Thin Overlay

SR 5 OC Bridge 900/12W
SR 5 OC Bridge 900/13W

WA-RD 234.1
Post Construction Report
June 1991

Washington State Department of Transportation
Highway Division
Bridge and Structures
Transportation Building, KF-01
Olympia, Washington 98504-5201

in cooperation with the
United States Department of Transportation
Federal Highway Administration

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO.	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.

4. TITLE AND SUBTITLE

Thin Overlay
SR 5 OC Bridge 900/12W
SR 5 OC Bridge 900/13W

5. REPORT DATE

June 1991

6. PERFORMING ORGANIZATION CODE

WA86-06,07

7. AUTHOR(S)

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8. PERFORMING ORGANIZATION REPORT NO

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Washington State Department of Transportation
Transportation Building
Olympia, WA 98504

10. WORK UNIT NO.

11. CONTRACT OR GRANT NO.

None

12. SPONSORING AGENCY NAME AND ADDRESS

Same

13. TYPE OF REPORT AN PERIOD COVERED

Post Construction
June 1991

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

The study was conducted in cooperation with the U. S. Department of Transportation, Federal Highway Administration.

16. ABSTRACT

The Washington State Department of Transportation is conducting experimental field evaluations of selected polymer concrete thin (1/4 inch) overlays. The polymer concrete material is manufactured by private industry firms and installed on selected bridge decks under standard WSDOT construction contracts. Approximately 24 bridges will be involved in the experiment; eight of these are included in federal participating construction projects as experimental features.

Two polymer concrete thin overlays, Dural Flexolith and Sika Pronto 19, were applied to the decks of the SR 5 OC Bridge 900/12W and the SR 5 OC Bridge 900/13W, respectively, under Contract No. 3189, SR 5 Weigh Station to Corson Ramp Resurfacing. Both bridges are concrete box girder bridges located on SR 900 just south of Seattle, Washington.

17. KEY WORDS

Thin overlay, polymer concrete, bridge deck repairs.

18. DISTRIBUTION STATEMENT

19. SECURITY CLASSIF. (of this report)	20. SECURITY CLASSIF. (of this page)	21. NO. OF PAGES	22. PRICE
Unclassified	Unclassified	58	

DOT FORM 310-022 (11/86) -1216-

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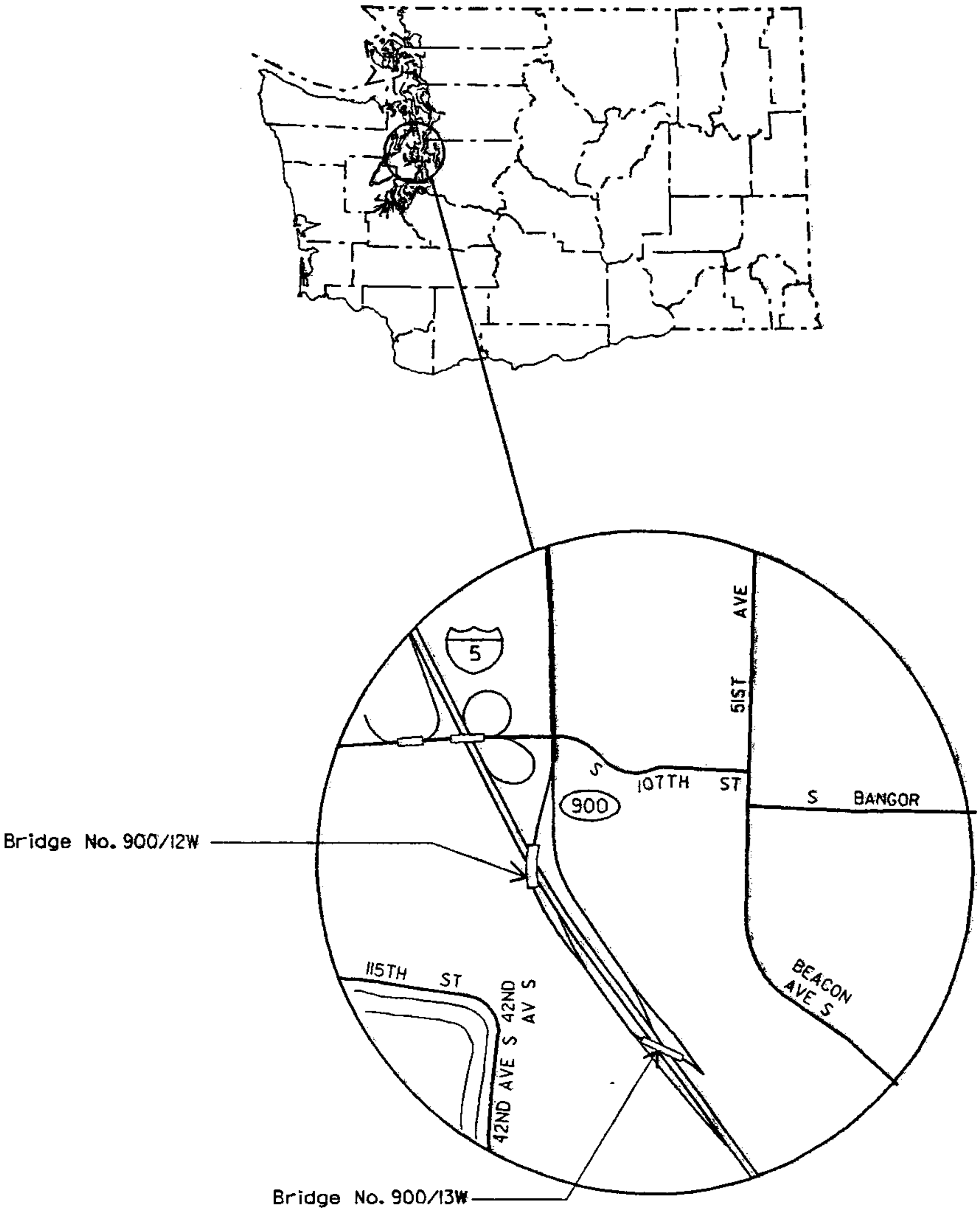
VICINITY MAP



PROJECT SITE

INTRODUCTION

These are the third and fourth bridges in a series of eight federal participating bridge deck overlay projects using thin polymer concretes. Each deck in the series will be constructed using a different commercially available polymer concrete system, with work performed under a standard WSDOT contract. Each deck will be monitored over a ten-year period to evaluate the long-term performance. A description of the total experimental project design can be found in Appendix A.

BRIDGE 900/12W
FLEXOLITH EPOXY OVERLAY

Study Site

Dural Flexolith was applied to the deck of the SR 5 OC Bridge 900/12W under Contract Number 3189, SR 5 Weigh Station to Corson Ramp Resurfacing. This bridge is a concrete box girder bridge located on SR 900 just south of Seattle.

This structure is 31 feet wide and 450 feet long, for a total deck area of 13,950 square feet. The existing deck had negative moment cracks over the piers, and the wheel paths were worn down to the aggregate. The average chloride content was 1.52 lbs. per cubic yard, and twenty-two percent of the chloride samples measured greater than 2.0 lbs. per cubic yard. Half-cell values were small, with most less than 0.05 volts negative. Average rebar cover was 1-3/4 inches.

Nominal delamination and spall repairs were followed by the application of the thin (1/4 inch) overlay.

Installation Procedures

The contractor began by shotblasting the deck with a Blastrac machine. The area along the curb was then cleaned with a small scabbler, and the bridge deck was blown clean with compressed air. The first layer of epoxy was applied with a squeegee at 80 sq. ft. per gallon. After the epoxy placement had progressed 20 lin. ft. along the deck, the aggregate was broadcast by hand at 1 to 2 lbs. per sq. ft. The second lift of epoxy was applied at the same rate as the first, but the aggregate was broadcast to excess. After the second lift had cured, the excess aggregate was broomed off the surface. Installation was completed in November of 1986.

The bridge overlay construction took 15 days to complete, including setup and removal of traffic control. Of this, seven days were spent on the actual overlay work. On the other eight days, work was impeded by rain and cold temperatures. The first coat, 10 feet wide by 450 feet long, took eight hours to install and seven hours to cure. The air temperature ranged from 44 degrees to 58 degrees.

Construction Problems

Bridge 900/12W was originally completed in November 1986. Areas of the completed overlay that did not cure were removed and replaced on the east half of the deck. At the contractor's option, the areas that displayed incomplete curing on the west half were not repaired in November of 1986. Repairs were done later.

Initial field testing was performed in June of 1987. At that time, the overlay failed the resistivity test and several areas of uncured epoxy were evident. Visual inspection of Bridge 900/12W showed approximately six areas (1′ x 1′ to 2′ x 2′) on the west half that were soft and had not retained sufficient aggregate to provide adequate skid resistance. Tests by the Materials Lab indicated improper proportions of resin and hardener in the uncured areas. According to the district inspector, the correct proportions were used, but the manual stirring procedure may have resulted in inadequate mixing. The overlay thickness averaged 3/16 of an inch. Specifications required a minimum of 1/4 inch.

The contractor began remedial work on June 20, 1988, by sawcutting the limits of the defective areas and chipping them out. The repair areas were patched with the epoxy concrete overlay material specified in the original contract. The deck was shotblasted and another lift of epoxy concrete was placed on the entire deck, using the original procedure. All work was completed on July 10, 1988. Field testing was performed in July of 1988.

Bridge 900/12W was visually inspected in April of 1990 and the overlay appeared to be in good condition. Friction values ranged from 43 to 52, with the average at 47.

Acceptance Testing

Specifications required the average bond strength to be a minimum of 300 psi or failure in the bridge deck Portland cement concrete. Two of the ten bond pull-off tests in 1988 broke in the epoxy overlay. Neither of the breaks in the epoxy met the minimum 300 psi strength. The other eight breaks occurred in the old concrete or the pipe cap adhesive.

Friction tests were conducted after the final lift of epoxy was placed on the bridge. The values obtained in July 1988 ranged from 55 to 63, with the average at 59. Contract specifications required a minimum of 50.

Contract specifications require that 70 percent of resistivity test readings should be above 250,000 ohms, with no single reading less than 100,000 ohms. In June 1987, resistivity test results did not meet specification requirements. In September 1988, after application of additional overlay material, all readings exceeded the minimum specifications.

Conclusions and Recommendations

Final bond strength, friction tests, and resistivity tests of this thin overlay were acceptable. A number of soft spots appeared in the overlay during construction. These spots would not cure properly and had to be removed and repaired. WSDOT laboratory and project personnel indicate that the problem was most likely due to improper mixing of the resin.

The need to apply a third lift of overlay material to attain the required resistivity poses a concern regarding rapid construction objectives. Since adequate resistivity was obtained on a prior WSDOT overlay project using this material, it appears that the problems arose more from construction quality control (mixing method) than from the materials used.

BRIDGE 900/13W

SIKA PRONTO 19 METHYL METHACRYLATE OVERLAY

Study Site

Sika Pronto 19 was applied to the deck of the SR 5 OC Bridge 900/13W, under Contract Number 3189, SR 5 Weigh Station to Corson Ramp Resurfacing. This bridge is a concrete box girder bridge located on SR 900 just south of Seattle.

This structure is 31 feet wide and 450 feet long, for a total deck area of 13,950 sq. ft. The deck was worn in the wheel paths to the extent that aggregate was exposed. Some pop-outs and transverse cracks were observed. Forty-two percent of the chloride samples measured greater than 2.0 lbs. of chloride per cubic yard. All half-cell values were less than 0.1 volts negative. Three percent of the rebar had concrete cover of less than one inch. Wheel rutting measurements ranged from 1/16 inch to 3/16 inch.

Nominal delamination and spall repairs were followed by the application of a thin (1/4 inch) overlay.

Installation Procedures

In June of 1987, the contractor began by shotblasting the deck with a Blastrac machine. The thin strip at the curb was cleaned with a small scabbler. Three small areas of deck repair were sawcut, chipped out, and patched with Sika Pronto 11. The deck was blown clean with compressed air, and a prime coat of the neat material was applied with squeegees at a rate of 150 sq. ft. per gallon. After the prime coat was applied, the Sika Pronto 19 resin was mixed and applied with squeegees at a rate of 32 sq. ft. per gallon. As soon as the Sika Pronto 19 resin was squeegeed, the aggregate was broadcast by hand to excess. After the initial set of the material, the excess aggregate was swept off with a power broom.

The Sika Pronto 19 was mixed in five gallon batches with an electric drill mixer. The mixing was done on the bridge deck. The manufacturer's representative adjusted the amount of hardener as the temperature rose. There were problems throughout the day with the material pot-life. The Special Provisions called for a two lift application. The manufacturer's representative claimed the required depth could be attained with a single lift. It was decided to use a single lift. After brooming off excess aggregate, there were bare spots on the deck due to the resin setting up before the aggregate was applied. These areas were repaired using the original procedure.

The overlay construction in June of 1987 took 15 days to complete, of which 12 days were spent waiting for shipment of material needed to finish the job. The bridge was closed to all traffic for one weekend to accomplish the overlay.

Construction Problems

The first lift overlay was found to be deficient in depth throughout. The supplier and contractor agreed to place a second lift over the entire deck. The supplier had problems supplying sufficient material to finish the bridge. The deck received the second lift in intervals, over a 12-day period, as the material became available. After the second lift was applied, the overlay thickness and resistivity tests did not meet the contract specification requirements.

In the fall of 1987, significant debonding of the overlay from the deck and some interlayer delaminiation were observed. Bridge 900/13W had one large (2' x 10') area in which the polymer concrete was debonded and spalled off. On September 15, 1987, the contractor was notified that the overlay did not meet the specifications and would have to be repaired. The contractor decided to repair the delaminated areas and apply another lift over the entire deck.

In June and July of 1988, areas that were debonded were chain dragged to find the limits, then sawcut, and chipped out. These areas were sandblasted, blown clean with compressed air, and patched, using the original procedure. The whole deck was then overlaid with a third lift, after sandblasting and cleaning with compressed air. The work was accomplished with single lane closures, minimizing the disruption to traffic. This work was completed in two working days. The manufacturer's representative was on the job to assist the contractor. After all work was completed, state forces tested for resistivity, bond, and overlay thickness. The resistivity tests were satisfactory, the overlay failed the bond tests, and the overlay thickness was still deficient.

Quality control by the contractor was inadequate. Problems included:

1. Resin setting up before aggregate was applied.

2. Manufacturer's representative not being on the job site during all phases of the construction.

3. The second lift being applied intermittently.

4. Repairs being necessary during initial installation.

The deck was visually inspected again in April of 1989. Three areas approximately 2′ x 4′ had debonded and a loss of aggregate in the wheel path was noted in some areas.

Acceptance Testing

Specifications required the average bond strength to be a minimum of 300 psi or failure in the bridge deck Portland cement concrete. Eight of the ten bond pull-off tests in 1988 broke in the methyl methacrylate overlay. None of the breaks in the methacrylate met the minimum 300 psi strength.

Friction tests were conducted after the final lift of methacrylate was applied on the bridge. The values obtained in July 1988 ranged from 55 to 58, with the average at 57. Contract specifications require a minimum of 50.

Contract specificatons require that 70 percent of resistivity test readings should be above 250,000 ohms, with no single reading less than 100,000 ohms. In June 1987, the overlay resistivity tests were significantly less than required. In September 1988, after a third application of overlay material, all readings exceeded the minimum.

Conclusions and Recommendations

This overlay project posed numerous problems in construction sensitivity of the materials and in construction quality control. Repairs and application of additional overlay material have not resolved the problems with debonding, and a third application of overlay material was needed to raise the resistivity to meet specification requirements. The comparative successes of other thin overlays tested in this program suggest that, as used on this project, Sika Pronto 19 does not meet WSDOT protective overlay objectives.

This overlay will continue to be monitored and tested in accordance with the ten-year work plan. Should debonding be progressive, repairs will be made to preserve ride quality. Replacement is not currently warranted.

APPENDIX A

TOTAL EXPERIMENTAL

PROJECT DESIGN

TOTAL EXPERIMENTAL PROJECT DESIGN

General Background

Over time, the top few inches of a concrete structure can become contaminated with salt from the saltwater marine environment or from deicing agents used during the winter months. This condition destroys the passivity of the reinforcing steel and provides a favorable environment for the development of corrosive anode-cathode relationships on the surfaces of the reinforcing steel. The salt and moisture in the concrete serve as the electrolyte. A reinforcing bar will corrode at the anodes, with the rust expanding and cracking the concrete. Delaminations and spalls occur in the deck, with resulting deterioration.

Latex modified concrete (LMC), low slump dense concrete (LSDC), and asphalt concrete with waterproofing membranes are the most common systems being used for bridge deck overlays, to restore deteriorated decks and to help prevent further penetration of chloride into the deck concrete. These systems add extra weight to bridges. In addition, the latex modified and low slump concrete overlays require careful quality control during construction and generally require 48 to 96 hours of cure time before traffic can be restored to the structure.

In recent years, polymer concrete (PC) in the form of 1/4 inch thin bridge deck overlays has shown promise of providing a long-lasting, maintenance-free deck protection system. It is impervious to the penetration of salt, can be constructed with relative ease and with relatively simple construction equipment, allows traffic to be restored within 1 to 12 hours, and provides good skid resistance. No scarifying is necessary during construction; therefore, there is less potential for debonding and damage to rebars. These polymer concretes have a cross-linked polymer that replaces Portland cement as a binder in a concrete mix. Epoxy resins are commonly used in polymer concretes, but much attention has also been focused on the use of vinyl monomers such as polyester-styrene, methyl methacrylate, high molecular weight methacrylate, furane derivative, and styrene. Since the polymer constitutes the continuous phase, behavior of the PC will be determined by the specific polymer used.

Purpose

The purpose of the experimental project is to gain knowledge about field installation techniques and procedures and to assess the performance and effectiveness of the PC thin overlays over time.

General Project Description

WSDOT has elected to use PC overlays on eight federal aid and 16 state-funded bridges that needed deck rehabilitation and protection. The normal delamination and spall repairs have been followed by the application of thin (usually 1/4 inch) PC overlays. These PC overlays were done under usual WSDOT contracts. A number of different PC systems have been used on the bridges. Contract documents specify the type of overlay system for each bridge. A total of approximately 130,000 sq. ft. of bridge deck is involved in the FHWA experimental feature project portion of this study.

Installation of the PC overlay for the bridge deck has been in compliance with the manufacturer's recommendations. Contract documents require that a supplier's field representative be present during installation of the system. Complete records of field observations, testing, and subsequent monitoring is maintained for each installation, with emphasis on the cause and resolution of problems during any phase of the project. The district field office provides an end of construction report on each installation.

Annual inspections and testing of the experimental feature projects will be made over a ten-year period. The WSDOT Materials Laboratory will be responsible for all field testing and reporting on all field activities. See Appendix B for scheduled testing and reporting.

Control Section

The final performance evaluation report for each thin overlay application will include a comparison of the installation techniques and procedures with those for the latex modified and low slump concrete overlays. Likewise, the effectiveness of the permeability for deck protection and length of service life will be compared to the LMC and LSDC overlays in similar environments and service conditions.

The current "Bridge Deck Program Development" includes research for "Evaluation of Concrete Overlays for Bridge Applications." It is intended to utilize, to the fullest extent possible, the data collected and analyzed in that research as the basis for comparative evaluation of the overlays in this experimental feature project.

Tests

Annual inspections and testing of each federal aid bridge will be made over a ten-year period. The testing will include: 1) friction measurements for skid resistance of the overlay surface; 2) half-cell for corrosion activity; 3) chloride content for intrusion of corrosive chloride ions; 4) pachometer for rebar depth; 5) pull-off for bond strength; and 6) visual inspection for detection of surface deterioration, such as cracks, spalls, or delaminations. The schedule upon which each of these tests will be performed is shown in Appendix B.

Reporting

A post-construction report will be issued after completion of the construction project. Annual Form 1461 reports will be submitted through the WSDOT Research Office to FHWA summarizing the performance of the overlay. The testing results for each year will be reported to the Research Office with a brief letter report summarizing any observations or conclusions that can be made at that point. A final report will be issued at the end of the evaluation period. This report will contain all of the observations, test results, and conclusions from the study, along with any appropriate photographs.

APPENDIX B

PROJECT LIST AND TEST PLAN

Experimental Bridge Deck Thin Overlay Projects

	Federal Aid Projects	District	Deck Area (Sq. Ft.)	Deck Rating	Install Date	Contract Number	System Type	Dollars Per Square Yard
403/7	Grays R. Rosburg	4	5,360	7	8/86	3090	Degussa	35
12/915	Snake R. Clarkston	5	56,940	4	6/86	3107	Flexogrid	40
82/114S	Yakima R.	5	11,370	3	7/87	3131	Concressive 2020	77
82/115S	Naches R.	5	11,370	4	7/87	3131	Concressive 3070	77
900/12W	SR 5 OC	1	13,950	5	11/86	3189	Flexolith	60
900/13W	SR 5 OC	1	13,950	4	6/87	3189	Sika Pronto 19	55
5/316	Custer Way UC	3	6,190	4	1990	3361	EPI/Flex III	62.60
5/523E	S. 154th St. OC	1	7,300	6	8/88	3354	Conkryl	100
	Non Federal Aid Projects							
167/102	Third Ave. SW OC	3	7,216	7	8/87	3078	Flexogrid	43
167/104	Ellingston Rd. OC	3	7,172	7	8/87	3078	Flexogrid	43
167/106	First Ave. N. OC	3	6,424	7	8/87	3078	Flexogrid	43
161/10	SR 512 OC	3	11,120	7	6/86	3100	EPI/Flex III	40
167/21	Milwaukee Ave. OC	3	6,864	7	8/87	3183	Degussa	43
512/40	SR 167 OC	3	12,806	7	8/87	3183	Degussa	43
529/20W	Steamboat SL	1	20,472	5	10/87	XE 2625	Flexogrid	40
529/20E	Steamboat SL	1	21,840	3	10/87	XE 2625	Flexogrid	40
104/5.2	Hood Canal E 1/2	3	101,388	4	7/88	3316	Flexogrid	32
82/10S	Thrall Rd. O-Xing	5	18,992	5	4/85	2857	Flexolith	82
101/115	Chehalis River Br.	3	14,508	6	8/84	2643	Flexogrid	65
101/514	Mottman Road O-Xing	3	6,640	7	8/85	2945	Degussa	45
16/120	Olympic Inter UC	3	6,417	7	7/88	3336	Degussa	42
99/530	Duwamish R. (Bascule) (Wheel Paths)	1	17,028	6	8/88	3432	Flexogrid	Unk.
520/8	Evergreen Point (Drawspan) (Wheel Paths)	1	20,070	6	8/88	3432	Flexogrid	Unk.
97/2	BN RR OC	4	5,876	3	6/89	3530	Degussa	55

THIN OVERLAY EXPERIMENTAL PROJECT
TESTING AND ANALYSIS COSTS PER AVERAGE 13,000 $FT.^2$ BRIDGE

Responsible Unit	Work Item	Pre-Construct.	Post-Construct.	Year* 1	2	3	4	5	6	7	8	9	10	Totals
HQ ML	Friction Testing (x hrs) at $100/hr		(1 hr) $ 100	(1 hr) $ 100	(1 hr) $ 110	(1 hr) $ 121	(1 hr) $ 133	(1 hr) $ 146	(1 hr) $ 161	(1 hr) $ 177	(1 hr) $195	(1 hr) $ 215	(1 hr) $ 237	$1,695
HQ ML	Electrical *** Resistivity (x hrs) at $108/hr		(6 hrs) $ 648	(6 hrs) $ 648	(6 hrs) $ 713	(6 hrs) $ 784		(6 hrs) $ 948		(6 hrs) $1,147			(6 hrs) $1,527	$6,415
HQ ML	Half-Cell Testing (x hrs) at $108/hr	(8 hrs) $ 864				(1 hr) $ 131				(1 hr) $ 192			(1 hr) $ 255	$1,442
HQ ML	Chloride Testing (x hrs) at $108/hr	(2 hrs) $ 216				(1 hr) $ 131				(1 hr) $ 192			(1 hr) $ 255	$ 794
HQ ML	Rebar Depth (x hrs) at $108/hr	(2 hrs) $ 216												$ 216
HQ ML	Bond Testing (x hrs) at $108/hr		(2 hrs) $ 216	(2 hrs) $ 216		(2 hrs) $ 262							(2 hrs) $ 510	$1,204
HQ ML	Visual Observation (x hrs) at $108/hr		(2 hrs) $ 216	(2 hrs) $ 216	(2 hrs) $ 238	(2 hrs) $ 262		(2 hrs) $ 317		(2 hrs) $ 384			(2 hrs) $ 510	$2,143
**HQ Br. Branch & ML	Analysis & Report Writing (x hrs) at $27.50/hr		(40 hrs) $1,100	(8 hrs) $ 220	(8 hrs) $ 242	(8 hrs) $ 266	(4 hrs) $ 147	(8 hrs) $ 322	(4 hrs) $ 177	(8 hrs) $ 389	(4 hrs) $ 214	(4 hrs) $236	(40 hrs) $2,590	$5,903
	TOTALS	$1,296	$2,280	$1,400	$1,303	$1,957	$ 280	$1,733	$ 338	$2,481	$ 409	$ 451	$5,884	$19,812
	TOTAL CONTRACT FUNDING		$3,576											- 3,576
	TOTAL EXPERIMENTAL PROJECT FUNDING													$16,236

* 10% Annual Inflation Rate Assumed.

** Field data reporting will be by Materials Lab (ML). Analysis of data and final report by Bridge Branch.

*** Deleted per agreement with FHWA.

APPENDIX C

TEST RESULTS

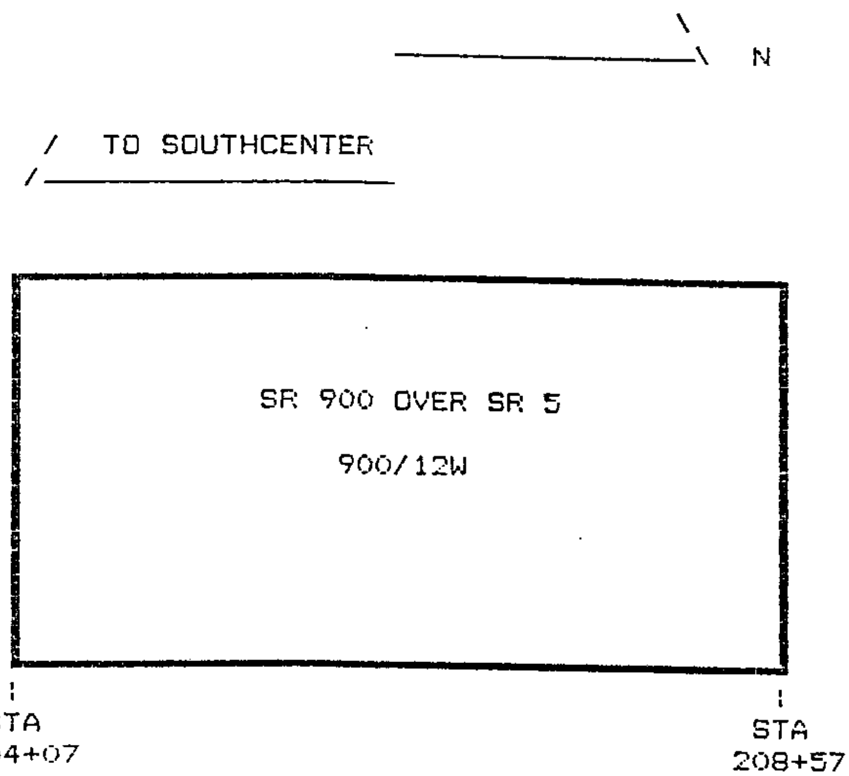
SR 900 OVER SR 5
900/12W
CONTRACT 3189

TESTING REQUIREMENTS

	Post Const 1987	** 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
FRICTION	7/87	7/88	x	x	x	x	x	x	x	x	x
RESISTIVITY	6/87	9/88	x	x		x		x			x
BOND	6/87	9/88		x							x
HALF-CELL				x				x			x
CHLORIDE				x				x			x

x = To Be Tested
**Deck resurfaced summer of 1988

Bridge
Orientation



BOND TEST RESULTS
SR 900 OVER SR 5 900/12W

Year	Station	Offset*	Depth	Load	PSI	Comments
1987	204+45	10 Rt	1/8"	625	199	90% Failure in surface aggregate
	204+57	4 Lt	3/16"	500	159	2% Break in concrete
	205+05	7 Lt	1/4"	375	119	25% Break in concrete
	205+25	5 Rt	3/16"	700	223	Surface aggregate failure
	205+57	13 Lt	1/4"	925	295	10% Break in conc-40% Inner bond fail
	205+74	6 Rt	3/16"	875	279	Surface aggregate failure
	206+07	5.5 Lt	3/16"	650	207	90% Break in conc
	206+12	7 Lt	3/16"	175	56	Bleeding area - failure in epoxy
	206+30	10 Rt	1/4"	1050	334	75% Break in conc
	206+57	9 Lt	3/16"	800	255	15% Break in conc
	206+77	3 Rt	3/16"	425	135	99% Break in epoxy bond
	207+07	4.5 Lt	3/16"	525	167	20% Break in conc
	207+47	6.5 Rt	1/4"	525	167	100% Break in surface aggregate
	207+57	13 Lt	3/16"	700	223	40% Break in conc-33% Inner bond fail
	208+09	7 Lt	3/16"	600	191	75% Break in conc
1988	204+69	3.5 Lt	1/4"	400	127	90% Break in conc
	205+11	7 Rt	3/16"	450	143	90% Break in conc
	205+74	8 Lt	1/4"	800	255	95% Break in conc
	206+05	11 Rt	3/16"	850	271	70% Break in conc
	206+79	6 Rt	1/4"	450	143	100% Cohesive failure in overlay
	206+83	11 Lt	5/16"	600	191	100% Break in conc
	207+47	8.5 Lt	1/4"	700	223	Break in pipe cap adhesive
	207+56	6.5 Rt	3/16"	350	111	100% Cohesive failure in overlay
	208+25	12 Rt	3/16"	1050	334	90% Break in conc
	208+41	2 Lt	1/4"	600	191	Break in pipe cap adhesive

*NOTE: Offset is feet right or left of centerline.

Percentages not accounted for are cohesive and/or adhesive failures in the epoxy overlay.

FRICTION TEST RESULTS
SR 900 OVER SR 5 900/12W

DATE	DIR	FN	AVE	RANGE
04/87	E	44		
	E	47		
	E	43		
	E	48		
	E	47		
	E	50		
	E	46		
	E	49	47	43-50
05/87	E	45		
	E	46		
	E	44		
	E	46		
	E	50		
	E	48		
	E	42		
	E	48	46	42-50
07/87	E	45		
	E	48		
	E	43		
	E	50		
	E	44		
	E	43		
	E	46		
	E	48		
	E	45	46	43-50
05/88	E	38		
	E	32		
	E	39		
	E	40		
	E	33		
	E	35		
	E	39		
	E	39	37	32-40
DECK RESURFACED				
07/88	E	57		
	E	63		
	E	57		
	E	62		
	E	55		
	E	62		
	E	56		
	E	60	59	55-63

DATE	DIR	FN	AVE	RANGE

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

JUNE, 1987

*Sta 204+07	5	10	15	20	25	30
4+12	152K	26K	33K	41K	65K	220K
4+17	100K	24K	95K	75K	100K	200K
4+22	130K	22K	70K	64K	90K	25K
4+27	145K	30K	52K	55K	170K	80K
4+32	34K	18K	55K	80K	22K	50K
4+37	28K	24K	65K	39K	75K	50K
4+42	20K	36K	32K	32K	80K	58K
4+47	45K	38K	80K	36K	31K	72K
4+52	22K	115K	57K	35K	90K	105K
4+57	100K	37K	40K	28K	140K	120K
4+62	45K	32K	38K	40K	250K	210K
4+67	40K	30K	38K	38K	300K	80K
4+72	40K	22K	40K	36K	200K	120K
4+77	x	x	x	x	x	x
4+82	60K	38K	40K	45K	250K	170K
4+87	22K	30K	38K	45K	55K	80K
4+92	150K	32K	75K	75K	28K	70K
4+97	50K	40K	100K	100K	115K	95K
205+02	120K	28K	160K	80K	200K	140K
5+07	540K	46K	70K	440K	100K	105K

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

JUNE, 1987
CONTINUED

	5	10	15	20	25	30
*Sta 205+07						
5+12	70K	34K	48K	80K	130K	80K
5+17	61K	20K	53K	110K	120K	130K
5+22	55K	31K	58K	320K	320K	280K
5+27	25K	90K	61K	200K	120K	220K
5+32	150K	240K	80K	55K	65K	45K
5+37	200K	280K	80K	60K	34K	22K
5+42	60K	65K	360K	60K	320K	240K
5+47	70K	130K	200K	95K	400K	170K
5+52	180K	200K	150K	90K	400K	1M
5+57	100K	120K	110K	60K	300K	1M
5+62	110K	100K	90K	125K	400K	400K
5+67	70K	80K	100K	130K	120K	240K
5+72	450K	32K	90K	140K	400K	270K
5+77	110K	28K	70K	280K	600K	700K
5+82	280K	110K	210K	300K	500K	500K
5+87	170K	120K	130K	70K	1M	500K
5+92	70K	70K	150K	90K	700K	450K
5+97	70K	100K	70K	120K	300K	380K
206+02	48K	30K	25K	80K	350K	280K
6+07	50K	110K	290K	80K	150K	280K

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

JUNE, 1987
CONTINUED

	5	10	15	20	25	30
*Sta 206+07						
6+12	42K	80K	190K	70K	240K	220K
6+17	28K	55K	120K	70K	200K	140K
6+22	28K	30K	90K	60K	300K	190K
6+27	32K	220K	100K	70K	250K	350K
6+32	45K	460K	150K	62K	100K	190K
6+37	75K	15K	190K	60K	400K	380K
6+42	50K	130K	140K	50K	700K	700K
6+47	50K	130K	100K	70K	450K	120K
6+52	70K	55K	40K	110K	190K	65K
6+57	30K	60K	30K	80K	310K	150K
6+62	22K	30K	32K	70K	15K	110K
6+67	28K	50K	13K	70K	30K	140K
6+72	30K	95K	27K	30K	35K	105K
6+77	60K	30K	30K	70K	150K	200K
6+82	70K	48K	60K	35K	260K	350K
6+87	70K	50K	160K	32K	95K	130K
6+92	55K	150K	26K	1800	45K	145K
6+97	38K	90K	30K	15K	21K	300K
207+02	50K	330K	50K	20K	120K	150K
7+07	32K	95K	30K	15K	140K	100K

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

JUNE, 1987
CONTINUED

	5	10	15	20	25	30
*Sta 207+07						
7+12	20K	55K	35K	20K	110K	70K
7+17	19K	45K	45K	45K	70K	32K
7+22	18K	45K	50K	30K	180K	90K
7+27	18K	40K	38K	45K	90K	25K
7+32	25K	45K	40K	40K	55K	37K
7+37	30K	30K	70K	70K	40K	24K
7+42	30K	30K	40K	35K	140K	30K
7+47	30K	40K	55K	40K	160K	40K
7+52	40K	95K	105K	32K	140K	90K
7+57	30K	70K	110K	40K	130K	35K
7+62	48K	110K	145K	60K	40K	17K
7+67	22K	150K	80K	50K	80K	55K
7+72	30K	13K	11K	70K	40K	30K
7+77	35K	50K	120K	40K	350K	60K
7+82	210K	50K	80K	50K	22K	30K
7+87	55K	200K	75K	60K	55K	160K
7+92	60K	45K	55K	40K	18K	150K
7+97	60K	55K	10K	50K	70K	50K
208+02	45K	40K	130K	60K	35K	1.4M
8+07	35K	80K	65K	70K	390K	600K

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

JUNE, 1987
CONTINUED

	5	10	15	20	25	30
*Sta 208+07						
8+12	35K	40K	100K	50K	290K	270K
8+17	30K	120K	300K	55K	70K	170K
8+22	30K	110K	180K	90K	1.5M	1M
8+27	80K	60K	100K	140K	450K	20K
8+32	35K	400K	130K	100K	2M	25K
8+37	65K	220K	170K	130K	800K	40K
8+42	x	x	x	x	x	x
8+47	100K	130K	1.5M	130K	600K	600K
8+52	250K	120K	1.5M	70K	125K	290K
8+57	&	300K	95K	22K	100K	200K
8+62	31K	160K	110K	500K	&	30K
208+67	38K	40K	50K	150K	240K	10K

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

SEPTEMBER, 1988

*Sta 204+07	5	10	15	20	25	30
4+12	2.4M	1.9M	3.1M	3.7M	5.4M	2.7M
4+17	3.1M	2.1M	4.3M	3.0M	11M	2.0M
4+22	3.5M	4.9M	3.5M	2.2M	17M	1.8M
4+27	2.5M	4.8M	3.3M	2.1M	9.5M	2.1M
4+32	1.5M	13M	2.7M	2.3M	3.6M	2.2M
4+37	1.9M	4.0M	2.6M	1.8M	2.3M	1.6M
4+42	3.7M	4.9M	2.4M	1.7M	1.6M	1.9M
4+47	2.5M	3.5M	3.2M	1.8M	1.5M	1.8M
4+52	1.7M	2.3M	2.0M	1.9M	1.9M	2.0M
4+57	1.7M	2.7M	2.0M	1.7M	2.4M	1.9M
4+62	2.5M	1.5M	1.8M	1.6M	1.9M	2.4M
4+67	1.8M	1.6M	2.0M	1.6M	2.0M	2.2M
4+72	1.6M	1.4M	2.3M	1.8M	3.0M	2.2M
4+77	1.7M	2.4M	3.2M	1.9M	3.6M	2.3M
4+82	1.4M	2.4M	2.4M	1.9M	1.5M	1.9M
4+87	1.8M	2.1M	2.2M	2.0M	1.9M	2.5M
4+92	2.0M	4.0M	4.2M	2.2M	1.1M	1.9M
4+97	4.6M	3.4M	4.0M	2.4M	2.7M	2.3M
205+02	2.7M	1.5M	7.5M	3.9M	3.5M	2.2M
5+07	1.5M	2.6M	4.2M	3.2M	2.5M	2.3M

& = Infinite Resistance

*Stationing along left curb
Offset is feet right of left curb ahead on station

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
*Sta 205+07						
5+12	1.1M	1.2M	3.2M	2.5M	2.6M	2.1M
5+17	1.2M	1.1M	1.9M	2.4M	3.7M	2.0M
5+22	1.5M	1.3M	1.6M	4.1M	3.2M	2.2M
5+27	1.6M	2.7M	2.4M	3.2M	4.4M	2.1M
5+32	1.3M	2.0M	1.9M	3.2M	4.4M	2.1M
5+37	1.8M	3.5M	4.1M	3.3M	5.2M	1.7M
5+42	3.0M	5.5M	3.3M	3.2M	5.4M	1.7M
5+47	1.6M	5.4M	4.5M	2.8M	9.0M	2.4M
5+52	2.0M	2.2M	3.3M	3.2M	5.8M	2.1M
5+57	2.7M	1.6M	3.3M	3.0M	4.2M	1.7M
5+62	2.0M	1.4M	2.0M	3.2M	1.4M	1.7M
5+67	1.7M	1.0M	1.6M	2.3M	4.4M	1.8M
5+72	1.5M	780K	1.4M	2.4M	3.7M	2.1M
5+77	2.3M	1.4M	1.7M	2.0M	3.3M	1.8M
5+82	2.0M	2.8M	3.1M	2.1M	4.2M	1.8M
5+87	2.3M	2.4M	1.6M	2.1M	5.2M	2.3M
5+92	1.8M	1.4M	1.8M	2.2M	4.5M	1.6M
5+97	1.7M	1.3M	2.8M	1.8M	2.4M	2.2M
206+02	1.2M	1.0M	7.5M	2.3M	2.4M	2.5M
6+07	1.9M	1.1M	4.3M	3.8M	5.7M	2.1M

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
*Sta 206+07						
6+12	1.9M	1.8M	3.6M	3.7M	4.0M	2.1M
6+17	2.0M	2.2M	2.7M	2.4M	5.2M	2.0M
6+22	1.8M	2.9M	2.4M	2.3M	4.6M	2.3M
6+27	1.9M	2.0M	2.4M	2.5M	2.8M	2.3M
6+32	1.6M	4.2M	2.0M	2.9M	3.7M	2.5M
6+37	1.4M	2.0M	1.8M	2.7M	2.0M	3.6M
6+42	1.5M	3.0M	3.4M	3.0M	4.2M	2.7M
6+47	1.2M	2.0M	1.7M	3.0M	3.0M	2.4M
6+52	1.5M	1.8M	1.6M	2.9M	3.2M	2.0M
6+57	1.4M	1.8M	1.4M	3.0M	2.5M	1.7M
6+62	1.0M	1.7M	1.9M	2.4M	2.0M	2.2M
6+67	1.2M	2.0M	3.0M	2.1M	2.8M	2.2M
6+72	1.8M	3.5M	2.1M	2.2M	1.8M	2.2M
6+77	1.7M	1.4M	1.5M	2.2M	2.6M	2.7M
6+82	1.7M	1.2M	2.2M	1.8M	3.0M	2.7M
6+87	1.5M	1.2M	2.9M	1.4M	1.8M	2.2M
6+92	2.4M	1.9M	2.0M	1.1M	2.9M	2.0M
6+97	1.3M	2.4M	1.3M	1.3M	3.0M	1.9M
207+02	2.2M	4.1M	2.0M	1.5M	1.8M	1.7M
7+07	3.4M	1.5M	2.0M	1.4M	1.9M	1.4M

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
*Sta 207+07						
7+12	1.5M	1.0M	1.3M	1.2M	1.6M	1.6M
7+17	700K	1.6M	2.1M	1.8M	3.6M	1.9M
7+22	717K	2.0M	1.3M	1.3M	3.6M	1.6M
7+27	950K	1.3M	1.5M	1.4M	950K	1.9M
7+32	1.5M	2.1M	2.0M	1.3M	1.5M	800K
7+37	1.4M	1.2M	1.4M	1.5M	1.7M	800K
7+42	1.6M	2.2M	1.7M	1.1M	2.0M	900K
7+47	1.6M	1.2M	1.8M	1.3M	2.0M	1.3M
7+52	1.4M	1.4M	1.4M	1.2M	2.0M	1.1M
7+57	1.0M	1.3M	1.5M	1.6M	1.9M	1.6M
7+62	1.4M	1.9M	1.3M	1.3M	1.5M	1.5M
7+67	930K	1.6M	3.0M	1.1M	1.4M	1.4M
7+72	1.2M	1.3M	1.3M	1.3M	1.1M	1.7M
7+77	1.7M	1.1M	1.7M	1.8M	2.8M	1.6M
7+82	2.4M	930K	1.5M	1.6M	2.2M	1.9M
7+87	1.1M	1.1M	1.5M	1.9M	2.4M	1.7M
7+92	770K	1.2M	1.4M	1.9M	2.5M	1.7M
7+97	925K	1.2M	1.7M	1.7M	4.2M	2.2M
208+02	1.2M	1.1M	2.0M	2.1M	3.0M	3.7M
8+07	910K	1.8M	1.7M	1.9M	3.5M	8.8M

& = Infinite Resistance

*Stationing along left curb

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/12W

SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
*Sta 208+07						
8+12	900K	2.0M	1.7M	1.8M	6.3M	11M
8+17	750K	1.8M	2.0M	2.0M	9.7M	21M
8+22	1.9M	1.7M	1.3M	2.5M	6.5M	9.5M
8+27	2.2M	1.4M	1.1M	1.6M	2.3M	7.6M
8+32	1.9M	1.5M	1.0M	1.6M	4.2M	2.5M
8+37	7.5M	2.1M	1.1M	1.7M	7.7M	1.9M
8+42	10M	3.5M	1.8M	1.6M	5.5M	2.9M
8+47	5.8M	1.8M	3.0M	2.0M	2.7M	3.1M
8+52	3.3M	2.5M	1.8M	2.5M	1.6M	2.8M
8+57	3.5M	2.1M	3.4M	2.4M	2.3M	2.3M
8+62	11M	2.8M	3.4M	2.3M	2.4M	3.7M
208+67	x	x	x	x	x	x

x = Infinite Resistance

*Stationing along left curb
End station not equal to plan station due to curve on bridge.

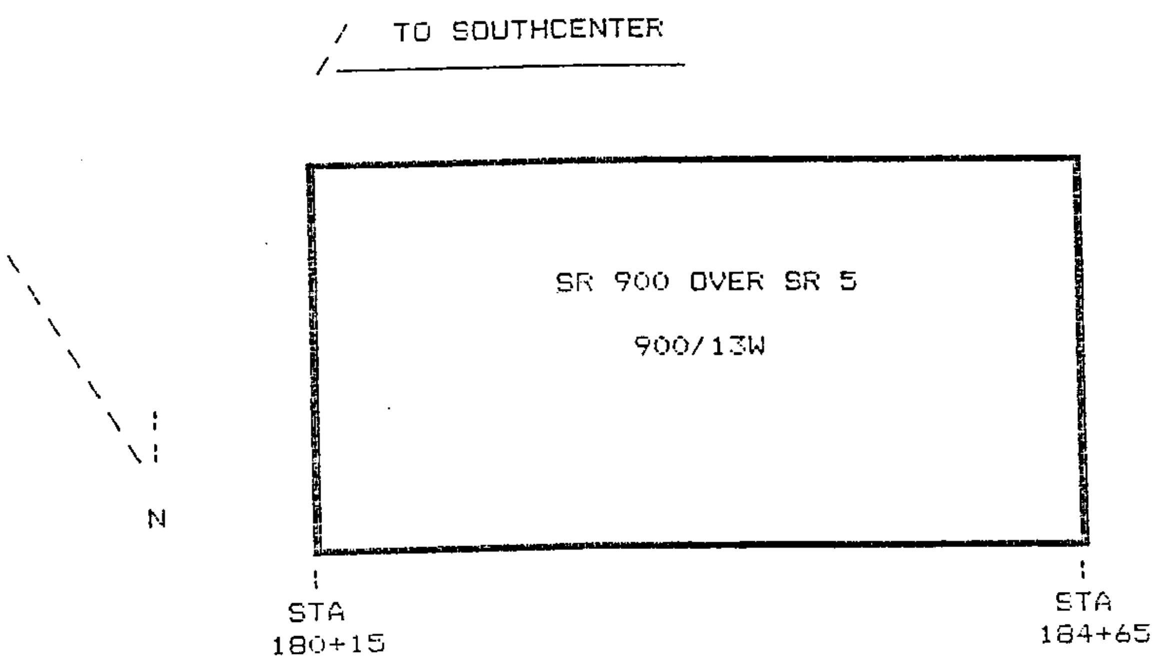
SR 900 OVER SR 5
900/13W
CONTRACT 3189

TESTING REQUIREMENTS

	Post Const 1987	** 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
FRICTION	7/87	7/88	x	x	x	x	x	x	x	x	x
RESISTIVITY	6/87	9/88	x	x		x		x			x
BOND	6/87	9/88		x							x
HALF-CELL				x				x			x
CHLORIDE				x				x			x

x = To Be Tested
**Deck resurfaced summer of 1988

Bridge
Orientation



BOND TEST RESULTS
SR 900 OVER SR 5 900/13W

Year	Station	Offset*	Depth	Load	PSI	Comments
**1987	180+58	8 Rt	3/16"	675	215	35% Break in conc-15% No methal bond
	180+86	7.5 Lt	3/16"	600	191	Broke in methal bond to conc
	181+47	9 Rt	1/4"	575	183	75% Break in conc-20% No methal bond
	181+74	12 Lt	1/4"	850	271	Cohesive failure of overlay
	182+10	3 Rt	1/8"	550	175	60% Break in conc-10% No methal bond
	182+60	9 Lt	3/16"	600	191	70% Break in conc
	182+88	10 Rt	3/16"	450	143	60% Break in conc-40% No methal bond
	183+45	10 Lt	3/16"	650	207	20% Break in conc
	183+62	4 Rt	3/16"	575	183	80% Break in conc-20% No methal bond
	184+14	9 Rt	3/16"	1200	382	80% Break in conc
	184+25	8.5 Lt	3/16"	650	207	70% Break in conc
1988	180+61	8 Rt	3/16"	425	135	100% Adhesive failure of overlay
	180+89	9 Lt	3/16"	450	143	95% Adhesive failure of overlay
	181+34	5 Rt	3/16"	<25	ZIP	100% Adhesive failure of overlay
	181+55	5 Lt	1/4"	75	24	100% Adhesive failure of overlay
	181+90	10 Rt	3/16"	425	135	95% Adhesive failure of overlay
	182+10	10 Lt	1/8"	750	239	80% Cohesive/20% Adhesive failure
	182+59	4 Rt	3/16"	125	40	100% Adhesive failure of overlay
	182+73	3 Lt	1/8"	100	32	100% Adhesive failure of overlay
	183+49	11 Rt	1/4"	550	175	95% Adhesive failure of overlay
	183+71	14 Lt	3/16"	350	111	40% Cohesive/40% Adhesive failure

*NOTE: Offset is feet right or left of centerline.

** Percentages not accounted for are cohesive failures in the methal overlay.

FRICTION TEST RESULTS
SR 900 OVER SR 5 900/13W

DATE	DIR	FN	AVE	RANGE
04/87	E	36		
	E	40		
	E	48		
	E	41		
	E	37		
	E	48		
	E	38		
	E	42	41	36-48*
05/87	E	39		
	E	38		
	E	40		
	E	44		
	E	39		
	E	50	42	38-50*
07/87	E	63		
	E	63		
	E	60		
	E	63		
	E	62		
	E	61		
	E	61		
	E	62	62	60-63
05/88	E	51		
	E	47		
	E	47		
	E	50		
	E	47		
	E	46		
	E	45		
	E	50	48	45-51
DECK RESURFACED				
07/88	E	55		
	E	58		
	E	57		
	E	58		
	E	57		
	E	58		
	E	55		
	E	56	57	55-58

DATE	DIR	FN	AVE	RANGE

* Tests run on bare concrete prior to overlay.

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

JUNE, 1987

Sta 180+15	5	10	15	20	25	30
0+20	340K	150K	20K	670K	400K	440K
0+25	52K	160K	28K	18K	130K	16K
0+30	350K	145K	95K	40K	83K	215K
0+35	70K	150K	40K	40K	230K	320K
0+40	270K	350K	28K	33K	55K	425K
0+45	70K	350K	18K	14K	300K	90K
0+50	110K	80K	35K	31K	100K	140K
0+55	22K	75K	16K	16K	80K	45K
0+60	20K	130K	18K	16K	45K	140K
0+65	39K	118K	32K	13K	160K	110K
0+70	60K	70K	17K	15K	42K	55K
0+75	55K	60K	10K	50K	60K	105K
0+80	44K	55K	36K	16K	52K	115K
0+85	24K	40K	10K	15K	104K	170K
0+90	36K	165K	23K	13K	23K	85K
0+95	65K	40K	25K	13K	33K	60K
181+00	60K	64K	12K	14K	33K	46K
1+05	80K	22K	28K	16K	47K	62K
1+10	30K	17K	52K	13K	35K	125K
1+15	65K	300K	16K	13K	500K	560K

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

JUNE, 1987
CONTINUED

	5	10	15	20	25	30
Sta 181+15						
1+20	3.5M	750K	14K	8K	135K	1.8M
1+25	105K	440K	12K	8K	800K	775K
1+30	160K	750K	35K	7K	850K	620K
1+35	70K	360K	22K	10K	540K	300K
1+40	5M	420K	28K	5K	74K	50K
1+45	2M	700K	38K	7K	115K	160K
1+50	42K	290K	70K	7K	42K	117K
1+55	110K	320K	95K	9K	110K	90K
1+60	260K	900K	45K	15K	85K	100K
1+65	1.2M	120K	20K	15K	1.4M	200K
1+70	x	x	x	x	x	x
1+75	400K	80K	25K	18K	140K	425K
1+80	200K	145K	20K	14K	175K	95K
1+85	&	230K	26K	12K	625K	500K
1+90	55K	170K	37K	35K	750K	2M
1+95	60K	175K	17K	17K	250K	800K
182+00	x	x	x	x	x	x
2+05	1.1M	140K	28K	17K	130K	1.3M
2+10	2M	160K	15K	9K	160K	640K
2+15	260K	410K	34K	7K	66K	560K

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

JUNE, 1987
CONTINUED

Sta	5	10	15	20	25	30
182+15						
2+20	80K	42K	10K	6K	45K	160K
2+25	45K	22K	32K	9K	50K	650K
2+30	130K	34K	10K	11K	65K	13K
2+35	40K	35K	18K	4K	640K	55K
2+40	24K	12K	6K	9K	125K	130K
2+45	30K	16K	8K	11K	90K	65K
2+50	55K	12K	22K	17K	80K	400K
2+55	40K	16K	8K	10K	75K	155K
2+60	42K	12K	20K	14K	780K	140K
2+65	40K	12K	40K	13K	1.3M	160K
2+70	32K	12K	12K	17K	70K	1.8M
2+75	17K	12K	8K	11K	875K	1M
2+80	40K	8K	6K	8K	850K	520K
2+85	200K	20K	7K	8K	1.1M	75K
2+90	80K	18K	4K	9K	490K	15K
2+95	38K	20K	10K	9K	365K	1.1M
183+00	160K	51K	16K	8K	290K	1.8M
3+05	50K	25K	12K	15K	240K	2M
3+10	42K	58K	10K	14K	710K	300K
3+15	80K	40K	10K	12K	430K	510K

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

JUNE, 1987
CONTINUED

	5	10	15	20	25	30
Sta 183+15						
3+20	130K	12K	7K	16K	660K	430K
3+25	75K	42K	10K	21K	67K	43K
3+30	120K	30K	12K	51K	82K	98K
3+35	135K	10K	16K	37K	88K	192K
3+40	18K	5K	40K	42K	107K	146K
3+45	90K	36K	38K	43K	62K	84K
3+50	120K	8K	18K	40K	53K	101K
3+55	32K	28K	12K	28K	43K	130K
3+60	37K	15K	1.5M	21K	73K	44K
3+65	80K	30K	310K	360K	120K	142K
3+70	28K	24K	35K	20K	76K	128K
3+75	30K	18K	40K	35K	77K	61K
3+80	70K	10K	14K	28K	73K	62K
3+85	35K	12K	18K	52K	65K	23K
3+90	22K	20K	13K	35K	332K	41K
3+95	60K	8K	8K	34K	106K	141K
184+00	25K	4K	12K	33K	28K	43K
4+05	28K	10K	8K	42K	91K	46K
4+10	38K	12K	10K	43K	93K	60K
4+15	60K	20K	8K	34K	71K	81K

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

JUNE, 1987
CONTINUED

Sta 184+15	5	10	15	20	25	30
4+20	32K	5K	20K	16K	540K	69K
4+25	50K	6K	5K	66K	117K	4K
4+30	34K	7K	8K	53K	62K	14K
4+35	30K	20K	10K	37K	49K	33K
4+40	28K	2K	7K	25K	77K	27K
4+45	40K	30K	10K	39K	160K	176K
4+50	8K	9K	30K	17K	41K	174K
4+55	17K	10K	5K	59K	37K	17K
4+60	24K	9K	10K	82K	48K	18K
4+65	55K	32K	4K	&	185K	145K

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

SEPTEMBER, 1988

Sta 180+15	5	10	15	20	25	30
0+20	1.7M	1.3M	1.7M	2.7M	2.1M	1.5M
0+25	1.2M	1.2M	1.1M	2.2M	2.0M	1.6M
0+30	1.2M	1.4M	1.1M	2.1M	2.0M	1.4M
0+35	1.1M	1.1M	1.1M	2.0M	1.9M	1.5M
0+40	850K	1.0M	900K	1.7M	1.9M	1.4M
0+45	1.1M	1.1M	1.1M	1.8M	1.7M	970K
0+50	900K	1.0M	950K	1.9M	1.8M	1.4M
0+55	950K	1.1M	1.0M	1.8M	1.8M	1.5M
0+60	1.0M	1.1M	1.1M	1.9M	1.7M	1.2M
0+65	900K	1.0M	1.0M	1.8M	1.6M	1.2M
0+70	900K	900K	900K	1.8M	1.7M	1.2M
0+75	800K	1.2M	1.1M	1.9M	1.4M	1.4M
0+80	900K	1.0M	1.0M	1.9M	1.7M	1.4M
0+85	800K	1.1M	1.0M	1.9M	1.6M	1.4M
0+90	1.0M	1.2M	1.1M	2.2M	1.8M	1.6M
0+95	700K	1.0M	1.0M	2.0M	1.7M	1.5M
181+00	1.0M	850K	1.1M	2.0M	1.7M	1.4M
1+05	1.0M	1.0M	1.2M	2.0M	1.8M	1.3M
1+10	1.0M	1.0M	1.2M	2.0M	1.8M	1.5M
1+15	900K	950K	1.3M	2.0M	1.8M	1.4M

& = Infinite Resistance
Offset is feet left of right curb ahead on station

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

SEPTEMBER, 1988
CONTINUED

Sta 181+15	5	10	15	20	25	30
1+20	700K	1.0M	1.2M	2.0M	1.7M	1.3M
1+25	900K	1.1M	1.3M	2.2M	2.1M	1.1M
1+30	1.0M	1.0M	1.1M	2.1M	2.0M	1.5M
1+35	1.0M	1.1M	1.1M	2.0M	2.0M	1.7M
1+40	900K	1.1M	1.2M	2.1M	2.0M	1.4M
1+45	1.0M	1.2M	1.2M	1.9M	1.8M	1.4M
1+50	1.0M	1.2M	1.1M	1.9M	1.7M	1.4M
1+55	1.0M	1.2M	1.2M	1.8M	1.8M	1.4M
1+60	990K	1.2M	1.4M	2.2M	1.9M	1.4M
1+65	800K	1.3M	1.7M	2.4M	1.8M	1.2M
1+70	950K	1.4M	2.0M	2.3M	1.8M	1.7M
1+75	1.2M	1.5M	1.4M	2.4M	2.0M	1.3M
1+80	1.1M	1.3M	1.7M	2.7M	2.2M	1.4M
1+85	1.1M	1.6M	1.8M	2.3M	2.0M	1.9M
1+90	1.3M	2.1M	2.4M	2.3M	2.0M	1.6M
1+95	1.1M	2.2M	2.4M	2.3M	1.9M	1.7M
182+00	1.4M	2.2M	1.6M	2.2M	2.0M	1.1M
2+05	1.7M	1.4M	1.4M	2.0M	1.7M	1.7M
2+10	2.1M	1.4M	1.5M	2.1M	1.8M	1.4M
2+15	1.1M	1.5M	2.0M	2.2M	2.2M	1.2M

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
Sta 182+15						
2+20	1.0M	1.4M	1.6M	2.1M	2.0M	1.5M
2+25	6.0M	1.4M	1.4M	1.9M	2.0M	1.5M
2+30	1.1M	1.1M	1.6M	2.2M	2.1M	1.5M
2+35	1.5M	2.5M	2.1M	2.7M	2.4M	2.0M
GROUND 2+38 *						
2+40	2.3M	2.3M	2.2M	2.7M	2.5M	2.0M
2+45	1.2M	1.8M	2.2M	2.8M	2.5M	1.7M
2+50	1.5M	1.5M	2.2M	2.7M	2.4M	1.8M
2+55	1.0M	1.4M	1.4M	2.1M	2.1M	1.4M
2+60	1.1M	1.2M	1.4M	2.1M	2.1M	1.5M
2+65	1.3M	1.2M	1.6M	2.2M	2.1M	1.2M
2+70	1.4M	1.4M	2.0M	2.4M	2.3M	1.5M
2+75	1.1M	1.3M	1.9M	2.2M	2.7M	1.4M
2+80	1.0M	1.3M	1.4M	2.2M	2.0M	1.4M
2+85	2.2M	1.2M	1.3M	2.0M	1.7M	1.4M
2+90	1.7M	1.4M	1.4M	2.1M	1.8M	1.4M
2+95	1.1M	1.5M	1.4M	2.2M	1.8M	1.5M
183+00	1.3M	1.5M	1.6M	2.5M	2.0M	1.5M
3+05	1.4M	1.4M	1.6M	2.5M	2.1M	1.6M
3+10	1.2M	1.4M	1.6M	2.4M	2.4M	1.6M
3+15	1.3M	1.7M	1.7M	2.4M	2.4M	1.6M

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
Sta 183+15						
3+20	1.2M	1.4M	1.7M	2.2M	2.3M	1.4M
3+25	1.0M	1.5M	1.7M	2.4M	2.6M	1.4M
3+30	1.2M	1.4M	1.5M	2.1M	2.4M	1.5M
3+35	1.1M	1.8M	1.5M	2.2M	2.0M	1.4M
3+40	1.1M	1.6M	1.7M	2.3M	2.3M	1.7M
3+45	1.2M	1.6M	2.3M	2.4M	2.2M	1.5M
3+50	1.5M	1.8M	2.4M	2.6M	2.1M	1.8M
3+55	1.3M	1.8M	2.0M	2.6M	2.3M	1.5M
3+60	1.3M	1.5M	1.8M	2.6M	2.1M	1.6M
3+65	1.4M	1.3M	1.4M	2.2M	1.8M	1.3M
3+70	1.3M	1.3M	1.2M	1.9M	1.7M	1.6M
3+75	1.3M	1.4M	1.5M	2.0M	1.7M	1.9M
3+80	1.4M	1.5M	1.7M	2.3M	2.0M	1.5M
3+85	1.4M	2.4M	2.5M	2.4M	2.1M	1.5M
3+90	1.7M	1.9M	2.1M	2.5M	2.0M	1.7M
3+95	1.6M	1.5M	2.4M	2.2M	1.8M	1.5M
184+00	1.5M	1.8M	2.1M	2.2M	2.1M	1.8M
4+05	2.0M	2.0M	2.3M	2.3M	2.2M	2.1M
4+10	2.4M	2.4M	2.8M	2.3M	2.3M	2.0M
4+15	1.8M	1.7M	2.8M	2.1M	1.9M	1.3M

& = Infinite Resistance

ELECTRICAL RESISTIVITY TEST RESULTS
SR 900 OVER SR 5 900/13W

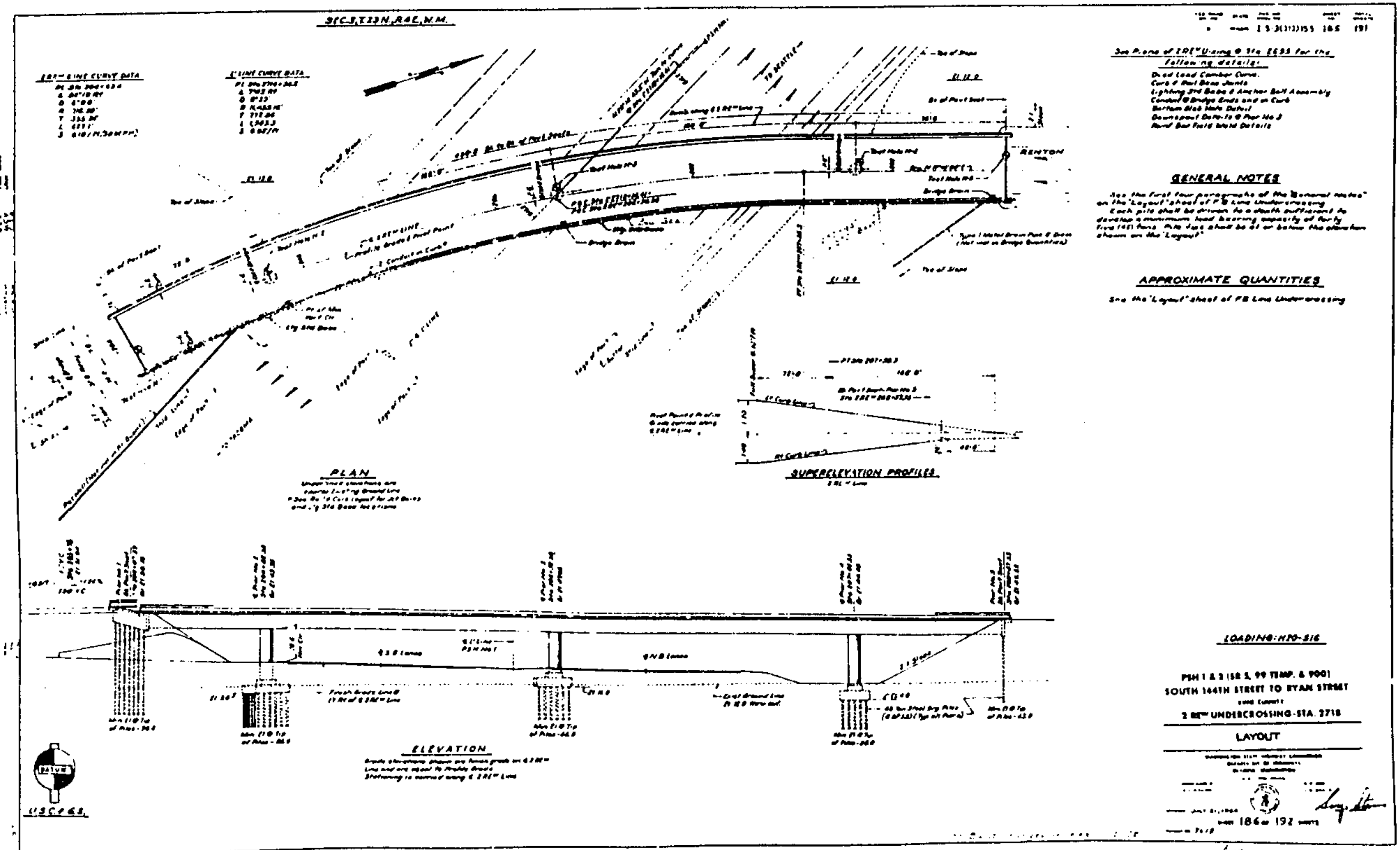
SEPTEMBER, 1988
CONTINUED

	5	10	15	20	25	30
Sta 184+15						
4+20	1.5M	1.5M	1.8M	2.1M	1.9M	1.6M
4+25	1.6M	1.7M	1.6M	2.1M	1.9M	1.9M
4+30	1.8M	1.8M	1.9M	2.3M	2.1M	1.7M
4+35	1.8M	2.1M	2.3M	2.4M	2.2M	2.0M
4+40	2.0M	2.0M	2.0M	2.3M	2.2M	1.9M
4+45	1.9M	2.0M	3.4M	2.7M	2.5M	2.2M
4+50	2.2M	2.4M	2.9M	3.0M	2.8M	1.8M
4+55	2.3M	3.0M	3.3M	2.3M	2.6M	1.9M
4+60	5.5M	3.2M	3.0M	2.9M	2.4M	2.1M
4+65						

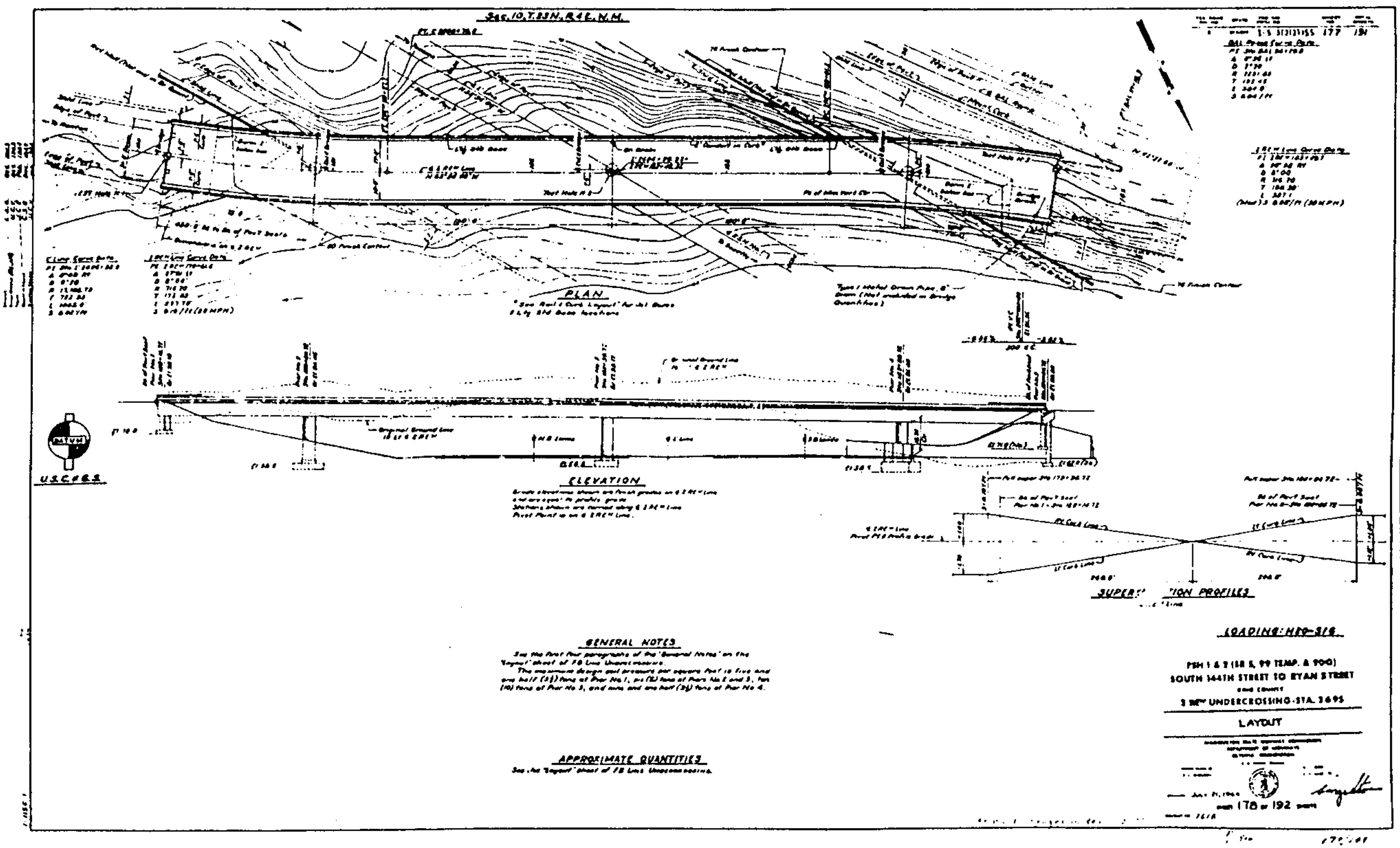
& = Infinite Resistance

APPENDIX D

GENERAL LAYOUTS


SEC.3,T23N,R4E,W.M.
RENTON
TO SEATTLE
PLAN
SUPERELEVATION PROFILES
ELEVATION
U.S.C.&G.S.
See Plans of 2RE" U-xing @ Sta 2685 for the following details:
Dead Load Camber Curve.
Curb & Rail Base Joints
Lighting Std Base & Anchor Bolt Assembly
Conduit @ Bridge Ends and in Curb
Bottom Slab Hole Detail
Downspout Details @ Pier No 3
Rail Bar Field Weld Details
GENERAL NOTES
See the first four paragraphs of the "General notes" on the "Layout" sheet of FB Line Undercrossing.
Each pile shall be driven to a depth sufficient to develop a minimum load bearing capacity of forty five (45) tons. Pile tips shall be at or below the elevation shown on the "Layout".
APPROXIMATE QUANTITIES
See the "Layout" sheet of FB Line Undercrossing
LOADING: H20-S16
PSH 1 & 2 (SR 5, 99 TEMP. & 900)
SOUTH 144TH STREET TO RYAN STREET
2 RE" UNDERCROSSING - STA. 2718
LAYOUT
SHEET 186 OF 192 SHEETS

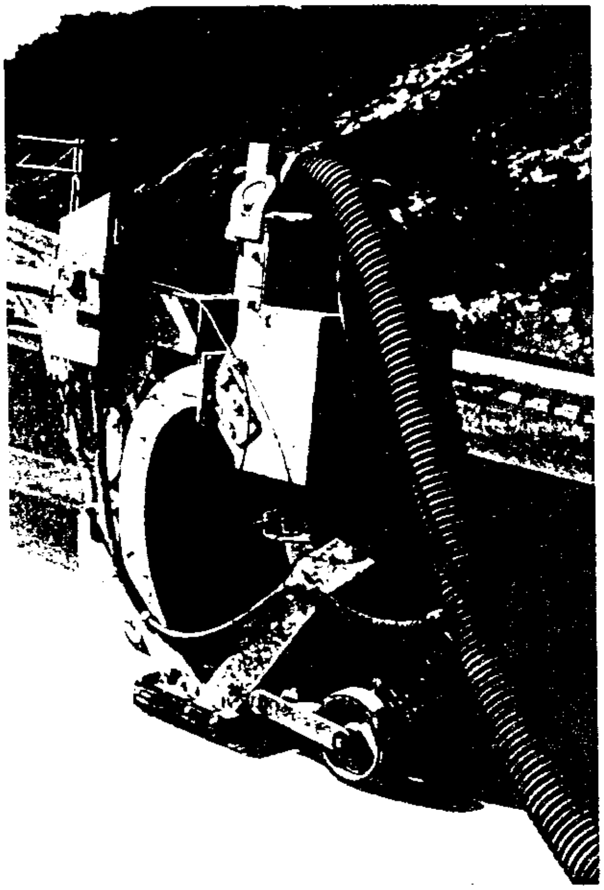
900/12 W


PLAN
ELEVATION
SUPER… …TION PROFILES
LOADING: H20-S16
GENERAL NOTES
APPROXIMATE QUANTITIES
U.S.C.&G.S.
LAYOUT
178 of 192

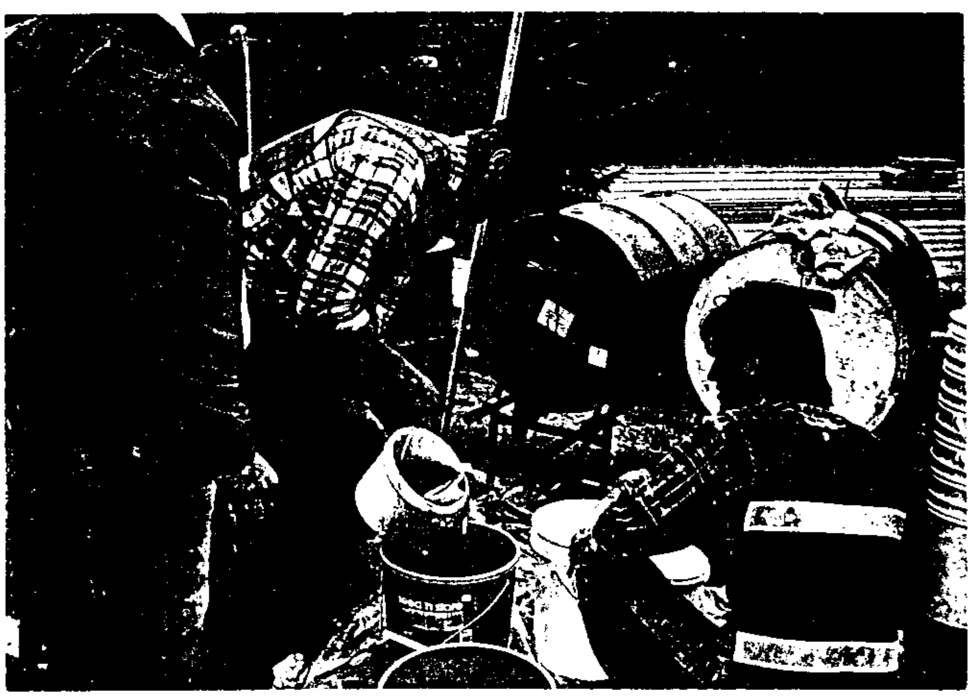
900/13W

APPENDIX E

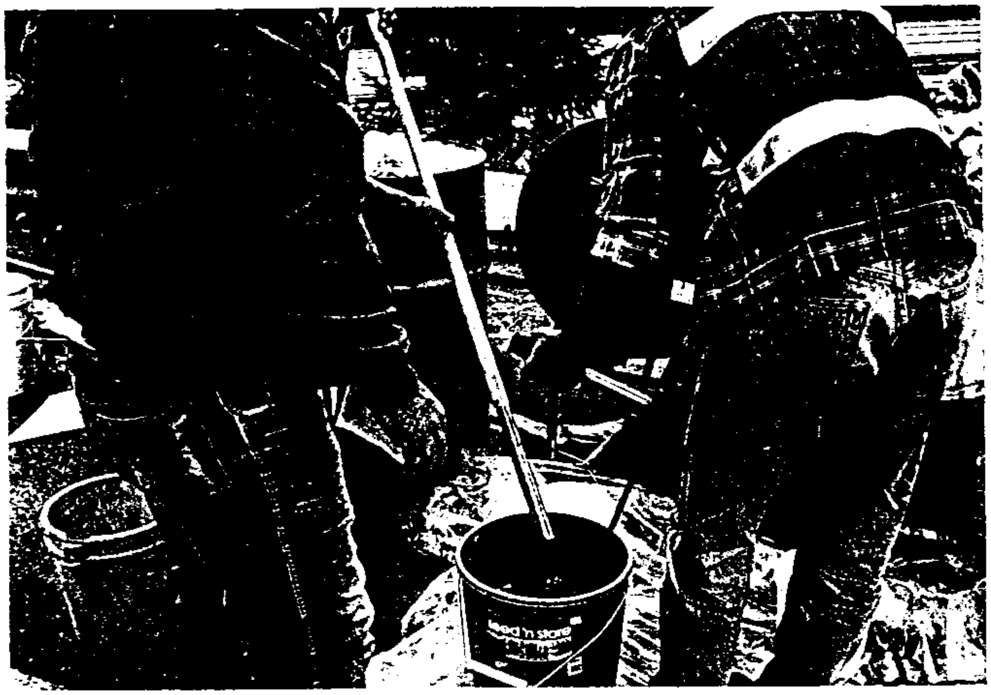
PROJECT PHOTOGRAPHS



Cleaning deck
with shotblast.



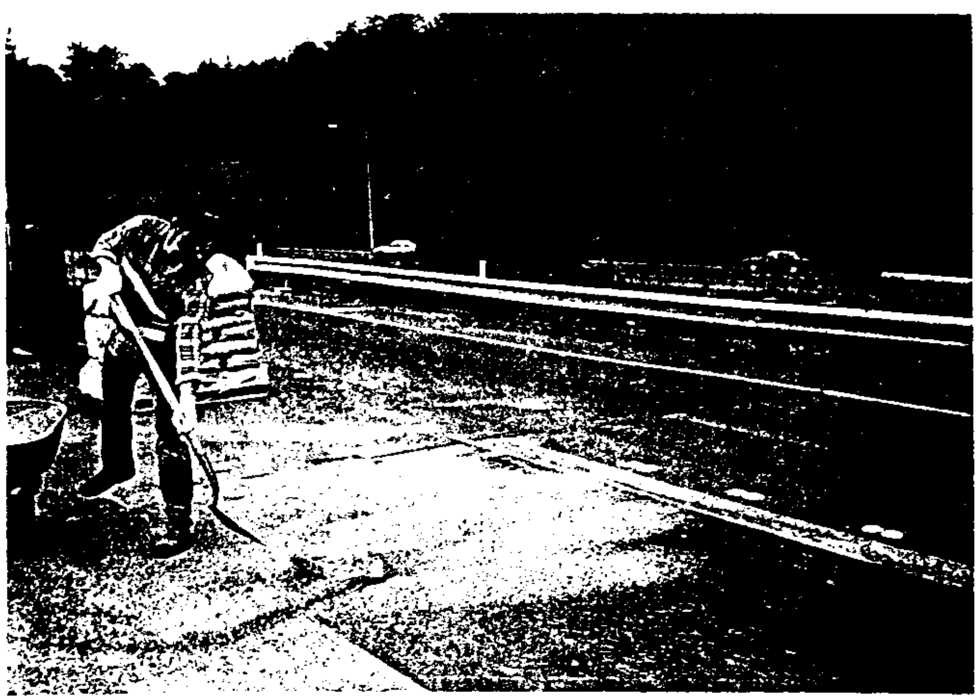
Proportioning epoxy.



Mixing epoxy.

Placing epoxy on deck.

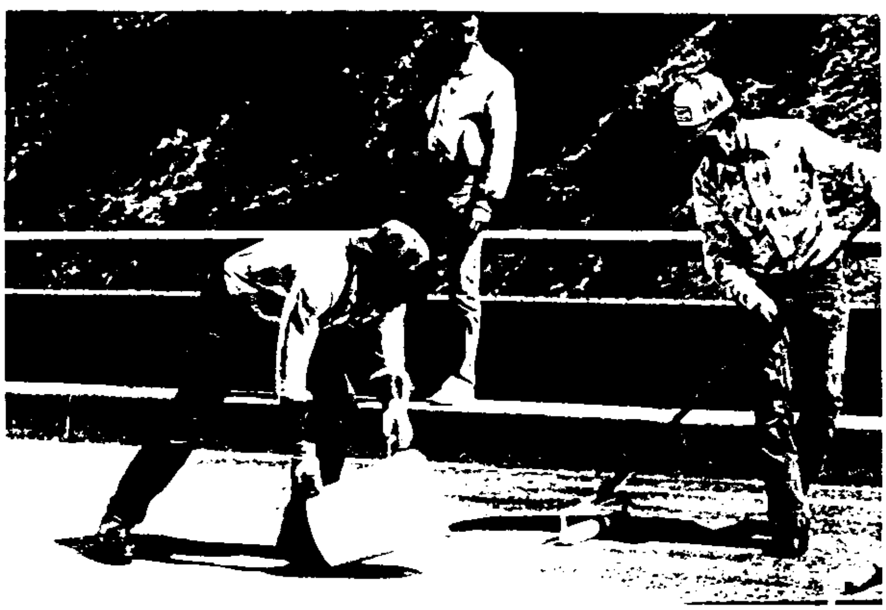
Spreading epoxy on deck.



Spreading aggregate on epoxy.

SR 5 OC BRIDGE 900/13W

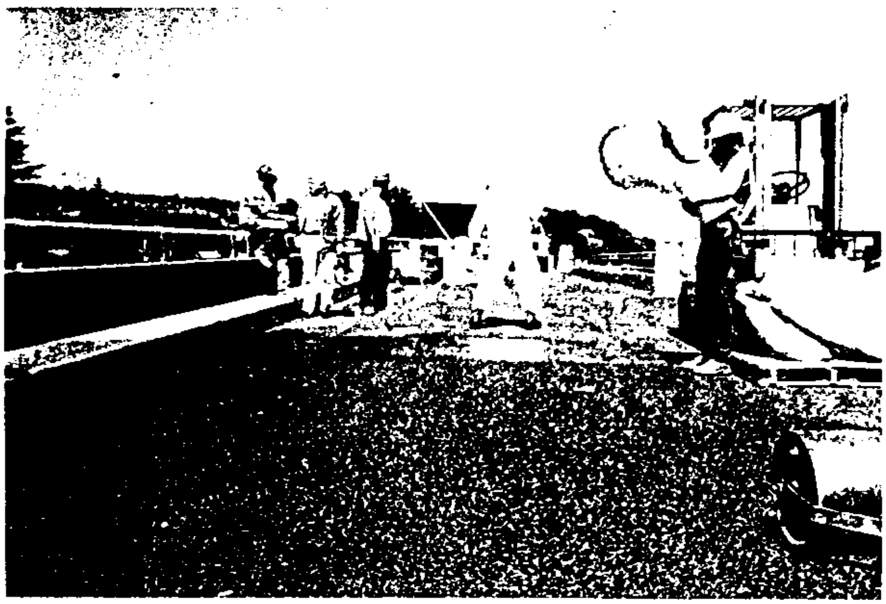
Mixing primer.



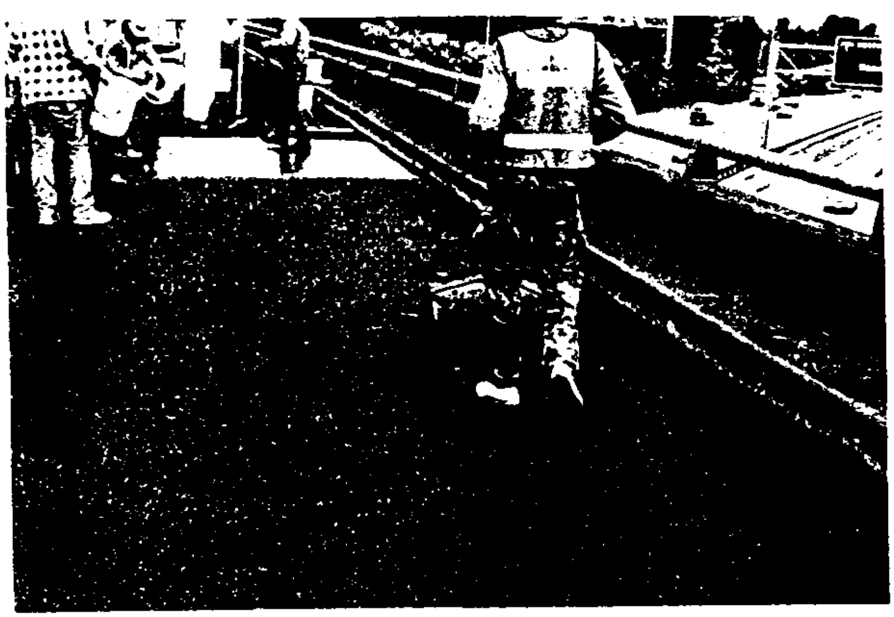
Spreading primer.

Mixing MMA resin.

Applying MMA resin to deck.



Spreading aggregate.



Rolling aggregate.