

# **PERFORMANCE OF CONCRETE BRIDGE DECK OVERLAYS**

**Final Report for  
Iowa DOT Project HR-501**

**Federal Highway Administration  
Project No. IA-73-03**

**November 1990**



Final Report  
for  
Iowa Department of Transportation  
Project HR-501

Performance of  
Concrete Bridge Deck Overlays

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## INTRODUCTION

Chloride-ions penetrating into bridge decks and corroding the steel have been a major problem. As the steel corrodes it exerts stresses on the surrounding concrete. When the stresses exceed the strength of the concrete, cracks or delaminations occur. This, of course, causes deterioration and spalling of bridge deck surfaces.

Both the Latex and Iowa Method were used to repair bridge decks for this project. The concrete was removed down to the steel and replaced with approximately 1 1/2 inches of low slump or latex modified concrete. The removal of unsound concrete below the top layer of steel was sometimes necessary.

## OBJECTIVE

The objective of this project was to determine if the bridge overlays would provide a cost effective method of rehabilitation. To do this, unsound and delaminated concrete was removed and replaced by an overlay of low slump or latex modified concrete.

## TESTING

Fifteen overlaid bridges were selected in the early 1970's for testing and evaluation. Delamtect, electrical potential and chloride content testing have been conducted biennially. Visual inspection of the bridge decks was made also. Delamination reached a level of approximately 2.0-3.0% after 10 years. The electrical potential mainly stayed below the

30 volts. The above observations are shown in the appendices.

#### DISCUSSION OF RESULTS

The overlays have extended the life of bridge decks requiring rehabilitation. Both the Iowa Method and Latex Method proved to be effective in delaying corrosion and deterring the increase of chloride content in the bridge overlays for a number of years. There were a couple of cases when substantial delamination had occurred that a new epoxy injection was used. This worked very effectively.

The overlays improved the electrical potential. In all cases, the electrical potential shifted to the left after the deck was overlaid, showing reduction in active corrosion. It seems the overlay either reduced the oxygen or the moisture that had been coming in contact with the steel.

There was also a definite chloride reduction around the steel after the overlay was placed.

Bridges built now contain epoxy coated steel. The epoxy coating on the steel has been a valuable asset to the life of the bridge decks by not allowing the chloride-ions to come in contact with the steel.

SUMMARY

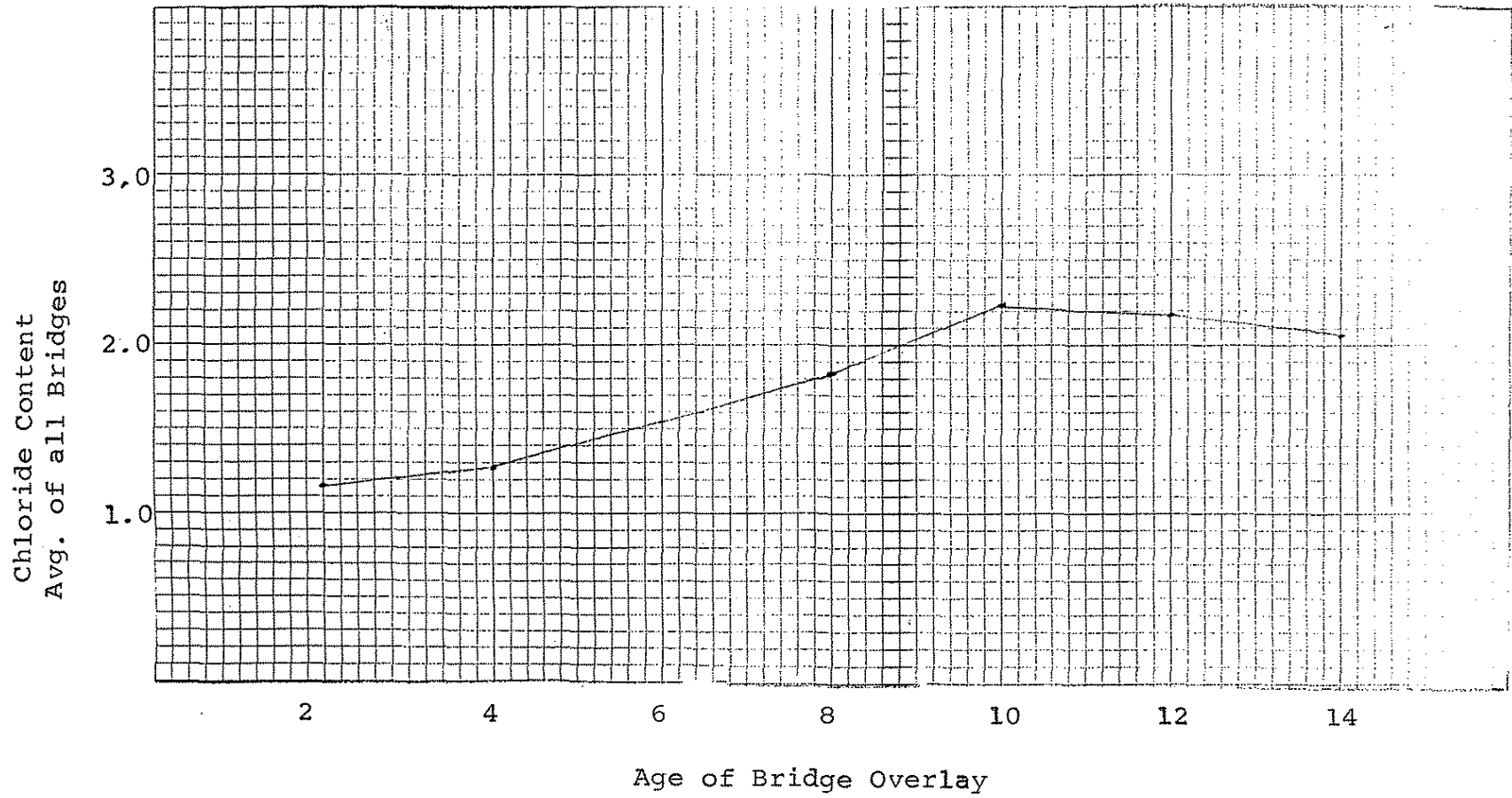
Both the Iowa Method and Latex Method have proven to be effective means of gaining life for older bridges. They have slowed steel corrosion which causes the concrete deterioration of the bridges.

CONCLUSION

The following conclusions can be drawn from this research.

1. The Iowa Method and Latex Method are cost effective methods of bridge deck rehabilitation.
2. Epoxy coated steel used in bridges today is currently the best method for protecting steel from chloride-ions.

Appendix A  
Chloride Content Summary of Deck Overlays



Chloride Content for all  
 Bridges at 1-1½ inch  
 Depth for Project HR-501



Bridge: I-80 Westbound over Iowa 146 - Poweshiek County

Resurfaced 1974 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1974	13.53	11.53	8.81	4.91	3.11
	18.75	12.44	5.44	1.75	0.51
	12.66	5.78	2.37	0.85	0.48
	12.32	8.20	2.23	0.88	0.57
	14.74	13.72	7.79	4.31	0.65
	16.41	14.74	13.57	6.96	3.56
	16.97	12.89	8.69	2.49	0.40
	18.33	11.08	6.88	1.30	0.62
1976	5.52	0.50	0.27	0.22	0.98
	7.33	0.93	1.05	0.98	2.57
	7.79	0.54	0.78	1.86	2.72
	0.86	1.03	1.10	1.25	5.71
	6.88	1.01	0.76	-	-
	7.94	0.37	0.30	0.33	0.27
1978	7.64	1.13	0.19	0.19	0.64
	8.43	0.79	0.19	0.26	0.19
	8.13	1.21	0.38	0.15	0.68
	8.62	1.47	0.23	0.26	1.20
	8.28	0.95	0.26	0.15	0.30
	8.20	1.06	0.19	0.19	0.26
	9.07	0.64	0.19	1.25	4.12
	7.48	0.38	0.19	0.15	0.26
1980	7.90	2.57	0.45	0.19	0.26
	8.13	1.85	0.30	0.30	0.23
	8.51	3.59	0.38	0.26	0.26
	10.28	3.29	0.87	1.17	2.38
	9.00	3.18	0.30	1.55	5.10
	7.33	1.44	0.42	0.87	3.67
	9.75	0.72	0.19	0.38	3.55

Bridge: I-80 Westbound over Iowa 146 - Poweshiek County  
Resurfaced 1974 - Iowa Method

## CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1982	7.86	2.91	0.34	0.23	0.79
	6.24	3.63	1.51	2.08	2.57
	6.62	1.36	0.95	4.76	4.38
	6.62	1.97	0.30	0.19	0.23
	6.99	0.68	0.83	3.93	6.50
	8.43	2.08	0.23	0.26	2.31
	7.48	2.31	0.57	0.30	3.48
1984	9.53	3.97	2.19	3.78	2.99
	8.35	2.72	1.29	3.67	5.90
	7.75	3.36	0.34	0.19	0.49
	8.66	3.40	0.34	0.30	1.47
	6.77	1.06	0.26	1.06	4.99
	9.07	4.23	1.32	3.40	7.41
	8.62	3.02	0.45	1.44	6.01
1986	8.88	3.21	0.49	0.45	0.38
	2.15	5.14	3.63	1.70	9.11
	5.90	1.93	0.49	0.30	0.45
	0.34	1.78	7.82	0.34	0.26
	10.77	4.95	2.15	2.00	5.41
	7.22	1.55	0.68	0.49	2.87
	8.73	3.14	0.26	0.30	0.45
1988	9.03	3.89	1.10	0.68	0.57
	6.62	2.99	0.64	1.89	1.85
	11.23	3.29	0.57	1.02	2.91
	11.79	7.11	2.08	1.13	4.84
	6.99	1.55	0.45	1.47	4.27
	9.60	2.99	0.64	1.59	4.80
1990	8.96	2.53	0.49	0.49	2.27
	9.83	6.31	1.40	1.25	3.40
	11.70	4.54	1.25	0.26	0.49
	8.43	3.52	0.76	0.38	0.26
	11.98	5.18	1.25	3.52	2.76
	11.08	6.16	2.53	0.49	0.87

Bridge: I-80 Westbound over East 29th & RR - Polk County

Resurfaced 1974 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1974 Preconstr	12.21	12.10	6.39	6.05	3.52
	9.64	5.90	3.35	1.17	0.62
	11.72	9.87	8.58	4.54	3.18
	7.22	3.11	2.37	1.15	0.64
	12.74	8.66	11.45	11.11	7.60
	11.64	8.50	4.27	0.64	0.64
	17.77	13.95	10.28	5.29	3.15
	12.70	11.94	9.94	5.44	1.47
1977	3.17	0.80	2.97	3.37	3.63
	3.30	1.04	1.03	1.19	-
	1.05	0.50	2.64	-	-
	1.49	0.53	0.36	0.66	-
	2.31	0.40	0.36	0.69	0.36
	2.67	0.40	4.73	5.48	4.12
	0.80	0.50	0.88	0.79	0.62
	2.47	0.73	3.21	6.26	5.33
	2.25	0.26	1.09	2.77	1.39
	4.12	0.66	1.05	2.21	1.05
	0.72	0.49	1.44	3.18	2.91
	3.90	0.76	0.38	0.30	0.42
	0.95	0.42	2.19	5.07	4.65
	1.89	0.49	0.42	0.49	0.38
	2.08	1.17	0.53	0.49	4.91
	1.51	0.42	1.47	4.20	3.52
	1.47	0.42	0.45	1.63	0.79
1.17	0.53	1.74	6.12	-	
2.23	0.38	0.68	2.53	3.97	
1.85	0.57	0.42	-	-	
1978	1.28	0.45	0.38	1.70	3.18
	4.95	0.76	0.95	4.80	4.80
	1.13	2.31	5.67	-	6.43
	1.29	0.38	0.42	0.38	0.45
	1.70	0.49	0.26	0.08	0.53
	6.69	0.91	3.33	0.38	0.95
	5.67	0.64	0.45	1.89	3.36

Bridge: I-80 Westbound over E. 29th & RR Polk County

Resurfaced 1974 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1980	2.57	0.49	1.78	4.80	6.16
	1.10	0.42	0.30	0.68	0.83
	5.44	1.63	4.73	6.50	7.86
	2.12	0.30	0.34	0.34	0.64
	0.57	0.30	0.26	0.30	0.26
	1.02	0.11	0.11	0.42	1.13
1982	4.73	0.76	3.48	6.20	5.41
	0.95	0.45	0.30	1.21	1.32
	3.93	1.10	3.48	7.71	7.71
	3.44	0.79	0.45	1.17	2.34
	2.87	0.83	0.34	0.34	1.10
	2.19	0.45	0.30	0.34	0.60
1984	2.08	0.49	1.81	2.38	---
	1.89	0.76	0.30	0.83	1.93
	2.57	0.64	3.59	4.88	---
	0.91	1.70	4.46	8.05	6.62
	4.46	0.45	0.26	0.26	0.38
	2.19	0.57	0.08	0.57	1.59
	2.80	0.19	0.30	0.26	0.30
1986	3.44	1.81	3.44	7.07	5.56
	3.33	1.81	0.34	0.68	2.34
	8.54	3.36	5.44	4.42	7.75
	6.31	1.25	0.38	0.64	2.34
	2.15	1.44	0.57	0.38	0.45
	4.88	1.44	0.57	0.45	0.68
1988	4.76	1.32	2.57	5.10	5.86
	3.89	0.68	0.64	1.06	1.78
	5.78	1.36	1.17	3.06	5.18
	2.46	1.36	2.46	2.08	3.14
	7.60	2.38	0.72	0.57	0.76
	6.50	0.42	0.45	2.57	2.68

Bridge: I-80 Westbound over E 29th & RR Polk County

Resurfaced 1974 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1990	3.67	1.13	0.49	0.87	2.15
	4.91	2.76	3.52	6.92	6.80
	3.02	0.64	0.49	1.40	1.40
	7.56	4.42	1.89	0.76	1.63
	4.65	1.02	0.38	0.38	0.49
	4.04	0.87	0.49	0.76	2.15

Bridge: US 6 over I-80 Jasper County

Resurfaced 1978

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1980	4.42	0.49	0.15	0.30	0.19
	4.42	1.02	0.19	0.19	1.13
	4.27	0.26	0.26	0.34	0.38
	5.41	1.06	0.26	0.23	1.51
	5.97	1.63	0.45	2.08	7.86
	4.42	0.11	0.11	0.08	1.13
	1982	7.60	2.12	0.45	0.26
6.73		1.81	0.26	0.19	0.30
7.03		1.47	0.23	0.19	0.19
6.88		2.38	0.26	0.19	0.19
7.71		2.27	0.19	0.26	1.78
7.33		1.85	0.19	0.53	2.53
1984		8.77	4.01	1.55	0.76
	7.75	1.70	0.11	0.08	0.08
	9.11	4.42	0.64	0.38	2.08
	7.30	2.27	0.45	1.25	3.67
	10.62	2.27	0.42	1.29	4.35
	8.99	2.68	0.19	0.57	2.46
	9.37	2.76	0.49	0.30	1.55
	8.09	3.48	0.64	1.10	3.33
	1986	8.62	2.84	0.64	0.11
5.82		2.31	0.38	0.34	1.51
13.53		4.91	1.32	0.23	0.45
12.93		6.95	3.85	0.83	1.59
9.71		6.54	2.95	0.45	1.44
1.97		0.72	2.15	7.48	11.98
1988	9.53	2.72	0.68	0.38	0.38
	6.62	2.91	0.68	0.76	1.10
	11.26	5.86	3.97	2.65	2.27
	9.83	4.99	2.27	0.98	2.53
	6.12	3.59	1.59	0.64	1.59
	12.55	6.24	2.53	0.79	0.30

Bridge: US 6 over I-80 - Jasper County

Resurfaced 1978

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1990	10.21	4.65	1.51	0.49	0.11
	13.99	4.04	0.87	0.64	2.15
	9.94	5.29	2.00	0.49	0.38
	13.87	7.18	2.76	---	2.76
	8.43	6.43	3.52	1.40	1.13
	12.97	5.56	1.78	0.26	0.26

Bridge: US-30 Eastbound over Indian Creek - Nevada

Resurfaced 1976 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1976	17.2	11.0	7.2	6.8	
	14.8	9.0	7.0	5.0	
	15.7	9.5	8.1	5.0	
	13.2	17.7	10.3	5.3	
	22.4	8.4	1.8	0.7	
	15.8	8.8	1.2	1.0	
	14.9	13.6	4.7	0.4	
1979	6.04	2.61	0.42	0.30	0.38
	4.50	0.98	0.26	0.57	0.53
	2.65	0.49	0.26	0.26	0.26
	6.31	1.13	0.26	0.26	0.38
	5.18	1.06	0.87	6.12	8.09
	1.78	0.34	0.30	0.38	0.19
1980	3.97	1.81	0.53	0.87	6.58
	6.69	2.46	0.49	2.34	7.37
	4.57	0.83	0.49	3.44	4.57
	4.69	0.49	0.26	0.34	0.26
	6.62	0.95	0.30	0.30	0.30
	6.01	0.83	0.38	0.35	0.38
1982	5.44	2.61	0.68	0.30	0.26
	6.39	2.34	0.42	0.68	5.22
	4.73	2.72	1.89	5.22	6.84
	7.03	2.68	1.25	4.84	5.97
	6.65	1.74	0.34	0.23	0.26
	2.95	0.57	0.26	0.30	0.30
1984	5.71	2.65	0.68	0.26	0.26
	7.41	3.10	0.68	2.08	5.93
	7.26	1.44	1.36	6.99	5.22
	6.05	1.44	0.64	6.62	6.39
	14.48	8.01	0.95	0.30	0.34
	8.66	1.63	1.06	0.26	0.19
	13.87	6.92	0.57	0.26	0.23
	7.71	1.47	0.23	0.30	0.11



Bridge: US 30 - Eastbound over Indian Creek - Nevada  
Resurfaced 1976 - Iowa Method

## CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1986	8.85	5.33	3.14	1.63	4.57
	12.06	3.33	1.10	3.89	3.86
	7.82	4.20	1.70	1.32	----
	10.32	2.19	0.57	0.49	0.42
	11.26	6.62	3.74	1.32	2.61
	6.99	3.29	0.79	0.42	0.64
1988	7.41	3.70	2.31	5.97	5.56
	13.42	3.59	1.97	1.59	7.22
	5.10	1.21	2.38	6.92	7.75
	13.15	4.88	1.25	0.45	0.45
	11.34	4.35	0.79	0.49	0.45
	8.05	1.59	0.45	0.34	0.38
1990	10.70	5.18	1.25	0.26	0.38
	6.43	2.65	1.89	2.15	5.56
	7.67	2.00	0.76	4.65	5.29
	10.47	1.02	0.26	0.38	0.38
	11.34	4.16	0.76	0.49	0.38
	14.36	6.54	2.91	2.49	0.38

Bridge: Polk County Road over S-14 - Altoona Interchange

Resurfaced 1974 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1974	19.05	16.56	9.15	3.07	0.31
	21.92	19.96	13.83	7.94	3.31
	20.41	6.12	3.75	1.44	0.72
	14.40	11.60	12.66	5.86	2.82
	14.97	13.68	13.08	9.19	4.54
	19.09	11.45	10.13	10.62	6.69
	8.43	7.03	4.27	1.91	0.17
	19.39	15.50	9.34	9.00	5.97
1976	10.02	5.37	6.88	-	-
	7.79	0.20	0.17	0.20	1.12
	6.69	0.93	5.48	-	-
	3.59	0.93	0.45	0.37	-
	10.81	2.72	8.32	-	-
	2.92	0.74	7.60	-	-
	5.97	12.40	-	-	-
	8.13	0.97	0.18	0.25	-
1978	8.77	0.98	0.26	0.23	0.38
	10.09	3.21	0.26	0.23	0.45
	2.00	0.26	0.26	0.26	0.38
	4.65	0.23	0.23	0.30	3.36
	4.95	3.78	7.48	6.46	-
	9.83	0.60	0.23	0.19	1.40
	10.40	2.15	0.38	0.23	0.45
1980	3.48	0.72	6.09	1.40	5.59
	12.36	3.74	5.52	9.75	3.33
	11.94	2.31	0.15	0.15	0.19
	9.79	1.85	0.11	0.30	2.65
	7.41	0.15	0.11	0.15	0.15
	8.43	1.17	0.19	0.15	0.23
	11.91	3.29	0.15	0.45	0.19
	4.99	1.25	0.19	0.15	0.15

Bridge: Polk County S-14 Over I-80 Altoona Interchange

Resurfaced 1974 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1982	9.71	3.33	0.64	0.45	3.48
	10.77	3.21	0.19	0.15	0.15
	12.47	5.86	0.45	0.15	0.15
	8.09	0.95	0.19	0.15	0.15
	7.11	3.55	6.24	6.01	6.09
	2.27	0.42	0.15	0.15	0.19
	1984	12.66	7.94	10.40	8.32
8.43		0.91	0.22	0.15	0.15
5.25		0.49	0.26	3.02	5.86
10.92		0.72	0.11	0.19	0.23
12.59		----	3.63	0.57	0.30
5.37		4.27	8.58	7.71	6.05
10.58		3.97	0.30	0.23	0.19
1986	12.51	30.35	0.53	0.26	0.26
	4.20	0.11	0.45	2.65	4.31
	11.23	4.11	0.95	0.30	0.08
	16.52	10.02	0.98	0.11	0.26
1988	9.37	2.84	0.34	0.49	1.66
	4.99	1.06	1.81	4.73	3.70
	11.79	7.98	2.08	2.08	4.61
	11.26	5.22	1.36	0.45	0.49
	7.37	5.10	7.86	6.73	6.50
	11.26	5.78	2.23	0.68	0.60
1990	2.53	0.87	2.76	5.93	5.29
	13.12	6.54	0.38	0.38	0.49
	15.12	9.83	8.69	10.32	9.45
	9.56	3.78	0.76	1.02	3.29
	8.58	4.04	3.14	3.02	4.27
	9.71	3.52	0.49	0.26	0.76

Bridge: I-35 Northbound over South River

Resurfaced 1976

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1976	15.5	8.5	6.6	1.6	
	8.5	3.3	0.8	0.4	
	14.9	7.4	1.8	0.4	
	13.6	9.1	1.1	1.1	
	15.5	13.6	9.3	5.2	
	13.8	3.9	0.3	0.4	
	13.7	5.0	0.5	0.5	
	7.2	6.4	4.8	4.2	
1978	3.89	0.38	0.79	2.61	6.39
	6.92	1.81	0.30	0.91	5.63
	6.84	1.47	0.26	3.10	7.90
	4.27	0.64	0.45	3.86	5.18
	7.22	1.29	0.87	5.67	6.35
	1.81	0.34	1.29	5.97	7.26
	3.70	0.79	0.68	5.29	5.33
	1.97	0.19	0.23	0.87	3.97
1980	5.37	1.02	0.30	2.61	7.07
	3.82	1.55	0.64	2.95	3.93
	6.35	1.74	0.72	4.50	8.43
	1.81	0.45	0.60	3.74	4.57
	2.23	0.42	0.15	0.26	0.19
	-	0.95	2.27	5.86	5.18
1982	6.05	1.25	1.36	4.16	7.48
	8.81	3.44	0.83	2.34	6.27
	7.86	1.32	0.57	3.14	6.88
	6.27	1.78	0.57	3.48	7.14
	9.00	2.99	0.42	1.02	4.12
	3.21	0.45	0.45	2.23	3.36
	7.33	3.67	1.44	0.64	3.55
	5.52	1.78	1.51	4.61	5.25

Bridge: I-35 Northbound over South River

Resurfaced 1976

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1984	5.86	2.42	0.87	8.16	2.49
	3.70	0.91	2.87	6.84	7.45
	8.13	1.97	1.13	4.16	7.11
	11.23	4.95	1.02	2.80	7.07
	4.88	0.42	0.26	2.38	6.01
	4.08	7.30	0.83	2.57	5.86
	7.18	2.46	3.29	6.39	5.75
	6.84	2.15	0.11	0.15	0.11
1986	8.73	3.44	0.83	2.80	6.39
	5.56	1.66	1.89	2.80	5.63
	8.62	2.99	2.76	6.46	-----
	10.89	6.24	2.61	1.29	4.46
	7.11	1.06	0.64	2.19	5.10
	5.97	3.70	5.03	5.33	-----
1988	1.29	1.32	2.08	3.82	6.50
	6.99	3.21	1.81	3.70	5.75
	6.58	3.97	3.48	5.18	7.86
	9.68	5.48	3.29	1.97	3.44
	5.93	3.55	1.44	2.23	4.73
	7.14	3.10	4.31	6.24	6.35
1990	8.58	5.67	2.27	1.13	2.76
	5.93	2.53	.87	3.40	4.91
	7.30	4.91	2.38	2.65	5.93
	5.93	3.40	3.40	3.67	2.53
	5.03	1.25	1.02	2.65	4.80
	11.72	7.18	4.16	4.04	5.78

Bridge: I-35 Southbound over Badger Creek - Warren County  
Resurfaced 1976 - Iowa Method

## CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1976	12.06	2.28	0.64	2.32	-
	13.49	9.83	3.49	0.91	-
	13.80	7.82	2.79	0.68	-
	16.03	4.23	6.77	2.23	-
	12.32	7.14	3.55	4.12	-
	9.15	3.75	2.16	0.57	-
	13.30	6.99	3.14	0.95	-
	10.89	5.07	0.54	0.68	0.78
	11.19	5.59	2.57	0.54	0.35
	10.96	9.68	6.16	1.86	1.07
1978	7.07	1.55	1.85	5.41	4.80
	9.22	4.84	4.88	6.92	5.41
	2.46	0.76	4.46	7.18	7.07
	6.80	1.47	4.54	7.00	6.73
	9.64	2.68	3.33	7.26	8.69
	8.35	2.87	1.66	6.96	6.84
	8.05	3.29	5.82	6.92	7.33
	7.71	4.38	7.71	6.84	8.20
1980	2.34	0.25	0.87	4.27	4.46
	5.56	5.14	9.56	8.66	8.39
	7.67	3.86	5.22	6.80	10.36
	8.96	3.70	3.74	5.52	4.57
	9.19	3.25	5.67	8.32	6.35
	10.10	4.57	6.80	6.88	6.31
1982	9.94	5.90	4.20	6.24	6.12
	11.04	7.18	6.88	9.53	6.39
	9.75	7.41	7.23	8.24	8.35
	6.31	1.97	4.16	5.14	6.58
	10.85	7.56	8.35	8.13	8.69
	9.00	3.18	3.55	5.82	5.75
	8.01	3.18	3.67	5.18	5.03
	9.37	3.59	0.45	0.19	0.15

Bridge: I-35 Southbound over Badger Creek - Warren County

Resurfaced 1976 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1984	14.93	10.01	6.24	6.99	6.24
	14.55	10.55	10.40	7.82	8.88
	15.95	7.64	4.65	5.63	5.56
	12.02	6.73	5.75	6.69	4.38
	12.55	7.86	5.86	6.31	4.73
	12.51	5.41	4.12	3.59	3.82
	10.05	2.72	4.50	5.52	4.99
	11.30	4.61	3.70	3.06	2.15
1986	11.79	7.48	6.01	6.46	7.56
	15.88	11.64	8.24	6.20	6.24
	11.64	6.77	6.12	7.26	8.51
	11.15	7.52	6.43	5.44	6.62
	14.29	8.69	8.58	5.78	6.16
	11.98	6.09	5.97	5.59	7.07
1988	14.28	11.79	8.13	7.33	6.01
	12.40	8.62	8.39	10.51	7.14
	12.97	8.62	3.97	0.87	0.79
	14.29	6.99	4.42	5.03	4.84
	10.02	3.97	1.78	3.10	2.00
	14.33	6.96	5.03	4.42	4.46
1990	10.58	7.45	4.65	5.29	4.42
	8.43	2.00	3.89	5.18	6.43
	11.23	8.20	8.81	7.07	8.20
	12.10	8.81	7.30	9.07	9.34
	11.60	7.45	5.41	5.93	5.03
	9.19	4.42	3.67	5.18	6.69

Bridge: Iowa 25 - Over Turkey Creek - Adair County

Resurfaced 1977 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1977		5.18	3.32	1.37	1.01
	10.13	8.09	4.23	2.68	1.11
	5.97	4.08	2.26	1.60	1.31
	5.18	3.66	2.88	1.76	0.52
	8.77	6.73	4.95	3.13	1.45
	5.97	8.09	4.61	4.54	3.11
	2.26	2.51	1.73	2.18	2.35
	6.65	6.58	2.88	1.53	-
1979	7.71	1.44	0.26	2.08	2.91
	4.61	0.57	1.29	2.38	2.00
	5.29	0.64	0.11	0.15	0.08
	5.93	0.68	0.11	1.59	2.38
	7.82	0.60	0.42	2.80	1.97
	5.86	0.79	0.23	0.23	0.15
1981	4.31	0.83	0.11	1.70	1.47
	6.77	0.68	0.68	5.03	3.52
	6.99	1.06	0.11	0.15	0.15
	4.73	0.34	0.68	4.01	4.46
	4.65	0.34	0.23	2.87	3.59
	6.12	3.70	0.68	1.97	2.19
1983	7.11	0.49	0.68	5.33	4.35
	8.81	2.53	0.26	1.81	1.32
	10.66	4.08	0.30	1.21	-
	9.94	4.73	0.72	1.85	5.67
	7.26	1.81	1.17	4.23	3.33
1985	6.69	1.32	0.57	3.21	1.97
	8.47	0.42	1.81	2.57	3.40
	12.93	6.31	1.78	0.49	3.33
	8.73	3.33	0.57	1.51	-----
	9.56	6.16	4.73	4.80	-----
	10.81	2.87	2.04	5.82	3.67



Bridge: Iowa 25 Over Turkey Creek - Adair County

Resurfaced 1977 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1987	9.37	2.35	0.83	2.78	---
	2.34	0.87	1.06	0.53	3.10
	8.47	1.17	2.68	4.16	3.21
	11.94	3.89	0.79	3.55	---
	11.42	1.51	0.83	4.12	
	11.94	0.64	1.13	4.54	2.53
1989	10.09	2.65	0.49	1.78	1.40
	11.72	1.02	1.63	6.05	4.80
	10.85	3.78	1.40	4.04	3.40
	11.45	4.42	1.02	3.89	4.04
	14.25	5.78	0.60	0.49	0.49
	10.09	7.67	5.18	4.91	5.56

Bridge: I-80 Eastbound over Polk-Jasper County Line

Resurfaced 1978 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1980	1.21	0.19	1.21	3.25	6.24
	4.76	0.30	1.97	6.46	-
	1.59	0.30	4.38	4.35	-
	7.33	0.77	0.53	0.49	1.13
	1.74	0.19	0.19	2.61	2.57
	2.34	0.19	0.68	7.48	7.52
	1982	4.08	0.49	2.34	6.69
4.20		0.87	2.34	6.35	5.97
3.44		0.34	0.79	3.74	3.97
3.48		0.45	0.23	0.23	0.19
3.63		0.45	0.60	3.59	6.46
6.63		2.00	0.34	2.46	3.23
1984	8.54	3.89	1.78	5.71	5.37
	6.20	0.49	2.23	6.05	5.90
	2.84	0.26	1.02	3.78	3.82
	4.31	0.57	0.23	0.45	0.95
	8.24	3.33	0.38	1.55	3.48
	7.75	1.06	0.19	0.23	3.48
	6.31	1.02	2.04	4.76	5.78
	8.01	1.55	0.23	1.47	2.91
1986	7.94	2.49	2.15	5.10	5.25
	6.35	0.87	2.34	5.33	4.42
	8.13	1.81	0.83	2.68	4.61
	8.05	2.57	0.26	0.23	0.38
	5.10	1.13	2.57	5.82	4.38
	8.66	3.36	3.93	6.99	6.50
1988	9.30	3.06	1.47	1.97	2.34
	7.82	3.52	3.29	5.97	4.84
	7.94	3.02	1.81	5.18	4.99
	9.00	4.76	2.08	3.18	3.40
	7.30	2.95	1.21	5.03	4.88
	5.59	1.81	1.25	1.85	2.80

Bridge: I-80 Eastbound over Cedar River - Cedar County  
Resurfaced 1977 - Iowa Method

## CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1977	14.18	12.93	8.09	6.09	2.42
	5.18	1.37	0.72	0.59	0.52
	13.19	13.03	7.79	5.29	2.06
	16.03	11.76	3.50	0.76	0.65
	15.42	11.76	8.43	4.01	1.14
	5.41	1.11	0.60	0.59	0.65
	11.64	8.69	3.14	0.82	0.67
	15.24	11.11	4.76	1.14	0.78
	12.40	8.81	4.20	1.24	0.94
17.01	11.76	5.18	1.11	0.69	
1979	2.34	0.87	0.87	3.36	5.40
	2.38	0.68	1.06	4.35	5.41
	2.23	0.64	0.68	3.02	3.67
	2.80	0.87	1.21	4.95	7.67
	4.20	0.87	0.95	1.51	4.65
	5.63	1.55	1.13	2.76	7.48
	4.57	1.29	0.76	2.57	7.14
-	5.67	0.76	1.32	4.61	
1981	4.20	0.95	1.40	3.82	8.01
	2.23	0.76	0.79	2.42	2.57
	3.02	0.57	0.72	1.63	3.86
	5.14	1.21	0.79	0.83	1.78
	3.74	1.97	0.83	1.44	4.08
	4.50	1.74	1.25	2.91	6.35
1983	5.97	1.21	0.49	1.66	5.22
	2.98	0.79	0.76	2.87	2.76
	5.03	1.59	3.67	1.81	7.14
	7.41	3.40	1.25	0.95	1.32
	5.25	2.08	0.53	1.21	3.36
	5.71	1.89	1.17	3.52	8.28

Bridge: I-80 Eastbound over Cedar River

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1985	4.35	1.70	2.00	4.99	4.46
	3.82	1.29	0.72	1.32	2.00
	6.88	2.99	1.63	3.78	4.61
	4.91	2.19	1.40	2.19	5.06
	4.76	1.97	0.98	1.44	3.97
	6.27	2.08	1.44	2.65	5.75
1987	5.10	0.91	3.33	6.39	7.07
	6.69	3.18	2.57	4.73	---
	3.74	1.44	2.19	4.46	4.76
	7.11	3.10	1.81	3.86	7.41
	7.60	3.52	1.55	1.29	2.95
	7.18	2.46	1.17	3.59	---
1989	6.54	1.89	2.19	3.86	6.31
	3.29	2.00	1.25	1.78	2.76
	4.91	2.38	1.02	1.78	2.27
	9.45	5.41	3.14	3.67	5.78
	9.26	4.27	1.63	1.13	1.97
	7.26	4.73	1.89	2.98	6.35

Bridge: 19th Street over I-235 - Des Moines

Resurfaced 1977 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1977	15.46	8.54	4.46	3.33	2.84
	12.55	8.09	5.97	5.33	3.70
	11.45	4.20	2.65	2.34	1.59
	8.69	6.05	4.80	4.35	4.50
	13.04	14.06	11.72	7.94	5.67
	11.11	6.69	5.14	3.93	3.74
	17.96	15.72	11.53	8.58	7.75
	12.89	10.09	6.54	4.91	4.50
1979	10.05	3.06	0.26	0.19	0.23
	6.58	0.26	0.26	0.19	0.15
	6.88	1.66	0.19	0.15	0.19
	12.18	3.82	0.08	0.04	0.11
	7.52	0.45	0.15	0.11	0.04
	0.76	6.16	0.11	0.08	1.32
1981	9.87	7.11	2.61	0.49	0.15
	11.57	5.10	1.13	0.19	0.15
	10.89	3.33	0.19	0.11	0.15
	9.19	1.78	4.88	7.90	7.60
	11.72	4.99	1.02	0.11	0.15
	9.98	5.37	1.51	0.15	0.64
1983	12.89	8.16	2.65	0.34	0.34
	12.36	-	3.97	1.17	0.26
	11.53	8.01	4.16	0.45	0.08
	13.30	6.09	1.32	0.15	0.19
	14.93	11.83	4.88	0.68	0.15
	10.43	8.43	4.38	6.62	5.82
	15.42	10.47	4.12	0.49	0.91
	8.88	4.38	2.08	1.44	3.59

Bridge: 19th Street over I-235

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1985	12.13	7.86	4.04	0.76	0.98
	15.23	8.13	2.38	0.30	0.30
	16.48	8.99	1.70	0.38	0.04
	11.45	4.61	0.83	0.19	0.42
	12.78	10.77	3.82	0.11	0.34
	11.15	6.35	4.84	3.33	2.34
1987	14.82	11.53	1.96	0.72	0.19
	13.95	9.19	3.89	1.44	0.76
	15.95	5.03	0.30	0.19	0.34
	15.16	9.00	3.78	0.87	0.38
	14.01	8.96	3.86	0.49	0.42
	12.29	7.71	3.52	1.25	1.93
1989	15.04	8.96	5.75	2.19	0.38
	16.63	9.90	5.22	1.13	0.30
	13.42	7.26	4.27	1.63	0.49
	15.99	7.45	—	0.64	0.38
	16.52	9.94	4.42	2.00	2.38
	15.23	9.34	6.43	4.42	2.15

Bridge: US-169 Southbound over Lizard Creek

Resurfaced 1975 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1975	18.48	15.31	13.00	11.83	9.94
	15.95	7.03	9.90	9.41	9.49
	19.58	8.01	6.73	6.24	6.05
	14.02	9.60	2.69	4.57	5.71
	12.25	9.64	7.30	4.08	5.71
	1.85	1.37	1.72	1.98	0.52
	17.35	9.26	2.74	0.56	0.50
	14.86	16.14	13.57	7.94	0.92
	15.35	5.79	0.52	0.67	0.73
	15.46	14.44	8.05	1.28	0.61
1977	3.54		0.42		0.14
	4.58		0.28		0.28
	2.08		0.35		0.21
	3.60		0.28		0.21
	2.15		0.28		0.49
	1.67		0.28		1.11
	1.52		0.35		0.28
	1.38		0.28		1.59
0.56		0.21		0.28	
1979	4.3	0.5	0.7	0.4	0.8
	7.5	0.4	0.4	0.5	0.4
	6.7	0.7	0.4	0.4	0.4
	4.1	0.5	0.5	0.6	1.4
	7.7	0.9	0.4	1.6	7.8
	3.4	1.4	0.3	0.5	2.1
1983	12.32	3.02	1.70	0.95	0.76
	5.56	0.60	0.38	0.38	0.45
	7.22	0.72	0.49	0.42	2.16
	5.93	3.67	9.49	9.53	5.29
	4.31	0.49	0.57	1.17	3.86
	4.76	1.10	0.45	0.64	3.29

Bridge: IA 169 Southbound over Lizard Creek

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1985	7.30	1.36	0.72	4.08	14.40
	10.43	1.17	1.25	7.98	4.91
	8.43	1.02	0.49	3.02	0.83
	4.35	0.57	0.64	5.22	3.89
	8.51	0.68	0.30	0.49	0.45
	1.81	0.49	0.42	0.57	0.53
	10.13	0.72	0.49	0.34	0.49
	10.13	1.70	0.45	0.34	1.44
	1987	-----	0.53	0.49	2.34
4.65	0.57	0.38	1.44	6.92	
4.42	1.89	0.87	3.70	3.78	
13.76	2.46	0.49	0.79	0.57	
9.83	2.00	0.42	0.45	1.55	
4.99	0.49	0.57	0.83	3.97	
1989	13.72	1.25	0.49	0.76	0.49
	8.05	1.02	0.64	0.64	0.64
	14.25	2.38	0.64	0.64	0.76
	5.03	3.02	1.51	6.43	4.16
	9.07	3.29	1.13	3.29	-----
	5.93	0.76	0.76	2.38	4.54



Bridge: I-35 & 80 Westbound over F & D. D.M. & CRI.

Resurfaced 1975 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1975	4.76	2.23	0.58	0.19	0.56
	19.96	12.70	9.37	6.99	2.80
	10.47	5.22	4.54	3.93	2.83
	15.50	8.39	4.76	3.55	2.83
	19.81	11.64	9.07	9.37	5.07
	14.25	4.84	10.47	6.77	6.80
	12.02	5.25	3.93	1.44	0.70
	7.33	6.54	3.52	2.13	1.33
	14.93	8.05	3.52	5.56	2.78
	7.07	2.96	2.09	0.89	2.00
1977	3.03		0.92		5.08
	1.98		2.04		8.66
	2.44		1.97		7.26
	3.50		0.99		6.59
	3.10		1.12		6.40
	2.89		0.13		0.13
	3.50		0.20		0.06
	1.05		0.06		0.00
	2.97		0.40		0.13
	1.65		0.92		5.47
1979	4.31	2.19	7.98	9.15	7.11
	4.31	0.30	0.23	0.11	0.42
	4.42	0.23	0.15	0.19	1.40
	5.22	1.17	0.79	2.23	3.10
	1.66	2.08	6.05	6.99	7.07
	4.10	0.83	4.35	5.41	5.75

Bridge: I-35 & 80 Westbound over Ft. D. D.M.S. R.R.

Resurfaced 1975 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1981	9.41	4.23	5.75	6.69	8.09
	4.88	0.60	0.11	0.23	2.84
	6.24	1.97	0.26	0.11	0.38
	6.77	1.44	5.07	6.16	7.90
	3.82	2.08	4.73	3.70	4.80
	3.02	0.60	0.15	0.15	1.21
1983	6.65	0.26	0.11	0.08	0.11
	1.70	0.19	0.11	0.11	0.11
	8.58	5.75	2.84	1.51	1.70
	7.86	3.93	1.25	0.30	0.45
	10.13	5.14	6.58	5.82	8.43
	6.62	1.32	0.11	0.23	2.57
1985	4.75	2.08	4.99	5.75	5.10
	7.37	2.31	0.53	0.15	0.57
	11.07	4.61	0.38	0.34	2.80
	6.09	5.37	4.99	6.24	4.42
	8.81	4.73	5.48	5.71	5.52
	6.50	1.32	0.11	0.23	0.34
1987	6.65	6.16	8.01	8.47	7.90
	6.35	1.25	0.34	0.19	1.78
	8.24	1.44	0.19	0.26	0.79
	5.10	0.38	0.26	0.23	1.25
	4.08	1.32	3.78	2.99	2.99
	5.71	1.44	0.87	1.70	2.91
1989	3.52	0.64	1.02	1.89	1.63
	3.67	0.38	0.38	0.38	0.49
	10.58	3.02	0.30	0.45	2.57
	8.01	4.73	3.14	1.59	0.87
	9.64	8.43	8.96	7.30	9.45
	7.82	1.02	0.38	0.49	0.38

Bridge: I-35 Northbound over Raccoon River

Resurfaced 1973 - Iowa Method

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1974	4.5	0.3			
	2.6	0.3			
	3.5	0.4	0.3		
	3.8	0.5	0.4		
	2.6	0.5	0.5		
	2.4	0.7	0.4	0.4	
	3.7	0.3	0.5	0.3	
	5.1	0.5	0.4	0.4	
	3.5	0.4	0.4	0.4	
1975	7.94	0.61	1.22		
	2.18	0.33	0.89		
	3.28	0.45	0.36	2.62	
	8.58	1.18	0.45		
	7.90	0.39	0.22	0.20	
	5.33	0.45			
	4.84	0.33	0.39		
	3.51	0.39			
	6.12	0.33	0.33	0.79	
	5.90	0.28	0.28	2.18	
	2.85	0.28	0.23		
	1.29	0.33	0.32	0.99	
	3.72	0.42	0.28	0.28	0.17
	0.31	0.33	0.28	0.28	0.22
4.73	0.28	0.26	0.26	0.39	
1977	6.94		0.48		3.04
	1.81		0.07		2.77
	8.42		0.83		3.79
	0.62		0.42		5.34
	7.21		0.47		3.74
	5.76		0.48		3.89
	5.34		2.15		7.63

Bridge: I-35 Northbound over Raccoon River Continued

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1979	12.3	1.1	0.8	4.9	3.5
	5.9	0.2	0.3	3.3	3.3
	8.7	0.4	4.0	5.0	3.1
	6.5	0.2	1.2	6.6	4.9
	8.8	0.2	2.0	6.5	4.8
	8.7	0.6	4.5	6.7	3.0
	6.5	0.6	0.1	0.2	0.2
	8.3	0.3	0.2	0.1	0.2
	4.9	0.1	0.1	0.2	0.2
1981	9.6	2.0	0.8	3.3	3.5
	3.7	0.3	0.5	4.1	-
	9.2	2.6	5.1	2.8	3.4
	7.9	1.2	2.0	6.2	4.8
	7.1	0.6	0.5	5.0	6.3
	6.1	0.8	2.2	4.7	3.6
	10.6	1.0	0.2	0.1	0.2
	6.0	0.8	0.3	0.2	0.2
	8.6	1.2	0.3	0.1	0.2
1983	13.53	3.63	0.91	5.48	5.33
	2.08	0.30	0.19	2.34	3.33
	12.93	3.97	1.06	3.44	3.14
	5.90	5.86	7.22	7.26	4.95
	9.87	0.95	0.79	4.31	4.12
	8.77	1.06	0.57	4.38	N.T.
	8.28	0.95	4.57	4.84	N.T.
	8.13	0.30	0	0	0
	4.38	0	0	0.08	0.30
	4.20	0.26	0.19	0.19	2.19

Bridge: I-35 Northbound over Raccoon River

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)					
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5	
1985	14.74	6.73	1.44	5.10	5.48	
	16.78	6.09	0.83	6.01	4.69	
	14.06	3.67	5.18	4.95	3.86	
	16.18	1.25	7.48	1.81	6.43	
	10.55	0.34	0.72	5.41	4.99	
	10.40	1.85	3.33	4.80	3.40	
	10.02	0.64	0.30	0.45	0.38	
	9.34	0.49	0.30	0.30	0.60	
	1.78	0.38	0.49	1.59	2.19	
	7.30	0.83	0.38	1.13	4.35	
	1987	7.75	0.95	0.95	3.97	4.16
		6.12	0.64	1.29	4.16	
10.51		2.15	2.19	4.54	3.14	
8.43		0.76	0.23	0.26	0.26	
6.96		0.26	0.19	0.19		
4.88		0.30	0.15	0.45	2.38	
18.82		4.35	1.13	4.42	5.10	
6.65		0.49	1.47	6.96	4.76	
22.08		9.94	2.84	8.05	6.84	
9.34		4.73	8.24	6.50	2.84	
1989	11.45	5.93	1.63	4.65	4.27	
	7.67	2.00	1.25	2.76	2.76	
	12.85	2.53	1.63	4.65	4.54	
	7.45	1.89	2.15	4.54	---	
	8.69	1.63	2.15	3.67	3.67	

Bridge: I-35 Southbound over Raccoon River

Resurfaced 1973 - Latex Modified Concrete

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1974	3.8	0.4			
	4.7	2.3	0.4	0.4	0.4
	3.3	0.6			
	4.9	0.6	0.3	0.3	
	5.6	1.1	0.6		
	3.1	0.9	0.4	0.4	0.4
	4.7	0.9	0.3	0.4	
	4.0	0.3	0.3		
	4.3	0.9	0.4	0.4	0.4
1975	5.48	0.45	0.45		
	6.80	0.36	1.92		
	6.12	0.28	0.25	0.22	0.28
	4.08	0.61	0.44	0.58	0.36
	5.93	0.28	0.27	0.26	0.5
	5.78	0.28	4.01		
	5.93	0.92			
	7.11	0.69			
	6.27	0.40	0.45		
	6.12	0.52	0.38		
	7.94	0.27	0.33	0.31	0.71
	8.01	0.45	0.23	0.32	
	9.30	0.56	0.34	0.26	0.93
	6.31	0.84	0.22	0.27	0.88
4.99	0.26	0.26	1.18		
1977	7.56		0.62		4.43
	6.31		0.42		1.32
	4.65		0.21		0.14
	6.52		0.76		0.07
	5.13		0.14		0.21
	5.25		0.26		0.00
	5.41		0.07		0.07
	3.54		0.07		0.35
	4.99		1.18		0.83
	6.79		0.69		0.14

Bridge: I-35 Southbound over Raccoon River Continued.

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1979	6.01	0.49	0.11	3.48	5.97
	8.43	0.26	0.15	0.34	2.00
	5.52	0.15	0.11	0.19	2.53
	8.16	0.34	0.26	0.38	3.06
	9.34	0.76	0.08	2.80	2.76
	9.49	1.10	0.15	0.26	7.67
	1.47	0.64	0.08	1.06	2.19
	5.90	0.42	2.61	1.81	3.33
	7.86	0.45	2.31	4.12	3.70
1981	9.00	0.42	0.49	1.70	1.13
	8.35	0.83	0.34	2.57	1.85
	7.37	0.95	3.89	3.29	3.82
	6.46	0.42	0.11	0.15	0.99
	8.66	1.06	0.19	0.19	0.19
	8.01	1.59	0.30	0.15	0.15
	9.68	3.18	0.87	0.64	4.65
	11.45	0.19	0.26	0.60	3.70
1983	4.91	0.26	2.38	2.65	2.72
	6.88	0.87	3.02	3.78	3.21
	9.15	1.55	3.67	5.63	3.33
	7.18	0.60	1.97	2.15	1.93
	7.64	0.57	0.19	0.23	0.27
	9.87	1.29	0.19	0.11	0.34
	8.35	3.10	1.40	3.40	3.02
	8.96	0.11	0.11	0.04	1.59
	7.90	0.68	0.23	0.19	0.64
	7.86	0.19	0.11	0.15	0.87

Bridge: I-35 Southbound over Raccoon River

CHLORIDE CONTENT - LBS/CU. YD.

Year Sampled	Sample Depth (Inches)				
	0 - 0.5	0.5 - 1	1 - 1.5	1.5 - 2	2 - 2.5
1985	9.98	0.83	0.30	10.10	2.99
	13.46	1.32	0.30	1.02	1.17
	12.55	2.00	0.34	0.19	0.34
	8.32	0.30	0.30	0.19	0.68
	0.91	9.64	0.23	0.42	1.06
	10.47	2.08	3.10	4.65	3.10
	10.02	0.45	0.45	2.27	2.34
	12.66	0.60	0.23	0.19	2.46
	10.32	0.45	0.38	0.30	0.30
	9.60	2.42	0.30	0.42	3.36
	1987	9.26	0.87	2.78	4.35
6.88		0.23	0.23	0.38	1.02
9.90		2.72	0.26	0.19	0.68
7.52		4.99	0.23	0.26	0.30
9.56		1.63	3.59	2.34	1.02
7.94		0.38	0.30	4.20	1.85
7.26		0.91	3.14	2.15	1.74
7.56		0.38	0.26	1.25	2.57
9.49		0.45	0.19	0.23	2.04
13.23		4.80	2.57	1.63	0.57
1989		8.20	1.89	0.76	4.04
	8.96	0.87	0.64	0.49	0.76
	9.07	2.46	0.19	0.19	0.83
	8.32	1.06	1.32	4.46	3.97
	9.90	0.76	0.30	0.30	2.00
	9.26	1.32	0.19	0.30	0.68



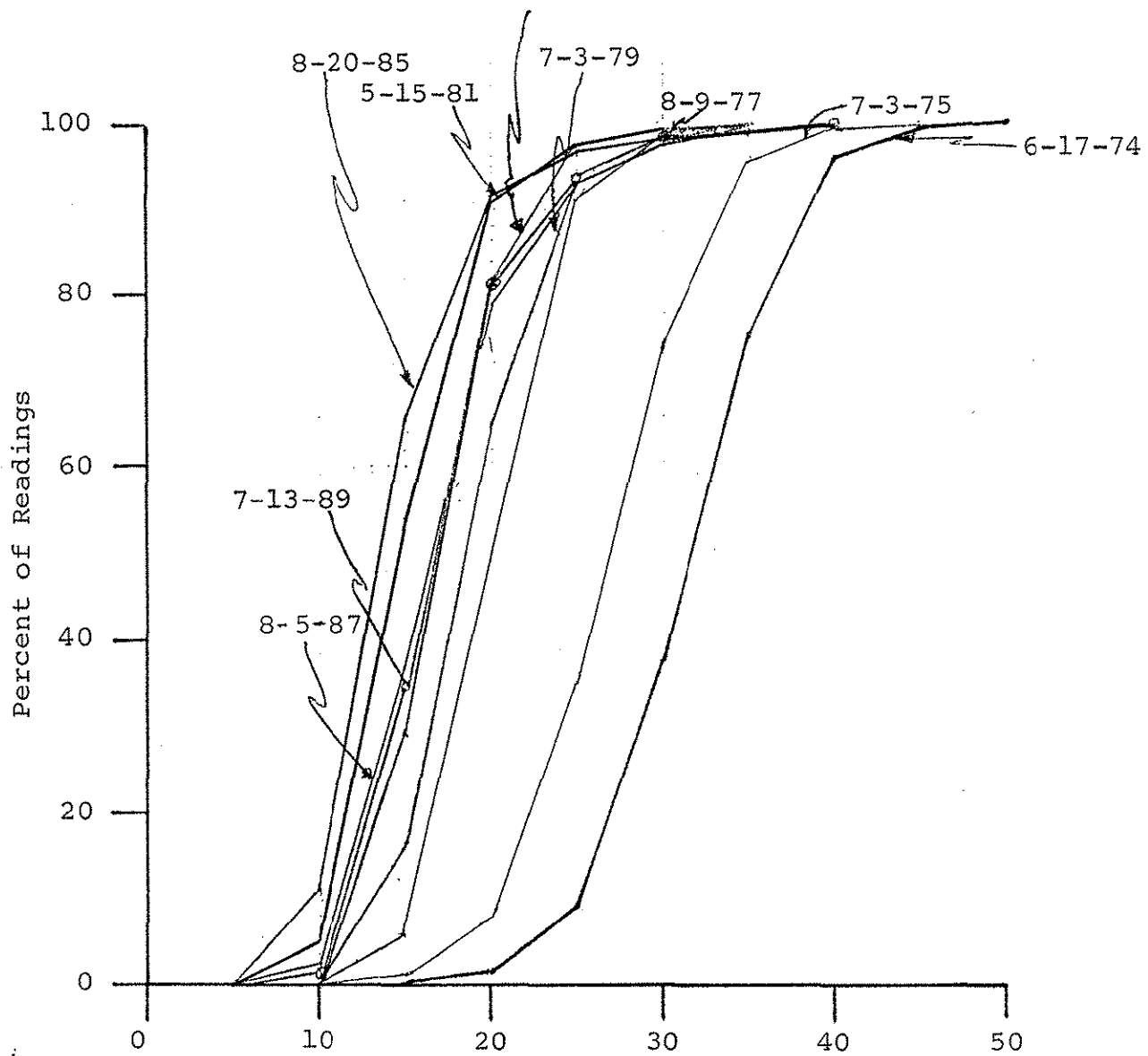
Appendix B  
Delamination Summary of Deck Overlays

Percent of Delamination  
in all Bridges for Project HR-501  
(for 10 and 12 year period)

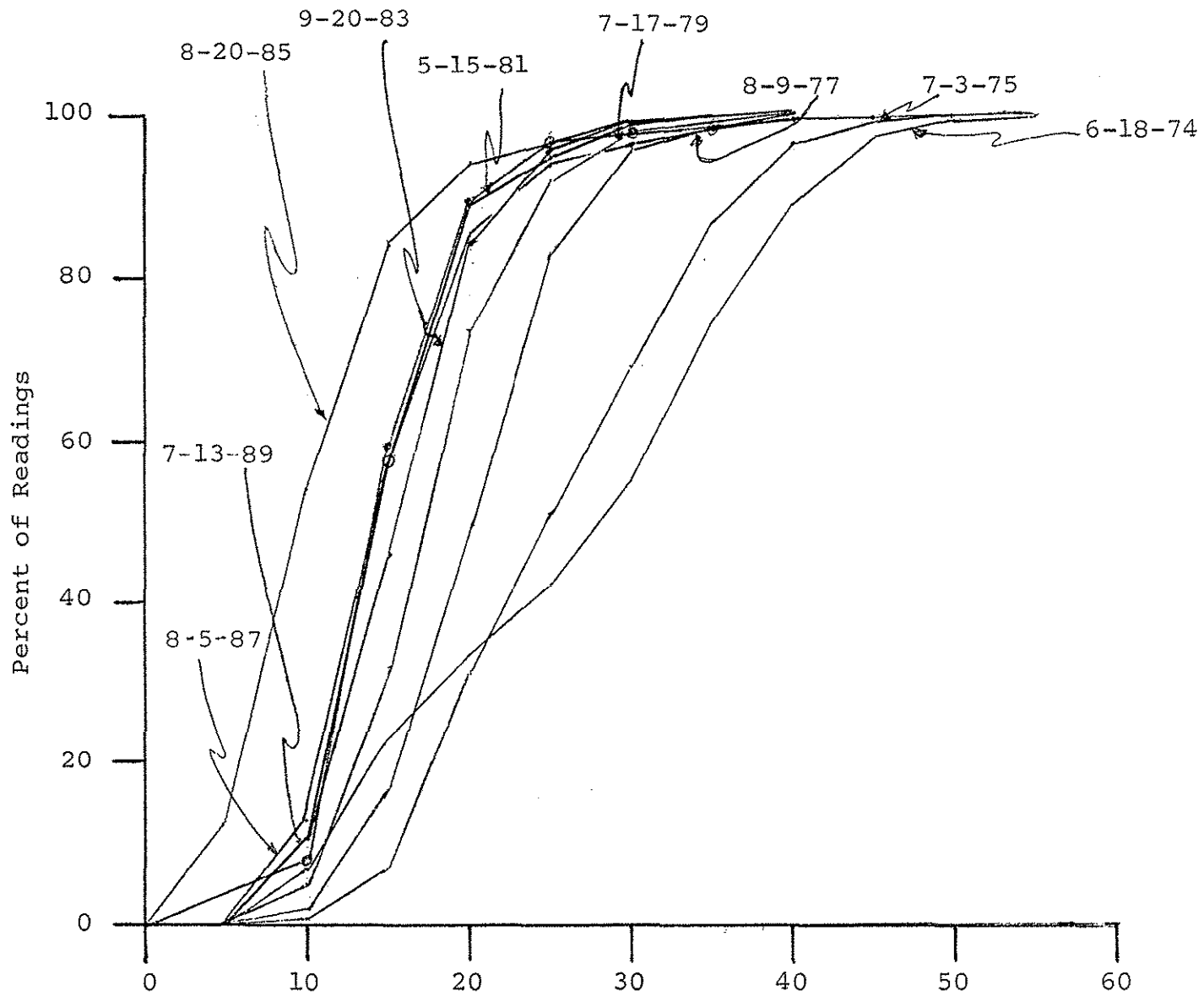
	<u>10 yr.</u>	<u>12 yr.</u>
I-35 NB over Raccoon River	0.7	0.8
I-35 SB over Raccoon River	1.7	3.3
US 169 SB over Lizard Creek	0.0	0.5
I-35 WB over Ft. D.D.M. R.R.	9.3	7.2
IA 25 over Turkey Creek	0.0	0.04
I-80 EB over Cedar River	0.4	0.4
I-80 WB over IA 146	2.4	1.66
I-80 over E. 29th St. Polk Co.	4.3	2.31
S.14th over I-80 Polk Co.	14.2	8.68
I-35 SB over Badger Creek	0.46	0.26
I-35 NB over South River	1.15	0.88
US 30 EB over Indian Creek	2.68	1.55
Old US 6 over I-80 Jasper Co.	0.01	0.00
I-80 EB over Polk-Jasper Co. Line	0.06	0.02
19th St. over I-235	5.40	5.40
Average Delamination	<u>2.85</u>	<u>2.20</u>

Appendix C  
Summary of Electrical Potentials Indicating Rate of Corrosion

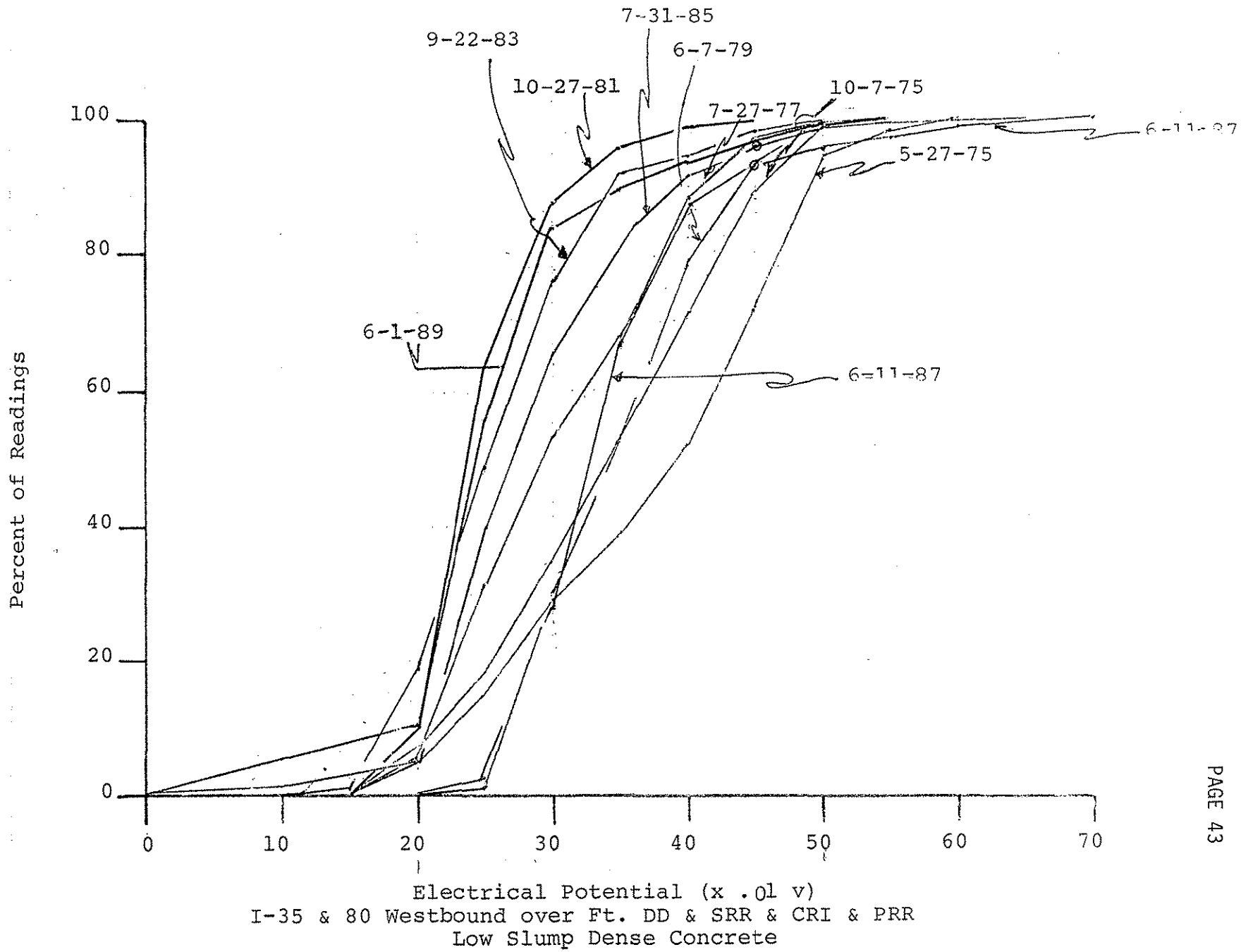
9-20-83

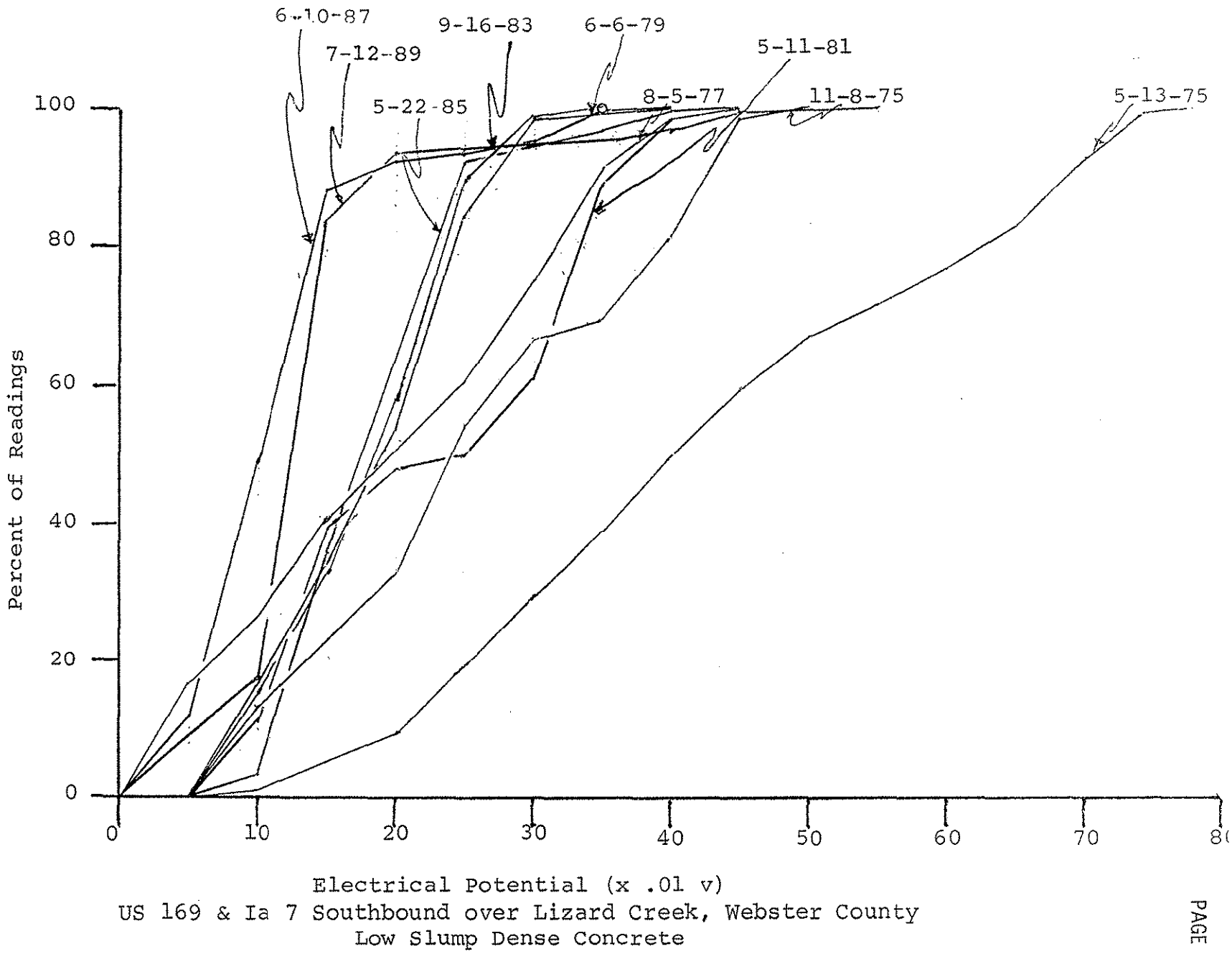


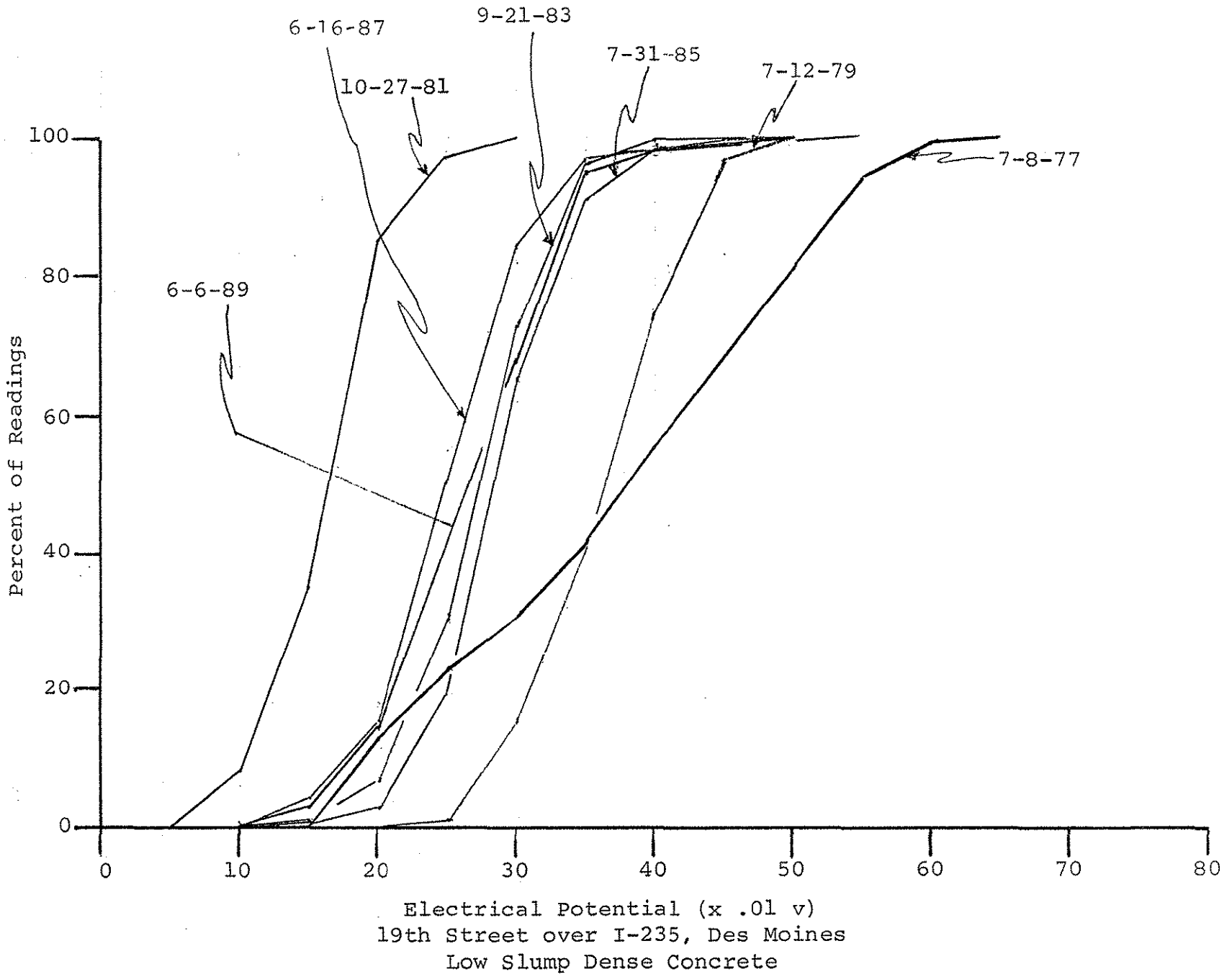
Electrical Potential (x .01 v)  
I-35 Southbound over Raccoon River.  
Latex Modified Concrete



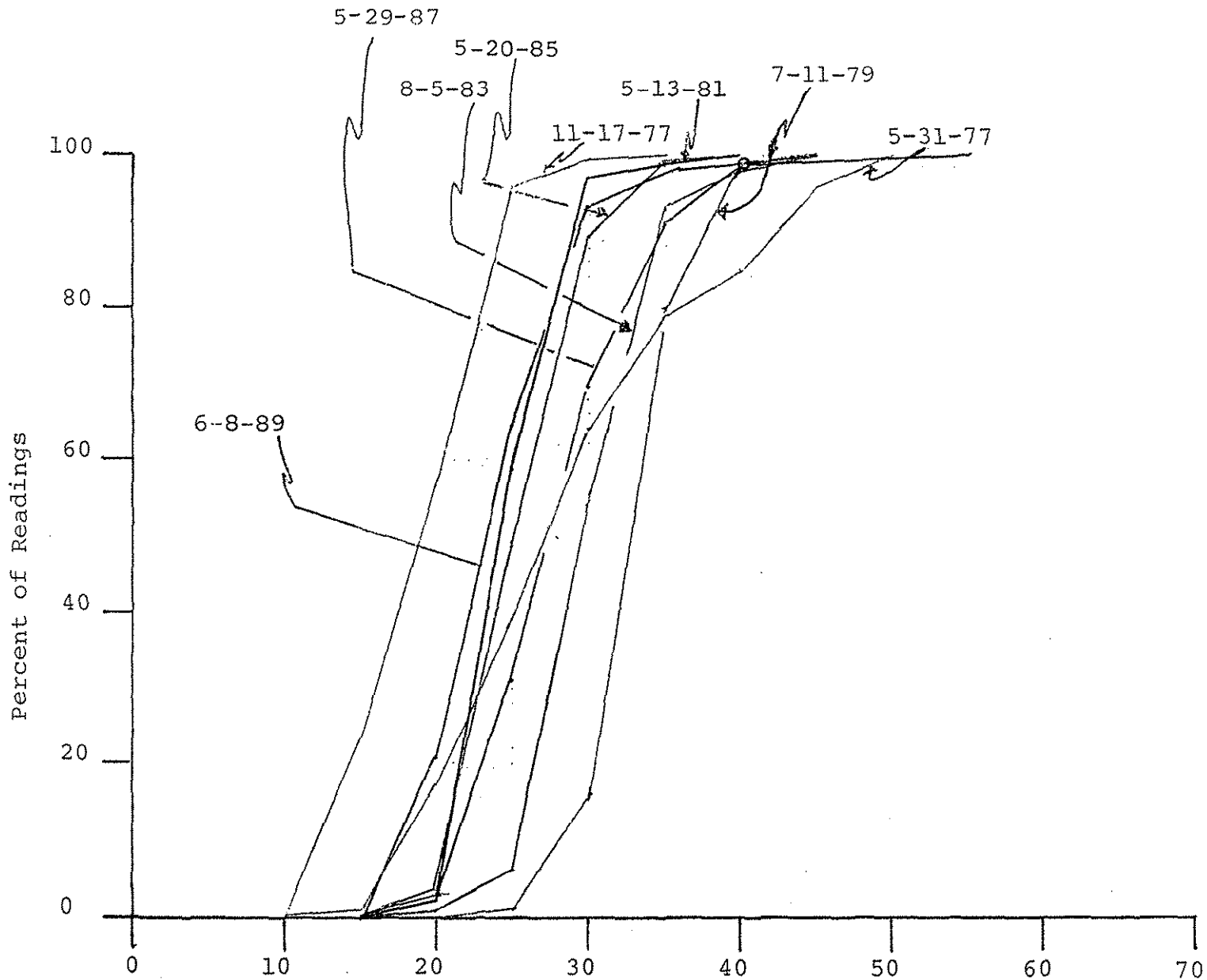
Electrical Potential (x .01 v)  
 I-35 Northbound over Raccoon River  
 Iowa Method Low Slump Concrete



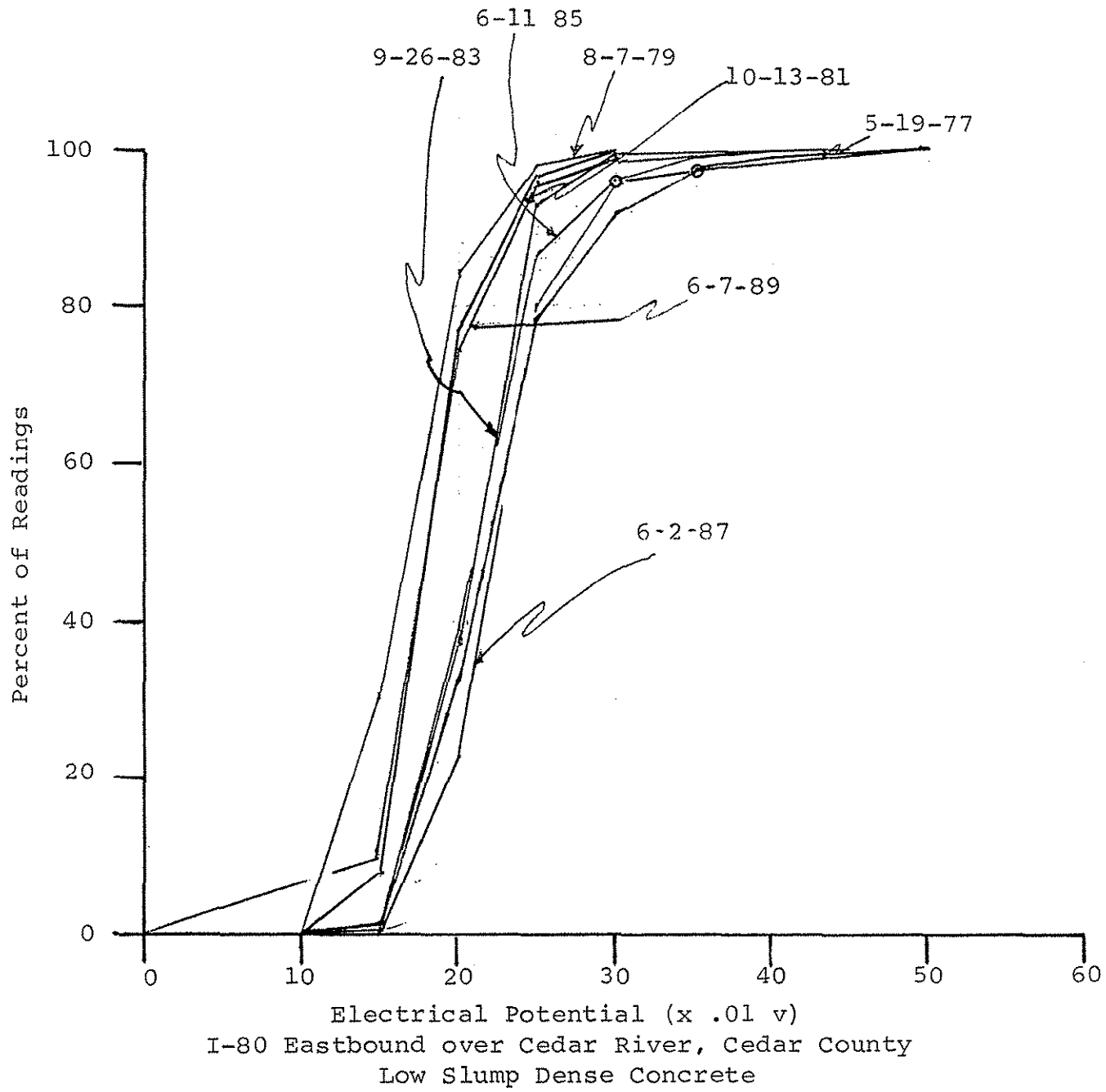


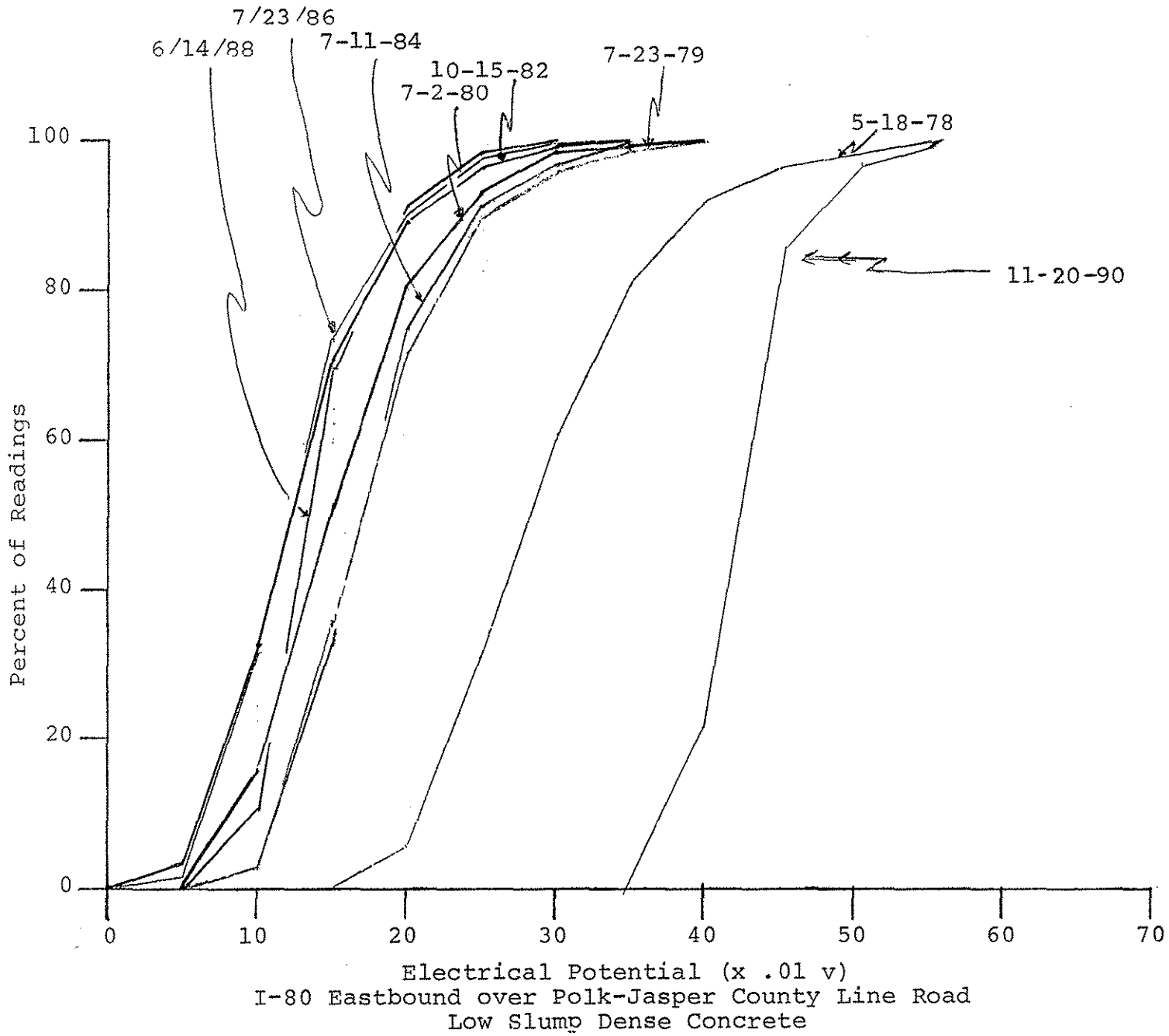


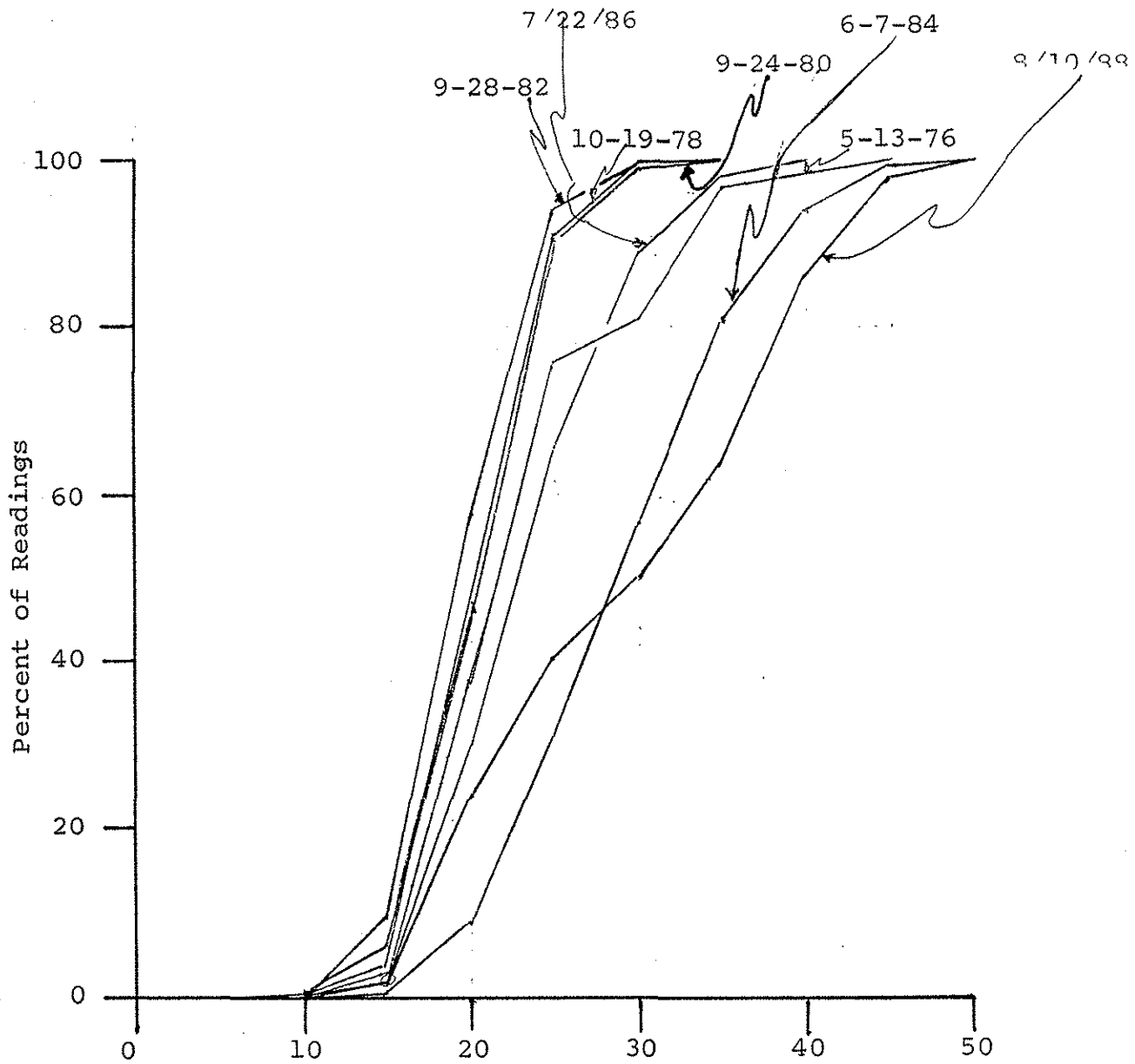




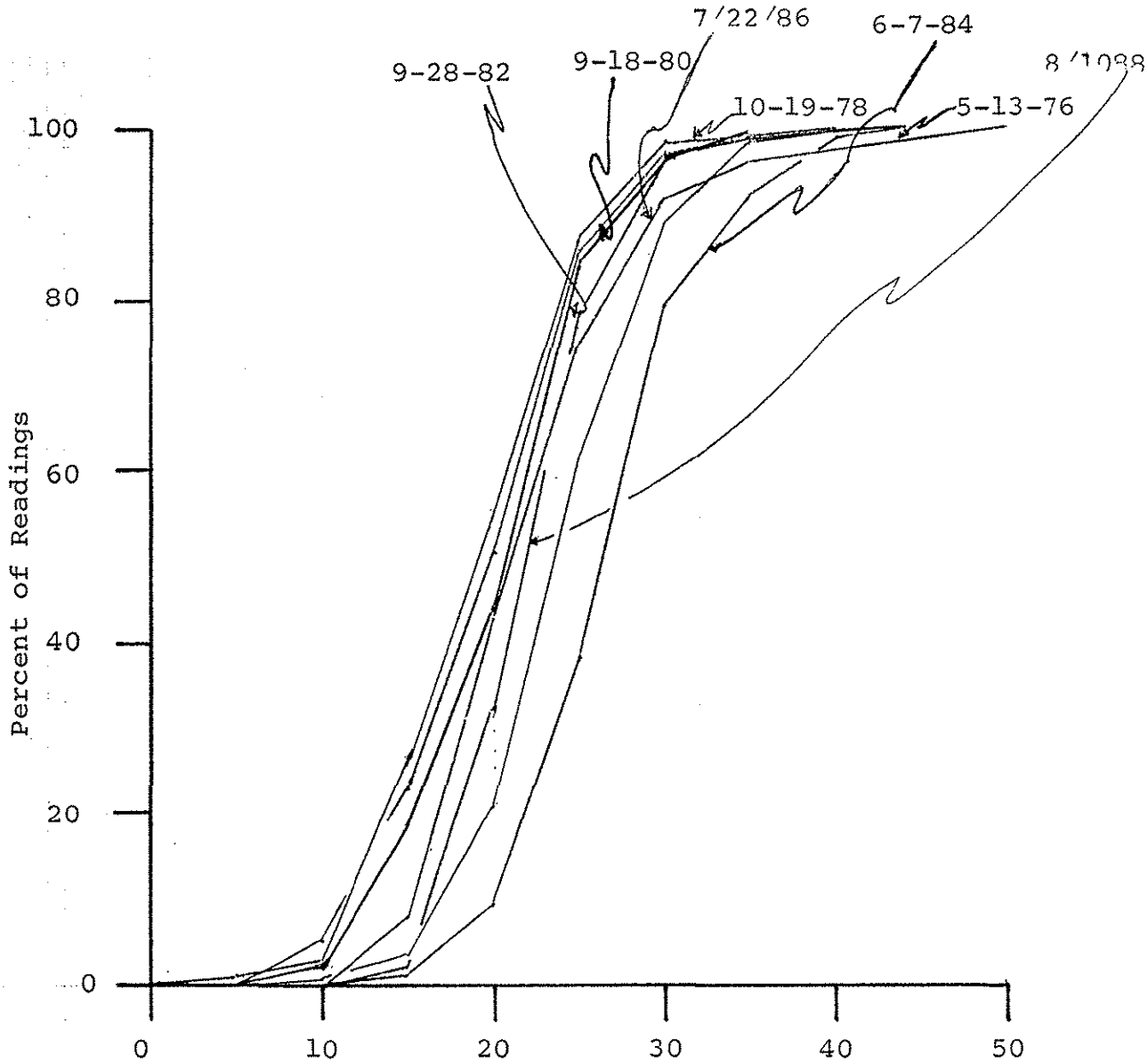
Electrical Potential (x .01 v)  
 Iowa 25 over Turkey Creek, Adair County  
 Low Slump Dense Concrete



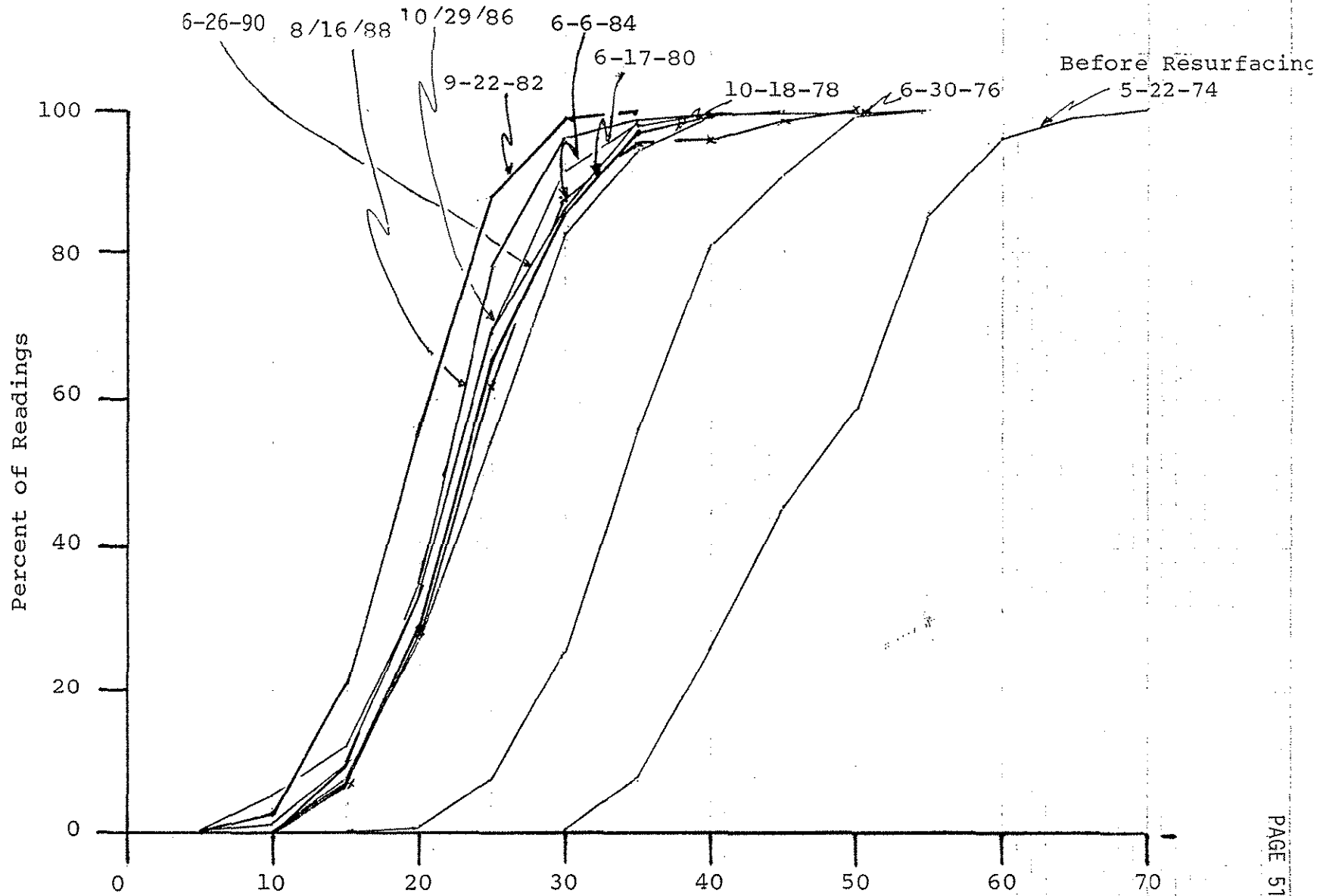




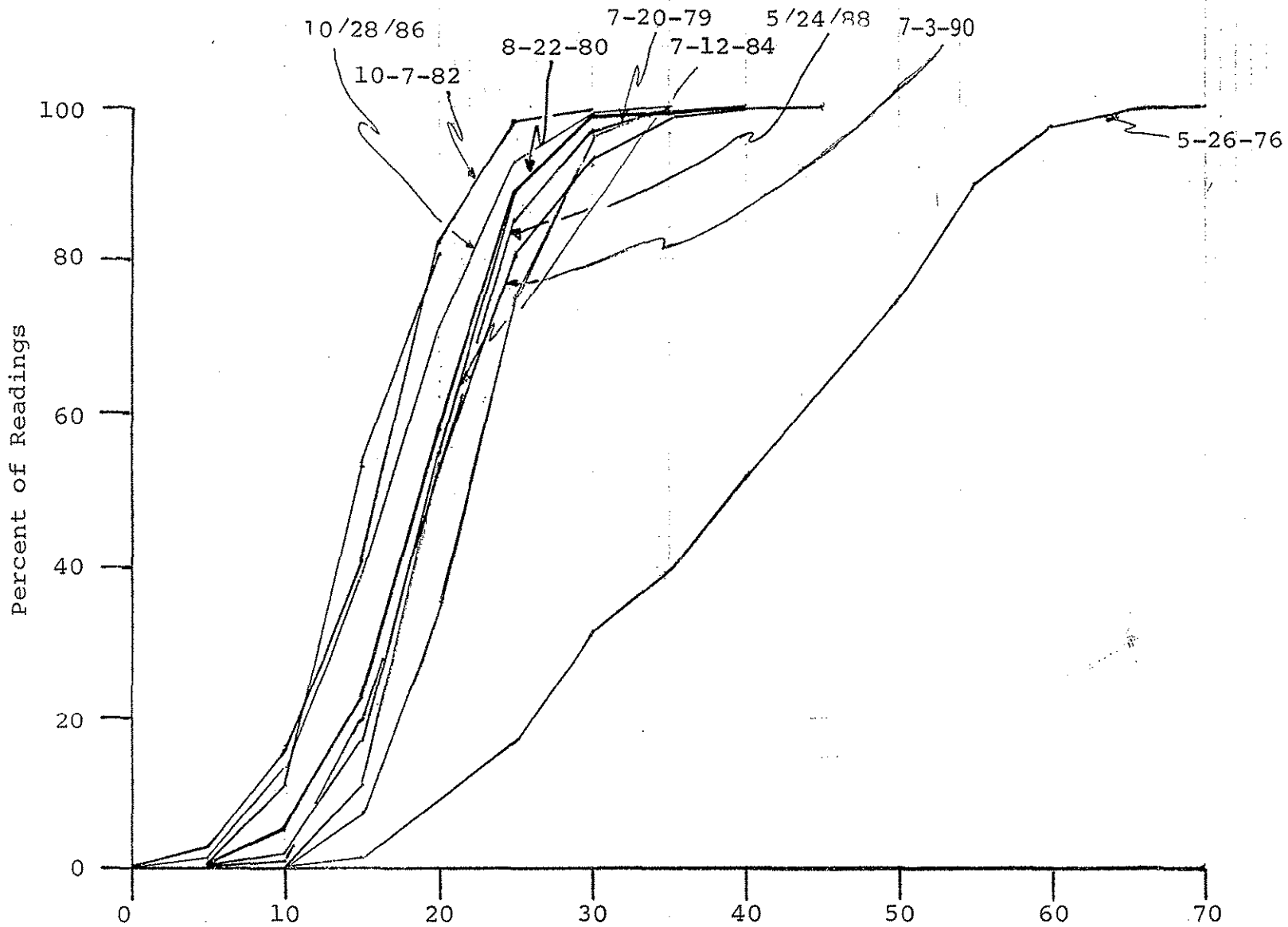
Electrical Potential (x .01 v)  
 I-35 Southbound Passing Lane over Badger Creek, Warren County  
 Low Slump Dense Concrete



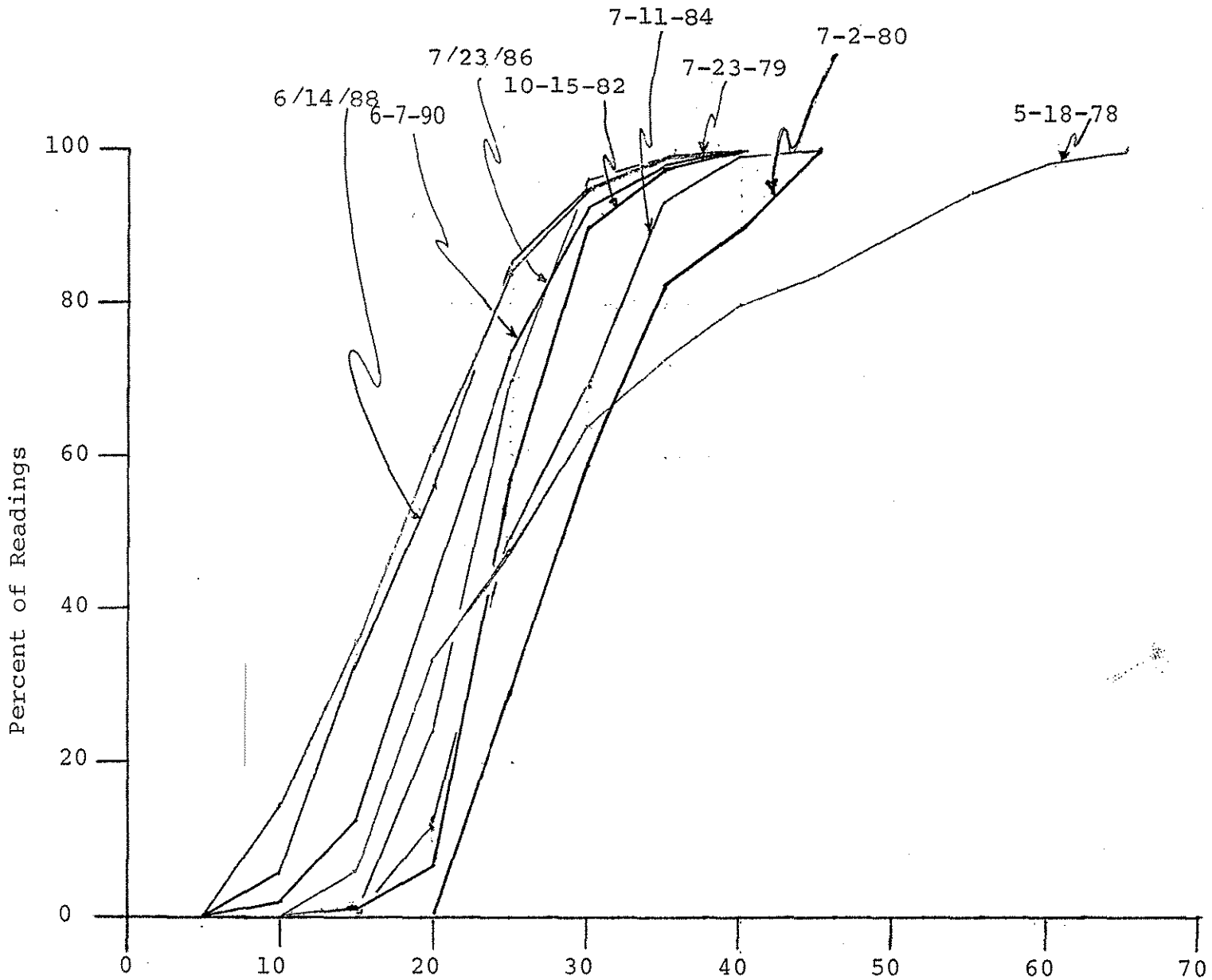
Electrical Potential (x .01 v)  
 I-35 Northbound over South River, Warren County  
 Low Slump Dense Concrete



Electrical Potential (x .01 v)  
 S-14 over I-80 Polk County  
 18 Low Slump Dense Concrete

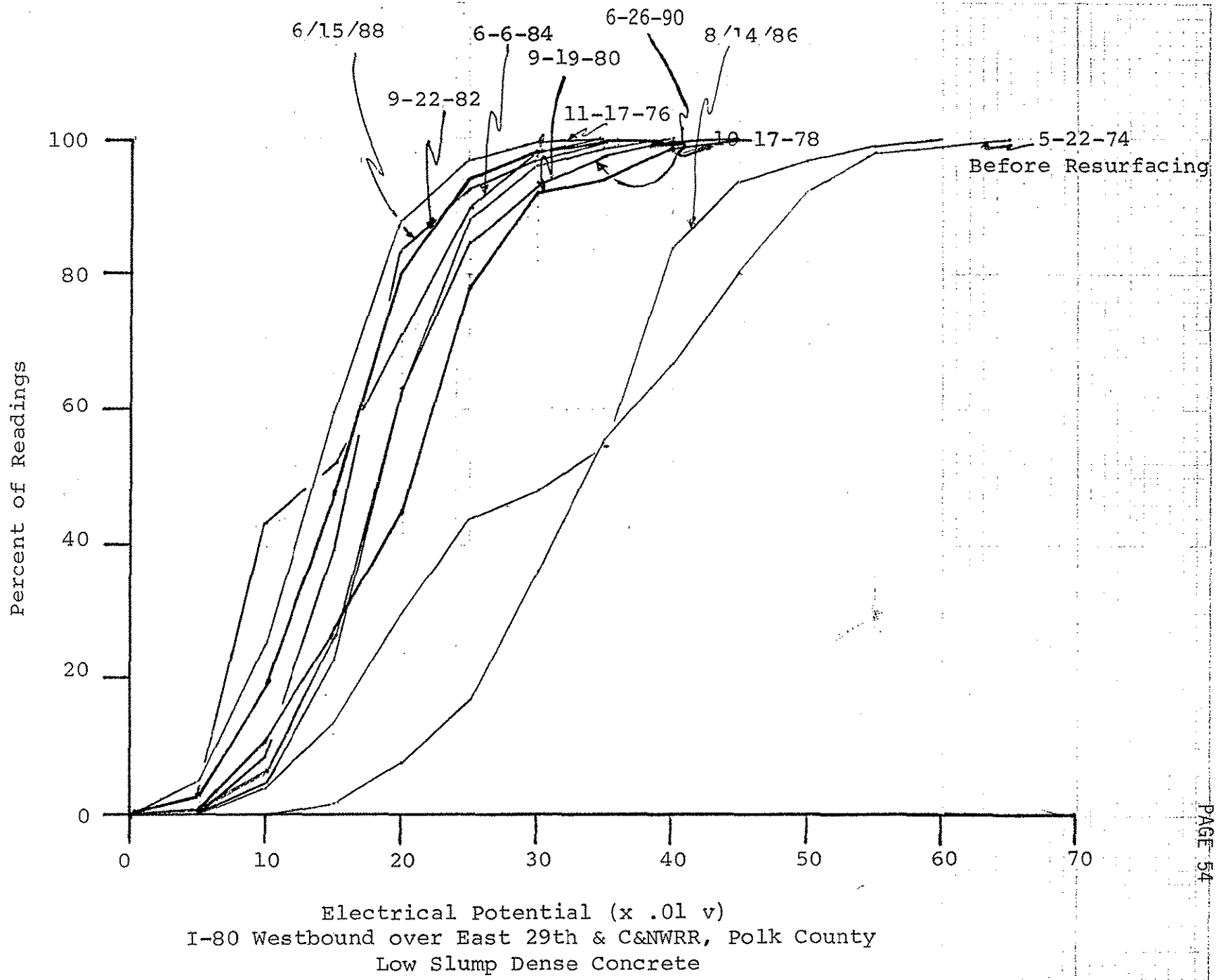


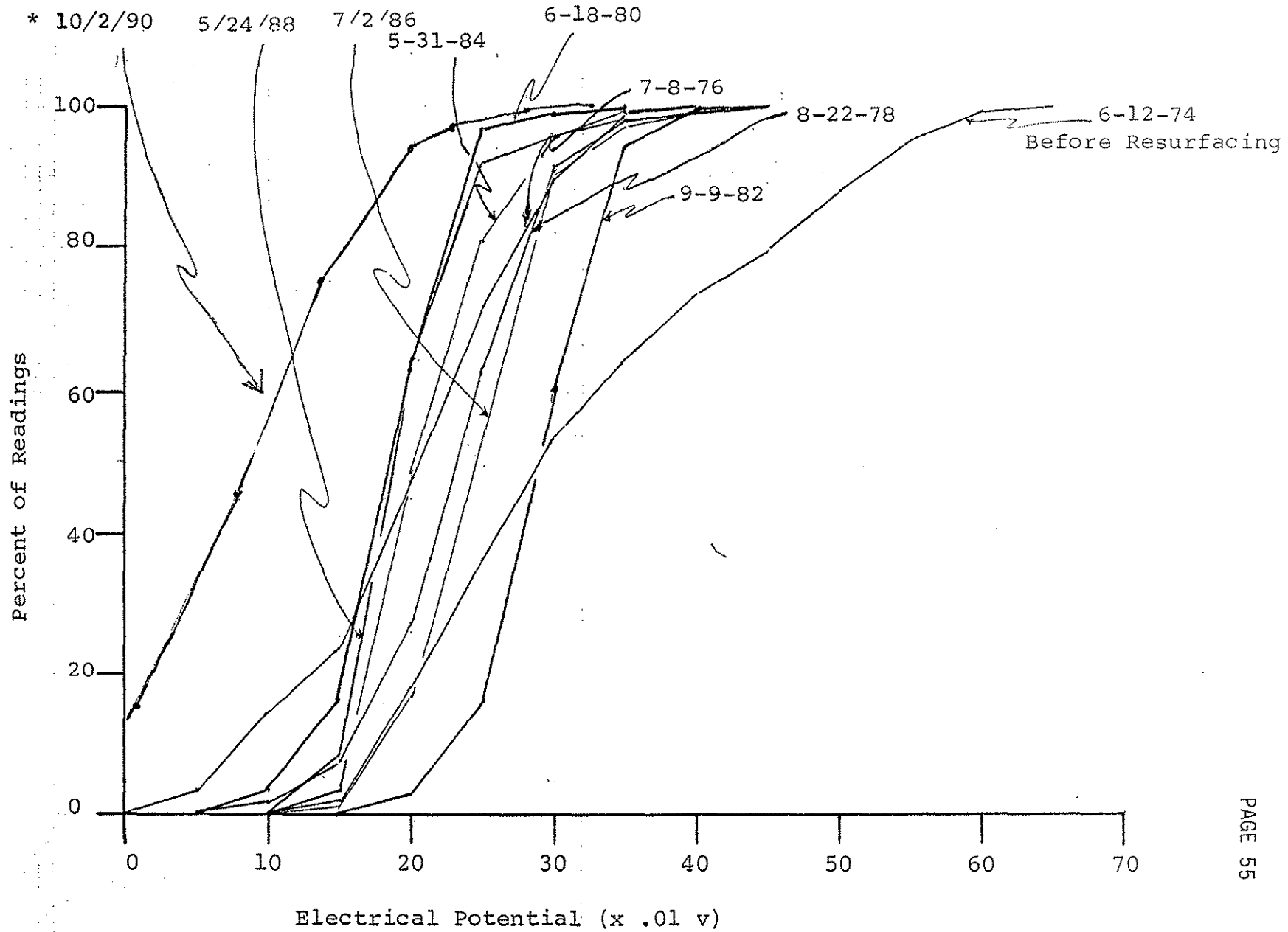
18 Electrical Potential (x .01 v)  
 US 30 Eastbound over Indian Creek, Nevada  
 Low Slump Dense Concrete



Electrical Potential (x .01 v)  
 US 6 over I-80 - Jasper County  
 Low Slump Dense Concrete







\*Epoxy Injection had been used prior to this reading.

Electrical Potential (x .01 v)  
 I-80 Westbound over Ia 146  
 Low Slump Dense Concrete