been established, but it has been suggested that they develop in the construction stage when the steel forms are removed from a span. The dead load of the concrete span, carried by the pan forms initially, is transferred to the concrete superstructure when the forms are removed. The transverse cracks possibly occur at this time, but it is not presently known if this is how it happens. The differences in details of vertical and longitudinal dowels noted above could have some influence on the behavior. Design changes are being made to eliminate this cracking problem.

The oldest PFT bridge with transverse cracking, item 267, Table A-1, was constructed in 1980. No functional problems attributable to the cracks have developed, but the cracks provide an easy access for water to enter and initiate corrosion of reinforcing steel.

Simple span PC girder bridges (PCS) have the common defect of displaced joint seals in all areas of the state. A few of these bridges were found with an occasional transverse deck crack, but these are not causing problems. These cracks as well as the entire top surface of the deck should be sealed wherever deicing salt is used. This bridge type has a history of good service and, with the exception of seals, the deck maintenance requirements are low.

The PC girder bridge made continuous for live load (PCC-C) has two problems that could lead to more serious deterioration than was found in the inspection. The first of these is transverse deck cracking, which probably begins as soon as the bridge is built, and stabilizes years later (3). At the time of the inspection, only two bridges were seen with serious problems attributable to these cracks. These bridges are in an area that ices up in the winter and deicing salt is used to keep traffic moving. Both were 11 years old, and the bare concrete decks had serious cracking and spalling. The most advanced deck deterioration was over the bent areas.

Despite the extensive transverse cracking found in the PCC-C bridges, these cracks have caused problems only where deicing salt has penetrated into the deck. If salt is used on bare decks, it will eventually cause corrosion of uncoated steel and serious deterioration will follow.

The other problem that is considered to be at least mildly serious in PCC-C bridges is cracking and spalling in the continuity pour over bents. So far as could be seen visually, the problem is limited to the ends of the pour where it does not interfere with the efficient functioning of the structure. The spalls and cracks should be repaired and sealed to prevent entrance of corrosion which might cause spreading of spalls.

The common problem of all of the bridge types, except the nondoweled pan girder, is transverse cracking of the deck. The average spacings of these cracks are shown in Table 3. The two continuous-for-live-load bridges (PCC-C and SI-bm) have comparable spacings, whereas the spacings in the PCS-C bridge are considerably greater. The cracks in the SI-bm bridge tend to be more uniformly spaced than those in the PC girder bridges. In the latter, spacing is closer in the quarter span or so on each side of the interior bent of a continuous unit. There are two conditions wherein these cracks could become progressively more serious until major repairs or replacement would be necessary. These two conditions are active working of the cracks under live loads and penetration of chlorides from deicing salt. The gradual abrasion of crack faces caused by repeated traffic loads could seriously reduce both the stiffness of the slab and the load capacity of the bridge. The cracks, where deicing salt is used, provide easy entrance to chlorides where they, along with moisture, can accumulate to the point where corrosion of reinforcing steel sets in. The expansion caused by corrosion products causes spalling of the concrete. When this occurs, major repairs are eventually required.

The long lives of many continuous steel girder bridges, which are noted for transverse cracking, show that these cracks alone do not ruin a bridge deck. Some of the oldest decks in the state are on continuous steel girders, and even though they have many transverse cracks they still perform in a satisfactory way. On the other hand, experience has shown that spalling caused by steel corrosion initiated by deicing salt greatly reduces the life of the deck. If deicing salt is used on a bridge, the steel should be protected to insure a long service life.

The sample selected for inspection was not designed for statistical analysis, but the BRINSAP roadway condition rating was analyzed to see if there was any inferred correlation between that rating and age and ADT. The analysis failed to discover any such relationship using the limited data at hand.

Some bridges become functionally obsolete long before structural decadence causes their replacement. Many of these have been widened to meet new safety and traffic volume demands after many years of good service, and in these the old deck slab continues to serve alongside the new additional width. There is no standard life expectancy of any one bridge, although a general life span can be estimated from traffic predictions and material behavior under repeated loading. A number frequently given for the design life of the normal highway bridge is 50 years. The state of Pennsylvania recently reported that about 44% of its 21,800 inventoried bridges are more than 40 years old, and 26% are over 50 years old (7). The report does not give information on maintenance of these bridges.

The oldest series of bridges seen in the sample are those in District 14 -- items 250 to 264. These PCS bridges on US 290 south and east of Austin were all built between 1961 and 1969, have an average age of 18.5 years, and they carry five thousand to 34 thousand vehicles per day. No deicing salt is used on bridges in District 14, six of the 14 bridges cited are overlaid, and no cracks were seen in the decks when they were inspected. With similar traffic and continued good maintenance that these bridges receive, their useful lives will probably extend to an age of about 50 years or more unless they become functionally obsolete.

The PCS-C and PCC-C bridges are much younger than the PCS bridges cited above. Most of them have transverse cracks in the decks, but in many of the PCS-C type these were evident only over the bents. Movement of the deck in response to the thermal changes most likely causes these cracks to open and close, but nothing was seen to indicate deterioration from such action.

Transverse cracks between bents in the PCS-C and the PCC-C bridges showed no abrasive type of wear from the bottom, and extensometer readings on two decks indicated no crack movement on the underside of the slab when traffic moved over the structure. The edges of some cracks on bare concrete decks showed some wear, possibly caused by abrasion from grit under tire pressure. If this is the case -- if there is no active crack movement due to live load stresses -- a well maintained, overlay protected, and salt free continuous concrete deck of this bridge type might be expected to have a life span approaching that of the PCS bridge type. Some of the steel girder bridges, although with many transverse cracks in the decks, are in very good condition despite these cracks. Item 39, for example, is 30 years old and the deck is in very good condition.

Deck overlays generally are not impervious; they sometimes accelerate salt induced corrosion damage and hide damage that has developed or is in the process of development (8). Overlays do protect the concrete deck surface from abrasive wear, they seal some cracks in the deck, and they provide a smooth surface for traffic. Many of the decks seen in this inspection have been benefitted by overlays, but caution should be used when a salt treated bridge is considered for an overlay.

6. Conclusions

(1) The most prevalent type of deterioration of bridge decks in Texas is transverse cracking of reinforced concrete deck slabs.

  (a) The spacing of these cracks is smallest in the S-Ibm bridges, followed in order of increased spacing by PCC-C, PCS-C, and PCS. Most of these cracks are very narrow, and none were observed to be active under the influence of live load.

  (b) Transverse cracks develop at the ends of the longitudinal dowels in some PFT bridges; none were found in the PFS bridges.

  (c) Continued deterioration at these cracks was observed only in bridges where deicing salt is used.

(2) Longitudinal cracks are rare in all bridges except the pan girder type in which the cracks are common. These cracks do not present a deterioration potential except in the presence of deicing salt.

(3) No spalling of decks was found where no deicing salt was used; spalling was found where deicing salt was used.

(4) Decks with asphaltic overlays showed less visual evidence of cracking than did those without an overlay.

(5) Cracking and spalling are common at the outside ends of cast-in-place diaphragms over bents in prestressed concrete girder bridges made continuous for live load. No evidence was found to indicate that the overall efficiency of the bridge is reduced by this defect.

(6) Displacement and puncture of joint seals are common occurrences in simple span prestressed concrete girder bridges. No structural damage resulting from this was found.

(7) No spalls were found in either pier caps or beam ends of pan formed girder bridges with longitudinal ties across joints. These defects are common in the older untied bridges of this type.

(8) The deck condition of continuous steel I-girder bridges (S-Ibm) is comparable to that of prestressed concrete girder and reinforced concrete slab bridges made continuous for live load (PCC-C). The service lives of these two types will probably be about the same, assuming equal treatment.

(9) The deck condition of the simple prestressed concrete girder bridge (PCS) is very good, but deck seals require periodic maintenance or replacement. The service life of this bridge will probably exceed that of any other type except the pan formed girder type, assuming equal treatment.

(10) The deck condition of the simple prestressed concrete girder-continuous reinforced concrete slab bridge (PCS-C) is very good. This is a young bridge deck type, but its service life will probably exceed the continuous type (PCC-C) and be somewhat less than the simple type (PCS), assuming equal treatment.

7. Recommendations

(1) Take measures to prevent chlorides from reaching bare reinforcing steel in decks.

(2) Make a study of the design detail and performance of the cast-in-place diaphragm over bents of prestressed concrete beams made continuous for live load to determine the cause of cracking and

spalling at ends of the diaphragms. Make corrections in design or construction, or both, to eliminate the problem.

(3) Make changes in design details, or construction procedures, or both, to eliminate transverse cracking in PFT bridges.

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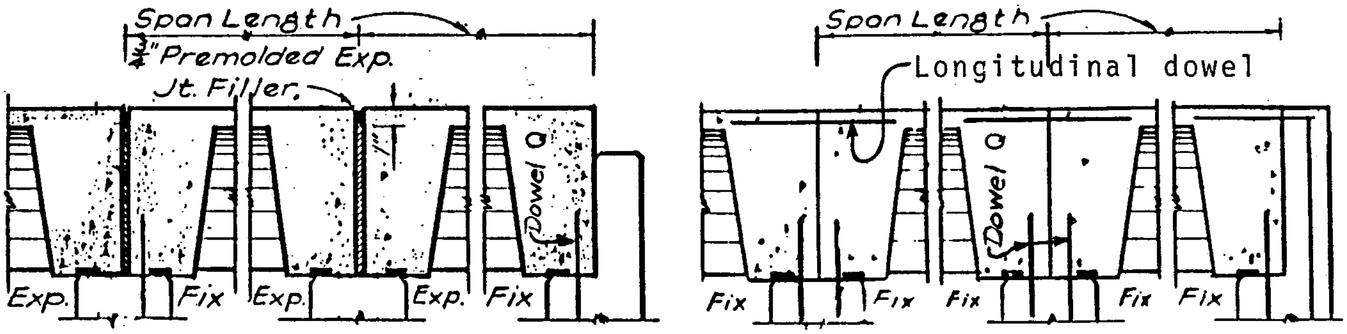
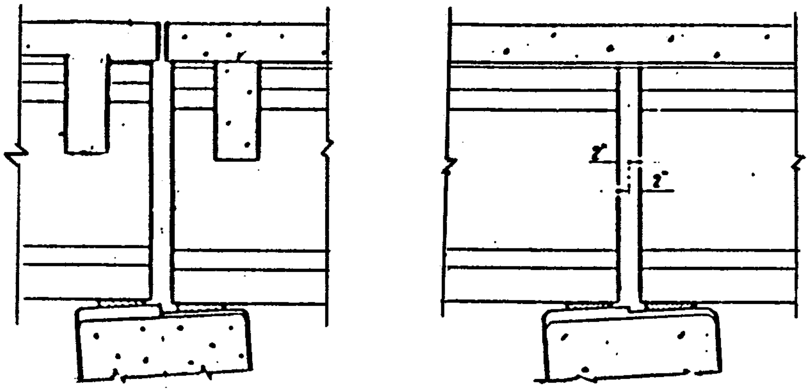
APPENDIX



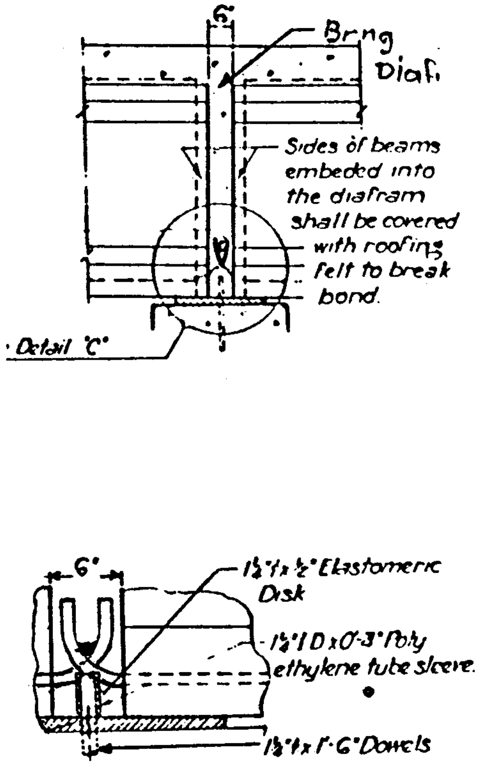
(a) Pan formed - simple (PFS)

(b) Pan formed - tied (PFT)



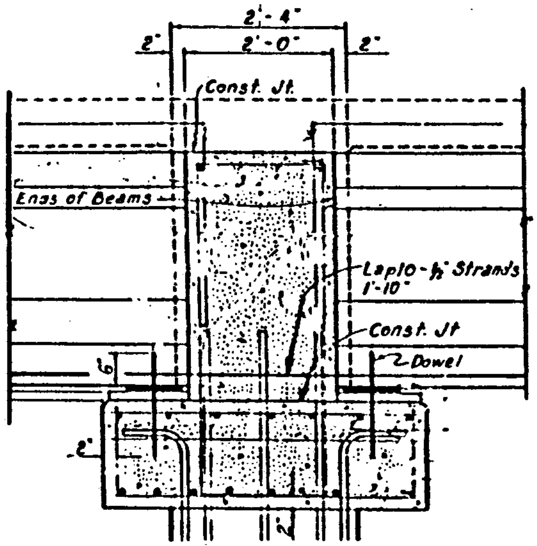
(c) PCS

(d) PCS-C



Detail C

(e) PCC-C with bent bars



(f) PCC C with extended strands

Figure A-1. Bridge details

Table A-1. Bridge data
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
1	9	Falls	209	2	59	PF S	8 @ 40	1958	4.5	Y	N	1/85	L Cr bm & Cap Sp
2	9	Falls	209	2	60	PF S	9 @ 40	1958	4.5	Y	N	1/85	L Cr
3	9	Falls	1656	4	8	PF S	8 @ 30.3	1965	0.3	Y	N	1/85	L Cr
4	9	Falls	752	4	31	PF S	10 @ 30.1	1964	0.2	N	Y	1/85	L & T Cr
5	9	Falls	49	4	73	PF S	4 @ 40	1967	2.8	Y	N	1/85	L Cr
6	9	Falls	49	4	74	PF S	7 @ 40	1967	2.8	Y	N	1/85	L Cr
7	9	Falls	209	4	71	PF T	20 @ 30.3	1984	0.7	Y	N	1/85	None
8	9	Falls	819	1	5	PF T	4 @ 30.3	1975	0.3	N	N	1/85	L Cr
9	9	Falls	232	2	33	PF T	12 @ 30.3	1981	0.7	N	N	1/85	None
10	9	Falls	232	2	34	PF T	6 @ 33.1	1981	0.7	N	Y	1/85	Diag. Slab Cr
11	9	Falls	752	4	34	PF T	4 @ 32.1	1984	0.3	N	Y	1/85	L Cr
12	9	McLennon	909	22	3	PF T	3 @ 30.3	1983	NA	N	N	1/85	L Cr
13	9	McLennon	2060	1	6	PF T	2 @ 30	1984	0.9	Y	N	1/85	None
14	9	Bell	231	4	349	PC S	59-122-59	1976	5.3	N	Y	1/85	None
15	9	Bell	231	4	110	PC S	40-104-104-60	1976	12.0	N	N	1/85	None
16	9	Bell	231	4	117	PC S	55-95-95-55	1977	9.8	N	N	1/85	None
17	9	Bell	231	3	115	PC S	3 @ 102	1977	4.5	N	N	1/85	None
18	9	Bell	231	3	116	PC S	3 @ 102	1977	4.5	N	N	1/85	None
19	9	Bell	184	4	40	PC S	60-120-120-60	1976	2.2	N	N	1/85	None
20	9	Coyrell	AA02	07	1	PCS-C	3 @ 80	1984	0.1	N	N	12/84	None
21	9	Bell	184	4	44	PCC-C	60-110-110-60	1979	22.2	Y	N	12/84	T Cr
22	9	Bell	231	4	124	PCC-C	3 @ 102	1978	4.8	N	N	1/85	T Cr, Wearing
23	9	Bell	231	4	125	PCC-C	3 @ 102	1978	4.8	N	N	1/85	T Cr, Wearing
24	9	Bell	231	4	126	PCC-C	3 @ 108.5	1978	4.8	N	N	1/85	T Cr
25	9	Bell	231	4	127	PCC-C	3 @ 108.5	1978	4.8	N	N	1/85	T Cr; Split Beam

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
26	9	Bell	231	4	128	PCC-C	55-95-95-55	1978	9.8	N	N	1/85	T Cr; Diag. Cr
27	9	Bell	231	4	108	PCC-C	3 @ 114	1976	5.9	N	Y	1/85	T Cr
28	9	Bell	231	4	109	PCC-C	3 @ 114	1976	5.9	N	Y	1/85	T Cr; Split Beam
29	9	Falls	49	3	129	PCC-C	54-82-54 + Other	1982	1.7	Y	N	1/85	None
30	9	Falls	49	3	130	PCC-C	54-82-54 + Other	1982	1.7	Y	N	1/85	T Cr
31	9	Falls	2631	1	NA	PCC-C	8 @ 87.5	1976	NA	N	N	1/85	T Cr; Abut Sp
Items 32, 33, and 34 deleted.													
35	17	Walker	109	9	35	PC-S	50-105-50	1977	NA	N	Y	12/84	T Cr
36	17	Walker	109	9	37	PC-S	40-50-70-70-60	1975	3.8	N	N	12/84	None
37	17	Walker	109	9	97	PC-S	45-120-45	1980	NA	N	Y	12/84	None
38	17	Walker	109	9	205	PCS-C	4 @ 75, 122-166 + Other	1980	NA	N	Y	12/84	T Cr
39	17	Robertson	204	9	61	S-I Beam	50-60-50 + Other	1956	4.4	N	N	12/84	T Cr
40	17	Grimes	338	1	107	PCS-C	71-70-70-71	1984	3.6	N	N	12/84	T Cr
41	18	Dallas	95	10	343	PCC-C	4 @ 89 Other	1972	20.7	N	Y	1/85	T & Diag Cr; Loose armor jt; Effl.
42	18	Dallas	95	10	368	PCS-C	3 @ 29 + Other	1979	3.5	N	Y	1/85	T Cr
43	18	Dallas	9	11	342	PCC-C	NA	1979	50.2	N	Y	1/85	T Cr
44	18	Dallas	9	11	345	PCS-C	3 @ 75 + Other	1977	96.0	N	Y	1/85	T Cr
45	18	Dallas	9	11	356	PCC-C	4 @ 66, 4 @ 70 + Other	1966	7.0	N	Y	1/85	T Cr
46 & 47 deleted.													
48	18	Dallas	91	6	50	PCS-C	4 @ 85	1978	38.0	N	N	1/85	L&T Cr

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
49 Deleted.													
50	18	Dallas	261	2	59	PCS-C	75-74-75	1979	6.1	N	N	1/85	T Cr
51	18	Dallas	261	2	60	PCS-C	75-74-75	1979	6.1	N	N	1/85	T Cr
52	18	Dallas	261	2	61	PCS-C	2 @ 131	1979	NA	N	Y	1/85	T Cr
53	18	Dallas	261	2	58	PCS-C	2 @ 126	1979	2.4	N	Y	1/85	None
54	18	Dallas	261	2	--	PCS-C	2 @ 130	1979	NA	N	Y	1/85	None; (PC panels)
55	18	Dallas	261	2	--	PCS-C	55, 3 @ 71, 60,55	1979	NA	N	Y	1/85	None; (PC panels)
56	18	Dallas	261	2	--	PCS-C	122-132-106	1979	NA	N	Y	1/85	None; (PC panels)
57	18	Dallas	261	2	--	PCS-C	60-70-2 @ 78-60-60	1979	NA	N	Y	1/85	None; (PC panels)
58	18	Dallas	261	2	--	PCS-C	2 @ 130	1979	NA	N	Y	1/85	None; (PC panels)
59	15	Bexar	521	4	229	PCS-C	70-5 @ 100	1978	6.5	N	N	2/85	None
60	15	Bexar	521	4	243	PCS-C	2 units 4 @ 85	1982	9.4	N	N	2/85	No Cr; (PC panels), Bm Sp
61	15	Bexar	24	8	166	PCS-C	94-9 @ 91	1982	2.9	N	Y	2/85	No Cr; (PC panels)
62	15	Bexar	24	8	165	PCS-C	2 @ 80-3 @ 90 + Other	1982	5.9	N	Y	2/85	None
63	15	Bexar	16	7	163	PCS-C	85-95-85	1984	25.0	N	Y	2/85	None
64	15	Bexar	16	7	164	PCS-C	85-95-85	1984	25.0	N	Y	2/85	None
65	15	Bexar	16	7	159	PCS-C	65-80-65	1984	25.0	N	Y	2/85	None; (PC panels)
66	15	Bexar	16	7	158	PCS-C	65-80-65	1984	25.0	N	Y	2/85	None; (PC panels)
67	15	Bexar	2452	4	48	PCS-C	3 @ 80	1978	1.6	Y	Y	2/85	T Cr, Sp at Abut
68	13	DeWitt	270	10	32	PCS-C	75-2 @ 120-2 @ 50	1983	1.1	N	N	2/85	T Cr in Overhang;(PC panels)
69	13	DeWitt	AA243		1	PCS-C	2 @ 50-2 @ 120-75	1984	0.2	N	Y	2/85	T Cr; (PC panels)
70	13	Victoria	841	1	8	PCS-C	50-2 @ 120-2 @ 80-50	1980	0.3	N	Y	2/85	T Cr
71	13	Colorado	266	2	61	PCC-C	77-2 @ 90-100 + Other	1982	2.2	N	Y	2/85	T Cr; Diaphrg Sp
72	13	Colorado	266	2	60	PCC-C	77-2 @ 90-100 + Other	1982	2.2	N	Y	2/85	T Cr; Backwall Sp

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
73	13	Colorado	266	2	191	PCC-C	72-91-98-87	1982	2.2	N	Y	2/85	T Cr; Diaphr. Sp
74	13	Colorado	266	2	60	PCC-C	45-60-45	1982	2.4	N	N	2/85	T Cr
75	13	Colorado	266	2	61	PCC-C	45-60-45	1982	2.4	N	N	2/85	T Cr
76	13	Colorado	266	2	58	PCC-C	4 @ 120-5 @ 79	1982	2.4	N	Y	2/85	T Cr; Diaphr. Sp
77	13	Colorado	266	2	59	PCC-C	4 @ 120-5 @ 79	1982	2.4	N	Y	2/85	T Cr
78	13	Colorado	266	2	57	PCC-C	50-60-50	1982	3.0	N	N	2/85	T Cr
79	13	Colorado	266	2	56	PCC-C	50-60-50	1982	3.0	N	N	2/85	T Cr
80	13	Fayette	266	1	54	PCS-C	40-2 @ 45-40	1979	2.3	N	N	2/85	T Cr
81	13	Fayette	266	1		PCS-C	40-55-40	1979	2.3	N	N	2/85	T Cr; Crs are wearing
82	13	Fayette	265	7	70	PCC-C	60-2 @ 80-90 + Other	1982	3.1	N	N	2/85	T Cr top of slab;(PC panels)
83	13	Fayette	265	7	71	PCC-C	50-4@80-2@70 + Other	1982	3.1	N	N	2/85	T Cr top of slab;(PC panels)
84	20	Hardin	65	5	124	PCC-C	40-40-80-70-90-70	1981	NA	N	N	1/85	T Cr
85	20	Hardin	65	5	123	PCC-C	4 @ 50	1981	NA	N	N	1/85	T Cr
86	20	Jasper	1237	2	8	C-I bm	70-90-70 + Other	1959	0.7	N	N	1/85	T Cr; Map Cr
87	20	Newton	244	5	71	PCC-C	5 @ 80 - 2 @ 135	1981	NA	N	N	1/85	T Cr
88	20	Jasper	244	2	59	C-I bm	90 + Other	1961	2.4	N	N	1/85	T Cr
89	20	Jasper	200	4	123	PCS-C	2 @ 80-90-130 + Other	1982	NA	N	N	1/85	T Cr (Steel stay in place form)
90	20	Jefferson	65	7	120	PCC-C	3 @ 64-95-3 @ 64	1978	17.5	N	N	1/85	T Cr
91	20	Jefferson	65	7	119	PCC-C	3 @ 64-95-3 @ 64	1978	17.5	N	N	1/85	T Cr
92	20	Jefferson	65	6	121	PCC-C	50-65-90-60-60-50	1978	17.5	N	N	1/85	None
93	20	jefferson	65	8	80	C-I bm	90 + Other	1965	27.4	N	N	1/85	T Cr
94	20	Jefferson	667	1	11	C-I bm	80 + Other	1965	10.5	N	N	1/85	T Cr
95	20	Jefferson	667	1	10	C-I bm	80 + Other	1965	10.5	N	Y	1/85	T Cr
96	20	Jefferson	667	1	12	PCS-C	75-90-90-63-82	1983	NA	N	Y	1/85	T Cr; (PC panels)

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
97	20	Jefferson	667	1	13	PCS-C	75-90-90-63-82	1983	NA	N	Y	1/85	T Cr; (PC panels)
98 Deleted													
99	6	Martin	5	4	209	S-I bm	65-2 @ 90-65	1968	8.8	Y	Y	3/85	T Cr
100	6	Martin	5	4	206	S-I bm	60-70-60	1968	3.5	N	Y	3/85	T Cr
101	6	Martin	5	4	207	S-I bm	60-70-60	1968	3.5	N	Y	3/85	T Cr
102	6	Martin	5	4	205	S-I bm	60-2 @ 85-60	1968	7.1	Y	Y	3/85	T Cr
103 & 104 Deleted													
105	6	Ector	5	13	172	S-I bm	51-80-51	1979	5.4	Y	N	3/85	T Cr - Some wearing
106	6	Ector	5	13	173	S-I bm	51-80-51	1975	5.4	Y	N	3/85	T Cr
107	6	Ector	5	13	176	S-I bm	61-95-61	1966	6.7	Y	Y	3/85	Branching Cr near abut
108	6	Ector	5	13	177	S-I bm	61-95-61	1966	6.0	Y	Y	3/85	Map Cr. near abut
109	6	Ector	2224	1	13	PCS-C	46-110-46	1979	4.8	Y	Y	3/85	T Cr; Diag CR at abut
110	6	Ector	2224	1	14	PCS-C	46-110-46	1979	4.8	Y	Y	3/85	Slab Cr at abut
111	6	Ector	2224	1	15	PCS-C	46-110-46	1979	4.8	Y	N	3/85	T Cr
112	6	Ector	2224	1	16	PCS-C	46-110-46	1979	4.8	Y	N	3/85	T Cr; slab Cr at abut
113	6	Ector	4	7	22	S-I bm	5 @ 40	1979	5.2	Y	Y	3/85	T Cr
114	6	Ector	4	7	23	S-I bm	5 @ 40	1979	5.2	Y	Y	3/85	None
115	6	Ector	4	6	84	PCS-C	40-2 @ 100-40	1982	1.4	N	N	3/85	T Cr
116	6	Ward	4	4	82	PCS-C	40-80-40	1982	4.4	N	N	3/85	Experimental deck-serious cr
117	6	Ward	4	4	83	PCS-C	40-80-40	1982	4.4	N	N	3/85	T Cr
118	6	Ward	4	2	64	S-I bm	60-2 @ 90-60	1968	5.2	Y	Y	3/85	T Cr

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
119	6	Pecos	441	8	180	PCS-C	50-85-50	1983	1.7	Y	N	3/85	T Cr
120	6	Pecos	441	8	181	PCS-C	50-85-50	1983	1.7	Y	N	3/85	T Cr
121	6	Pecos	441	8	183	PCS-C	65-2 @ 110-60	1983	3.7	Y	Y	3/85	T Cr
122	6	Pecos	140	1	313	PCS-C	60-100-60	1983	1.9	Y	N	3/85	T Cr
123	6	Pecos	140	1	314	PCS-C	60-100-60	1983	1.9	Y	N	3/85	T Cr
124	6	Pecos	140	1	316	PCS-C	55-2 @ 110-55	1983	3.7	Y	Y	3/85	T Cr
125	6	Pecos	140	1	318	PCC-C	55-65-2 @ 60 + Other	1984	1.5	Y	N	3/85	T Cr at bts only
126	6	Pecos	140	1	317	PCC-C	50-65-5 @ 60 + Other	1984	1.5	Y	N	3/85	T Cr at bts only
127	6	Pecos	140	1	320	PCS-C	4 @ 75	1983	1.5	Y	N	3/85	T Cr at bts only
128	6	Pecos	140	1	321	PCS-C	4 @ 75	1983	1.5	Y	N	3/85	T Cr at bts only
129	6	Pecos	140	1	322	PCS-C	50-85-50	1983	1.5	Y	N	3/85	T Cr at bts only
130	6	Pecos	140	1	323	PCS-C	50-85-50	1983	1.5	Y	N	3/85	T Cr at bts only
131	6	Pecos	140	3	234	PCC-C	60-2 @ 115-60	1976	2.1	Y	N	3/85	Diaphr. Cr
132	6	Pecos	140	4	220	PCC-C	3 @ 60	1977	1.2	Y	N	3/85	None
133	6	Pecos	140	4	221	PCC-C	3 @ 60	1977	1.2	Y	N	3/85	T Cr
134	6	Pecos	140	4	224	PCC-C	55-2 @ 110-55	1977	2.6	Y	N	3/85	None
135	6	Pecos	140	4	185	PCC-C	55-2 @ 115-55	1978	2.2	Y	N	3/85	No Cr; offset brng pad
136	6	Pecos	140	5	213	PCC-C	50-2 @ 110-50	1976	2.6	Y	N	3/85	No Cr; Minor diaphr. sp
137	6	Pecos	140	6	256	PCC-C	50-2 @ 110-50	1978	2.6	Y	N	3/85	Diaphr. Crs
138	6	Pecos	140	6	277	PCS-C	60-36-40	1979	1.3	Y	-	3/85	Cr slab bot. at abut
139	6	Pecos	140	6	276	PCS-C	40-60-40	1979	1.3	Y	-	3/85	Cr slab bot. at abut
140	7	Crockett	140	13	286	PCS-C	120-5 @ 80-65	1980	2.1	Y	Y	3/85	T Cr at bts only
141	7	Crockett	140	13	287	PCS-C	120-5 @ 80-65	1980	2.1	Y	Y	3/85	T Cr at bts only
142	7	Crockett	140	13	288	PCS-C	75-2 @ 115-75	1980	NA	Y	Y	3/85	No Cr; S end of br drifted
143	7	Crockett	140	13	289	PCS-C	40-2 @ 50-40	1980	2.1	Y	-	3/85	T Cr; Cr slab bot. at abut

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
144	7	Crockett	140	13	290	PCS-C	40-2 @ 50-40	1980	2.1	Y	-	3/85	Cr Slab bot. at abut
145	7	Crockett	140	13	291	PCS-C	75-40	1980	2.1	Y	Y	3/85	T Cr at bts only
146	7	Crockett	140	13	292	PCS-C	75-40	1980	2.1	Y	Y	3/85	T Cr at bts only
147	7	Crockett	140	13	293	PCS-C	5 @ 70	1980	2.1	Y	Y	3/85	T Cr at bts only
148	7	Crockett	140	13	294	PCS-C	5 @ 70	1980	2.1	Y	Y	3/85	T Cr at bts only
149	7	Crockett	140	13	302	PCS-C	55-2 @ 84-55	1981	1.1	Y	N	3/85	None
150	7	Crockett	140	10	275	PCS-C	56-2 @ 84-56	1979	0.3	Y	N	3/85	T Cr at bts only
151	7	Crockett	140	10		PCS	55-2 @ 84-55	1976	NA	N	N	3/85	None
152	7	Crockett	140	10	169	PCS	5 @ 80	1976	1.4	N	Y	3/85	None
153	7	Crockett	140	10	170	PCS	5 @ 80	1976	1.4	N	Y	3/85	None
154	7	Crockett	140	11	179	PCS	5 @ 80	1976	1.3	N	Y	3/85	L Cr
155	7	Crockett	140	11	180	PCS	5 @ 80	1976	1.3	N	Y	3/85	L Cr
156	7	Sutton	141	7	139	PCS-C	6 @ 80	1978	1.4	Y	Y	3/85	T Cr at bts only
157	7	Sutton	141	7	140	PCS-C	6 @ 80	1978	1.4	Y	Y	3/85	T Cr at bts only
158	7	Sutton	141	7	141	PCS-C	50-70-3 @ 50	1978	1.4	Y	N	3/85	T Cr at bts only
159	7	Sutton	141	7	142	PCS-C	50-70-3 @ 50	1978	1.4	Y	N	3/85	T Cr at bts only
160	7	Sutton	141	7	144	PCS-C	3 @ 40	1978	1.3	Y	N	3/85	T Cr at bts only
161	7	Sutton	141	7	145	PCS-C	3 @ 40	1978	1.3	Y	N	3/85	T Cr at bts only
162	7	Sutton	141	7	146	PCS-C	50-60-50	1978	1.3	Y	N	3/85	T Cr at bts only
163	7	Sutton	141	7	147	PCS-C	50-60-50	1978	1.3	Y	N	3/85	T Cr at bts only
164	7	Sutton	141	7	148	PCS-C	40-50-40	1978	1.3	Y	N	3/85	T Cr at bts only
165	7	Sutton	141	7	149	PCS-C	40-50-40	1978	1.3	Y	N	3/85	T Cr at bts only
166	7	Sutton	141	7	150	PCS-C	105-115	1978	3.2	N	N	3/85	T Cr at bts only
167	7	Kimble	141	8	151	PCS-C	50-70-50	1978	1.9	Y	N	3/85	T Cr at bts only
168	7	Kimble	141	8	152	PCS-C	50-70-50	1978	1.9	Y	N	3/85	T Cr at bts only

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
169	7	Kimble	141	8		PCC-C	53-65-53	1980	1.9	Y	N	3/85	T Cr at bts; slab cr at abut
170	7	Kimble	141	8		PCC-C	53-65-53	1980	1.9	Y	N	3/85	T Cr
171	7	Kimble	141	8	153	PCC-C	79-8 @ 80-79	1980	1.5	Y	Y	3/85	Sp bm & diaphrg.
172	7	Kimble	141	8	154	PCC-C	79-8 @ 80-79	1980	1.5	Y	Y	3/85	Sp bm & diaphrg.
173	7	Kimble	141	8	156	PCC-C	60-2 @ 105-60	1980	NA	Y	Y	3/85	None
174	7	Kimble	141	8	159	PCC-C	40-2 @ 105-55	1980	NA	Y	N	3/85	None
175	7	Kimble	141	9	131	PCC-C	40-2 @ 100-40	1975	NA	N	N	3/85	T Cr
176	7	Kimble	142	1	64	C-I bm	2 @ 105	1967	NA	Y	N	3/85	T Cr
177	7	Kimble	142	1	67	C-I bm	40-2 @ 105	1967	NA	Y	N	3/85	T Cr
178	4	Potter	41	5	64	PCS-C	4 @ 101 + Other	1980	3.2	Y	N	4/85	T Cr
179	4	Hutchinson	41	5	53	PCS	4 @ 100 + Other	1969	3.2	N	N	4/85	T, Diag, L Cr
180	4	Hutchinson	356	1	14	PCS-C	24 @ 81.5 + Other	1975	2.7	Y	N	4/85	T Cr
181	4	Potter	41	7	25	C-I bm	3 @ 50 + Other	1981	8.0	Y	N	4/85	T Cr
182	4	Potter	8006	4	1	PCS-C	3 @ 95 + Other	1981	NA	Y	Y	4/85	T Cr at bts only
183	4	Randall	168	8	45	PCS-C	20-2 @ 80-20	--	5.8	Y	N	4/85	T Cr at bts; H Cr on side
184	4	Deafsmith	90	1	69	PCC-C	45-2 @ 90-45	1973	7.4	Y	N	4/85	T Cr; cr diaphrg
185	5	Lubbock	783	2	62	PCC-C	40-2 @ 80-40	1974	18.6	N	N	4/85	T Cr-wearing; Deck Sp
186	5	Lubbock	783	2	63	PCC-C	66-120-40	1974	11.5	N	Y	4/85	Ckbd Cr; Sp, patches; Cr Dia
187	5	Lubbock	783	2	64	PCC-C	66-120-40	1974	11.5	N	Y	4/85	T Cr, Sp, rust stains
188	5	Lubbock	67	7	65	PCC-C	4 @ 100±	1978	4.9	Y	N	4/85	T Cr at abut; split bm ends
189	5	Lubbock	67	7	68	PCC-C	4 @ 100±	1978	4.9	Y	N	4/85	T Cr at abut; split bm ends
190	5	Lubbock	67	7	69	PCC-C	50-2 @ 90-50	1978	10.8	Y	Y	4/85	Cr bm web at end
191	5	Lubbock	67	7	73	PCC-C	88-115-88	1978	4.2	Y	N	4/85	None
192	5	Lubbock	67	7	72	PCC-C	88-115-88	1978	4.2	Y	N	4/85	None
193	5	Lubbock	67	7	79	PCC-C	88-103-88	1978	4.0	Y	N	4/85	None

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
194	5	Lubbock	67	7	78	PCC-C	88-103-88	1978	4.0	Y	N	4/85	None
195	5	Lubbock	67	7	83	PCC-C	50-107-50	1974	4.0	N	N	4/85	L Cr; Diaphrg Sp
196	5	Lubbock	67	7	80	PCC-C	50-107-50	1974	4.0	N	N	4/85	T Cr; Diaphrg Sp
197	5	Lubbock	67	7	85	PCC-C	60-120-60	1974	3.0	Y	Y	4/85	Vert Cr in web end of 2 bms
198	5	Lubbock	67	7	84	PCC-C	60-120-60	1974	3.0	Y	Y	4/85	Vert Cr in web end of 1 bm
199	5	Lubbock	6	7	88	PCC-C	60-107-60	1974	4.0	Y	N	4/85	T Cr; Bm & Diaphrg Sp
200	5	Lubbock	67	7	89	PCC-C	60-107-60	1974	4.0	Y	N	4/85	T Cr; effl marks below 1 span
201	5	Hale	67	6	95	PCC-C	2 @ 100	1981	3.2	Y	N	4/85	None
202	5	Hale	67	6	94	PCC-C	2 @ 100	1981	3.2	Y	N	4/85	Sp diaphrg
203	5	Hale	67	6	96	PCC-C	42-68-2 @ 80-68-42	1981	NA	Y	N	4/85	None
204	5	Hale	67	6	98	PCC-C	42-68-2 @ 80-68-42	1981	NA	Y	N	4/85	None
205	5	Hale	67	6	99	PCC-C	42-68-2 @ 80-68-42	1982	NA	Y	N	4/85	T Cr
206	5	Hale	67	6	100	PCC-C	2 @ 96	1982	3.2	Y	N	4/85	T Cr
207	5	Hale	67	6	101	PCC-C	2 @ 96	1982	3.2	Y	N	4/85	T Cr; Bm cr over bt
208	5	Hale	67	5	109	PCC-C	2 @ 90-2 @ 80 + Other	1982	NA	Y	N	4/85	Cr diaphrg on outside
209	5	Hale	67	5	114	PCC-C	3 @ 120 + Other	1982	NA	Y	Y	4/85	Cr diaphrg on outside
210	7	Kimble	141	8	-	PCS	105±	--	NA	Y	N	4/85	None
211	7	Kimble	141	8	-	PCS	105±	--	NA	Y	N	4/85	Sp backwall
212	25	Hardeman	98	1	38	PCS-C	73-72; 3 @ 27 + Other	1977	0.4	Y	N	4/85	T & L Cr
213	25	Collingsworth	31	3	16	PCC-C	8 @ 90 + Other	1975	0.6	Y	N	4/85	T Cr; Sp diaphrgs
214	25	Childress	31	5	13	C-I bm	50-10 x 4 @ 50 - 50	1958	1.1	Y	N	4/85	Heavy scale & Cr; rust
215 deleted													

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
216	25	Childress	42	12	42	S-I bm	50-57-50	1957	2.6	Y	Y	4/85	None
217	25	Dickens	131	1	24	PCS-C	2 @ 76	1982	0.6	Y	N	4/85	T Cr at bt only
218	25	Dickens	131	2	13	PCS-C	3 @ 60	1984	0.6	Y	N	4/85	T Cr at bts only
219	25	Dickens	131	2	11	PCS-C	3 @ 55	1983	0.6	Y	N	4/85	T Cr at bts only
220	3	Willbarger	124	1	4	PCC-C	8 x 4 @ 95 + Other	1982	1.3	N	N	4/85	T Cr
221	3	Wichita	156	1	11	PCS-C	5 x 6 @ 81 + Other	1978	0.8	Y	N	4/85	T Cr at bts only
222	3	Clay	224	1	22	PCS-C	5 @ 40	1984	4.5	N	Y	4/85	None (widened w/pc panels)
223	3	Clay	224	1	23	PCS-C	5 @ 40	1984	4.5	N	N	4/85	Shrinkage Crs; (widened br)
224 Deleted													
225	2	Wise	13	6	59	PCS-C		1981	5.0	Y	N	4/85	None
226	2	Wise	13	6	58	PCS-C		1981	5.0	Y	N	4/85	Bm end Sp
227	2	Wise	13	6	61	PCS-C	3 @ 70	1981	5.0	Y	N	4/85	T Cr at bts only
228	2	Wise	13	6	60	PCS-C	3 @ 70	1981	5.0	Y	N	4/85	T Cr at bts only
229	2	Wise	13	6		PCS-C	2 @ 80	1981	NA	Y	Y	4/85	None
230	2	Wise	13	7	65	PCS-C	42-58-42	1981	5.0	Y	Y	4/85	None
231	2	Wise	13	7	64	PCS-C	42-58-42	1981	5.0	Y	Y	4/85	None
232	2	Wise	13	7	66	PCS-C	45-70-45	1981	5.0	Y	Y	4/85	None
233	2	Wise	13	7	67	PCS-C	45-70-45	1981	5.0	Y	Y	4/85	None
234	2	Tarrant	2266	2	77	PCS-C	5 @ 85-115-120 + Other	1979	NA	Y	Y	4/85	T Cr at bts only
235	2	Tarrant	2266	2	78	PCS-C	100-77-77 + Other	1979	NA	Y	Y	4/85	T Cr at bts only
236	2	Tarrant	8	16	286	PCS-C	49-107-110-49	1982	NA	N	N	4/85	L Cr; Ckbd Cr; T Cr at bent
237	2	Tarrant	8	16	289	PCS-C	87-2 @ 105-49	1982	14.0	Y	Y	4/85	T Cr
238	2	Tarrant	80	7	60	PCS-C	75-2 @ 125	1982	7.0	Y	N	4/85	None (stay in place stl forms)

Table A-1. Bridge data (continued)
(See end of table for abbreviations.)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
239	2	Tarrant	80	7	59	PCS-C	2 @ 125, 75	1982	7.0	Y	N	4/85	T Cr at 1 bt (stay in place forms)
240	2	Tarrant	353	3	145	PCS-C	45-51-2 @ 65 + Other	1984	22.0	Y	Y	4/85	(New deck) T Cr at 1 bt
241	2	Tarrant	353	3	147	PCS-C	71-82-96	1984	NA	N	Y	4/85	T Cr at 1 bt (PC panels)
242	2	Tarrant	353	3	146	PCS-C	65-90-35	1984	NA	N	Y	4/85	None (PC panels)
243	2	Tarrant	353	3	157	PCS-C	48-124-108 + Other	1984	14.0	N	Y	4/85	None (PC panels)
244	14	Travis	3136	1	46	PCS-C	40-2 @ 80-46	1981	48.0	Y	Y	6/85	T Cr at bts only
245	14	Travis	3136	1	47	PCS-C	43-68-101-82-57	1981	44.0	Y	Y	6/85	T Cr at 2 bts
246	14	Travis	3136	1	48	PCS-C	50-92-98-50	1981	64.0	Y	N	6/85	None (rough approaches)
247	14	Travis	3136	1	51	PCS-C	77-3 @ 80	1981	44.0	Y	Y	6/85	T Cr at bts; 2 split bm ends
248	14	Travis	3136	1	53	PCC-C	89-82-89	1982	24.5	Y	N	6/85	None
249	14	Travis	3136	1	52	PCC-C	90-81-90	1982	24.5	Y	N	6/85	1 bm end Sp
250	14	Travis	3136	1	42	PCS	40-75-85-40±	1971	26.7	N	Y	6/85	None
251	14	Travis	113	13	57	PCS	2 @ 60-402@ 60	1961	34.8	Y	Y	6/85	None (twin bridges)
252	14	Travis	114	1	108	PCS	70-50-2 @ 65	1969	31.0	Y	Y	6/85	None (rough & worn overlay)
253	14	Travis	114	1	107	PCS	70-55-60-65	1969	20.0	Y	N	6/85	None
254	14	Travis	114	1	110	PCS	60-2 @ 65-60	1969	20.0	Y	N	6/85	Worn overlay
255	14	Travis	114	1	109	PCS	60-2 @ 65-60	1969	20.0	Y	N	6/85	In 2 spans bottom pockmarks
256	14	Travis	114	1	96	PCS	3 @ 60	1966	9.4	Y	Y	6/85	Worn overlay
257	14	Travis	151	9	97	PCS	50-2 @ 78-40	1966	15.2	N	Y	6/85	1 girder w/impact damage
258	14	Travis	151	9	98	PCS	50-2 @ 78-40	1966	16.2	N	Y	6/85	None
259	14	Travis	114	2	104	PCS	3 @ 40	1967	6.5	N	Y	6/85	None
260	14	Travis	114	2	105	PCS	50-75-50	1967	6.5	N	N	6/85	None
261	14	Travis	114	2	106	PCS	4 @ 75	1967	6.5	N	N	6/85	Closed armor jts; wear at jts
262	14	Travis	114	2	111	PCS	2 @ 50	1968	5.4	N	Y	6/85	None

Table A-1. Bridge data (continued)

Item	Dist.	County	Cont. & Sect.		Struct. No.	Type	Span Length (ft)	Year Constr.	ADT (1000)	Overl.	Skew	Mo/Yr Insp.	Defect Noted (L - Longit.; T = Transv.) (Cr - Crack; Sp = Spall)
										(Y=Yes	N=No)		
263	14	Travis	114	2	112	PCS	3 @ 60-80-60	1968	5.4	N	N	6/85	Uneven slab jts; rough appr.
264	14	Travis	114	2	113	PCS	7 @ 60	1968	4.7	N	N	6/85	Rough jts; slab bot Cr at abut
265	10	Cherokee	118	4	74	PF-T	2 @ 40, 130, 7 @ 40	1982	NA	N	N	6/86	T deck cracks at tied jts
266	10	Cherokee	118	4	75	PF-T	15 @ 40	1982	NA	N	Y	6/86	T deck cracks at tied jts
267	10	Rusk	123	5	57	PF-T	15 @ 40	1980	NA	Y	N	6/86	T deck cracks at tied jts
268	10	Rusk	138	5	94	PF-T	5 @ 30.3	1986	NA	N	N	6/86	T deck cracks at tied jts

Note: Abbreviations

PFS	Simple pan formed bridge
PFT	Tied pan formed bridge
PCS	Simple spans; prestressed concrete girder
PCS-D	Prestressed concrete girders w/simple doweled slab
PCS-C	Simple PC girders w/continuous slab over bents
PCC-C	PC girders and slab continuous for live load
S-I bm	Continuous steel I-beam bridge
T cr	Traverse crack
L cr	Longitudinal crack
Diag cr	Diagonal crack
Sp	Spall
Eff	Efflorescence or exudation