Bridge No. 403/7

Grays River Bridge At Roseburg Thin Overlay

Post Construction Report
WA-RD 114.1
August 1986

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

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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Tom H. Roper and Edward H. Henley, Jr.

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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 will be conducting experimental field testing of several selected polymer concrete thin (1/4 inch) overlays over a ten-year period. The polymer concrete material is manufactured by private industry firms and installed on selected bridge decks under standard WSDOT construction contracts. Approximately 21 bridges will be involved in the experiment; eight of these are included in federal participating projects as experimental features.

The Grays River Bridge at Rosburg, Washington, Bridge No. 403/7, is the second bridge of the federal aid projects to receive a thin polymer concrete overlay. The polymer concrete used was Degadur 330, made by Degussa Company and installed by Cal Floor. The deck was overlaid in August of 1986.

Work on the thin overlay began on August 4, 1986 and was completed on August 5, 1986. A total of 586 S.Y. of overlay was placed. There was no traffic on the bridge during the overlay placement. The overlay contractor had a well trained crew and the overlay placement went very smoothly. The crew's experience showed when the different operations of primer, overlay, and sealer were sequenced so that when one layer cured out, the next operation was ready to go.

Friction tests and electrical resistivity tests were all satisfactory.

17. KEY WORDS
Thin overlay, polymer concrete, bridge deck repairs

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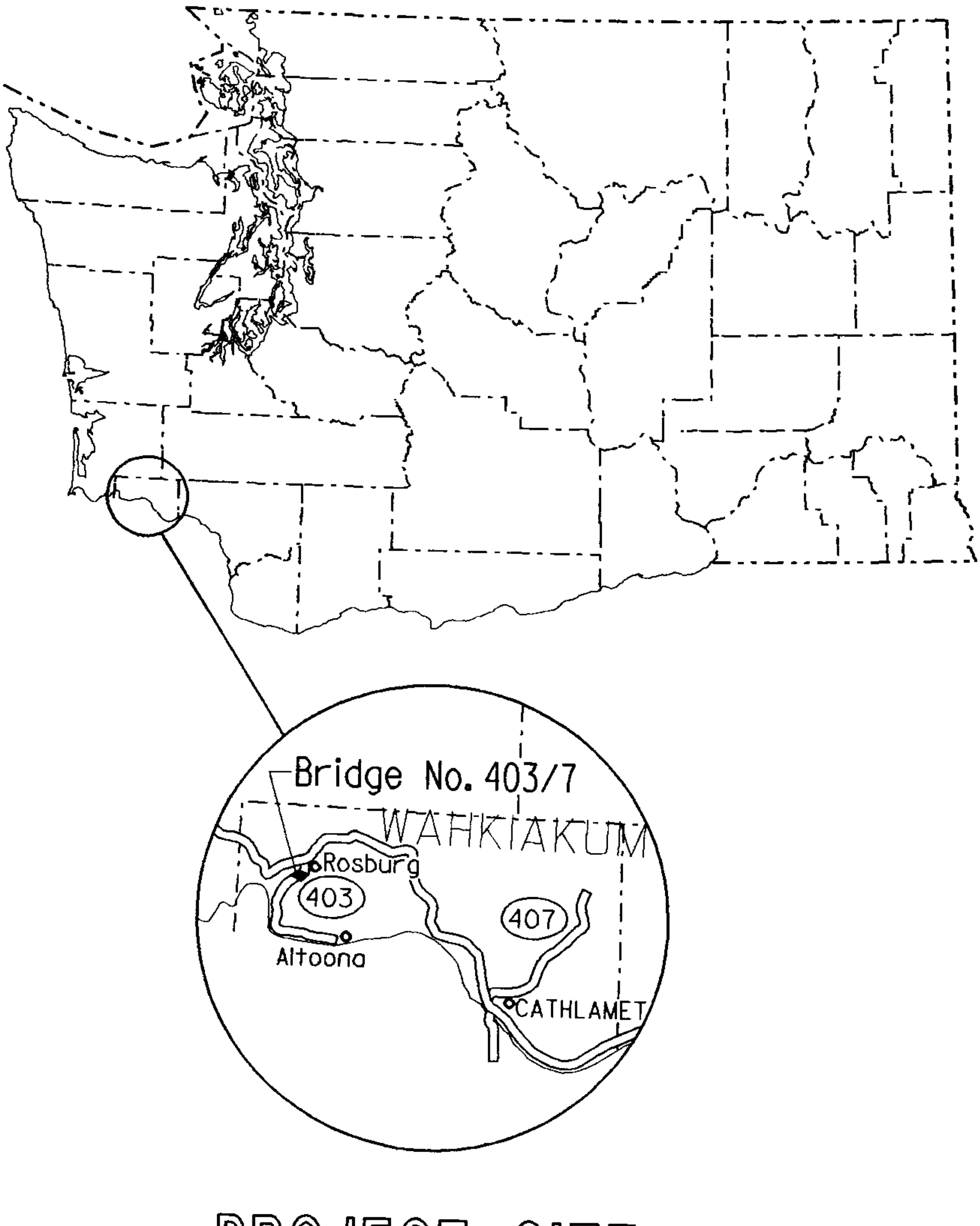
VICINITY MAP



PROJECT SITE

INTRODUCTION

This is the second 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. 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.

STUDY SITE

The polymer concrete was applied on the deck of the steel beam main spans under Contract Number 3090, SR 403, MP 6.68 to MP 6.38, Grays River Bridge 403/7, Wahkiakum County. The bridge is near Rosburg, Washington on SR 403.

The timber approach structures were replaced. The steel beam main spans were retained, with a widened roadway. Widening was accomplished through removal of sidewalks on each side and installation of New Jersey barrier rails. The steel beam spans of the structure have a final roadway width of 28 feet and a total length of 191 feet 6 inches, for a total deck overlay area of 5,362 square feet.

The design analysis indicated that the addition of a 1-1/2 inch concrete overlay could not be tolerated due to the added dead load. The Bridge and Structures Branch recommended placement of a thin overlay.

The condition of the deck prior to the overlay was reasonably good. There were no visual surface spalls, and no deck delaminations were found by chaindrag. The average deck chloride content was 0.37 pounds per cubic yard, and no samples were greater than 2.0 pounds per cubic yard. Rebar cover ranged from 1-5/8 inches to 2-1/4 inches. The maximum half-cell reading was -0.168 volts. The majority of wheel rut values were 1/8 inch.

A thin (1/4 inch) PC overlay system, marketed by private industry, was applied. The work was done under WSDOT contract specifications. The contract documents specified the type of system the bridge received.

CONSTRUCTION SUMMARY

General Description

The existing deck on the three steel spans of the Grays River Bridge 403/7 was protected under this contract by a methyl methacrylate concrete overlay. The overlay system, a product of the Degussa Corporation, was applied by Cal Floor Company of Los Angeles, California.

To begin installation of this system, the entire deck was cleaned and vacuumed by a shot blaster. This removed all grease, oil, other surface contaminants, and loose or unbonded material from the deck. Some hand grinding was necessary for hard to remove spots. The shot blaster was run adjacent to the steel expansion dams a number of times in order to ensure the finished overlay would be flush with the top of the steel expansion dam. The shot blaster removes approximately 1/32 inch with each pass. Sufficient passes were made to obtain a taper and 1/4 inch below the top of the expansion device steel plates.

After preparation of the deck, a primer was applied. The Degussa B71 Primer is a reactive MMA and is catalized with a hardener. The primer was applied with paint rollers. Steilacoom sand was then lightly broadcast on the primer by hand. The sand provides skid resistance for workers to safely walk on the primer and is not necessary for bonding of the Degadur 330. About 40 minutes cure time is required for the primer.

Degadur 330 (an MMA) was then mixed in five-gallon pails and troweled on the primer. By weight, the Degadur 330 is composed of 30 percent resin and hardener, 20 percent silica flower (minus 200 mesh), and 50 percent Steilacoom sand (#2 coarse). Before the Degadur 330 cures, Steilacoom 6 by 10 cover aggregate was broadcast to excess. After 30 minutes cure time, the excess aggregate was broomed off.

Degadur 410 resin sealer (an MMA), catalized with a hardener, was then applied with a thick nap roller to the Degadur 330 coating, to lock in the broadcast aggregate. Without the sealer, some of the surface aggregate tends to work loose under traffic. In actual practice, after 45 minutes sealer cure time the overlay is ready for traffic. Since there was no traffic on the bridge, cure time was not critical.

All three products (primer, overlay, and sealer) are MMAs and are catalized with the same hardener.

Quality Control Performance of the Contractor

Mr. William Lee, Product Manager for Degussa, was on the project throughout the installation of the overlay. Quality control checks by the contractor consisted of ensuring the mixed materials were in accordance with the submitted mix design. The contractor also performed depth checks throughout the overlay placement. Checks were made with a wire gage penetrating the overlay prior to set.

Special Construction Procedures or Construction Problems and Any Remedial Actions Taken

Three problems occurred during construction of this project:

1. Two apparent transverse construction joints were discovered in the existing deck. These joints had been overfilled with rubber sealant. The joints were cleaned out and filled with Degadur 330. The manufacturer's representative felt that the properties of the Degussa system would be adequate to seal these cracks even under traffic and weather related stresses.

2. One batch of the overlay mix was inadvertently made and installed without the hardener. To repair this, the nonsetting mix was removed. The area affected (approximately 3 feet by 5 feet) was completely cleaned and the edges of the adjacent solid overlay were ground clean and square. The overlay process was then repeated (primer, overlay, sealer). The resulting patch was satisfactory with no noticeable bump or color difference.

3. The overlay tended to creep at the expansion joints. This was corrected by reworking the still fluid overlay and by reducing the amount of overlay material slightly. On bridges with a steep grade, this would have been more of a problem. The Degussa Corporation has different viscosity MMA resins available depending on the practical requirements.

Personal Observations

The placement of the overlay went very smoothly. The overlay contractor, Cal Floor, had a well trained crew that worked with little wasted effort. Their experience showed when the different operations of primer, overlay, and sealer were sequenced so that when one layer cured out, the next operation was ready to go. If this system were to be applied by an inexperienced contractor, the results could be less than satisfactory. Had the bridge been open to traffic, half of the bridge could easily have been done in one working day with this process.

Construction Time for Installation

This deck consisted of 586 square yards to be overlayed. The deck was divided by expansion joints into sections of 220 SY, 146 SY, and 220 SY.

It took two days to complete the overlay. Part of this time was due to the contractor's supply truck breaking down on the way to the job site, thus holding up delivery of materials.

Work on the thin overlay began on August 4, 1986 and was completed on August 5, 1986. A total of 586 S.Y. of overlay was placed. There was no traffic on the bridge during the overlay placement. The overlay contractor had a well-trained crew and the overlay placement went very smoothly. The crew's experience showed when the different operations of the primer, overlay, and sealer were sequenced so that when one layer cured out, the next operation was ready to go.

TEST RESULTS

The bond pull off tests averaged 113 psi for six tests with all breaks occurring in the old concrete. The specifications required 350 psi or a break in the old concrete. Fourteen friction tests were taken on the overlay. One of the 14 tests was slightly less than 50. The specification stated that the minimum for all tests would be 50. Ninety-eight percent of the electrical resistivity tests were above 250,000 ohms. No single readings were found under 100,000 ohms. The specifications called for 70 percent of the readings to be above 250,000 ohms and no single reading less than 100,000. All tests are therefore considered satisfactory.

Good friction tests are necessary for vehicle traction on the overlaid surface. Good bond is necessary for the product to adhere to the existing surface. Adequate resistivity values indicate good resistance to the further intrusion of moisture and salts.

RECOMMENDATIONS

The installation of this product went smoothly, due in large part to the experience of the Cal Floor contractor. Future specifications should stipulate that an experienced contractor install the system and that the construction workers are trained to get the best results from this product.

This system appears to have merit where speed of construction may be a factor in traffic control, as well as where additional dead load may be a problem.

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 a 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 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. During construction, no scarifying is necessary; therefore, there is less potential for debonding and damage to rebars. These polymer concretes have a cross-linked polymer which 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 selected eight federal aid and 13 state funded bridges needing deck rehabilitation and protection. The normal delamination and spall repairs will be followed by the application of thin PC overlays (usually 1/4"). These PC overlays will be systems marketed by private industry. The work will be done under usual WSDOT contracts. It is anticipated that separate contracts will be necessary for each bridge. A number of different PC systems will be used on the bridges. Contract documents will specify what type of system each separate bridge will receive. A total of approximately 130,000 ft^2 of bridge deck will be involved in the FHWA experimental feature project portion of this study.

Installation of the PC overlay for the bridge deck will be per 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 will be maintained for each installation with emphasis on the cause and resolution of problems which may occur during any phase of the project. The district field office will be asked to submit an end of construction report on the installation.

Annual inspections and testing of the experimental feature projects will be made over a ten-year period. The WSDOT Materials Laboratory will have responsibility for all field testing and for reporting on all field activities. See Appendix A 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 LSC 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 bridge will be made over a ten year period. The testing will include: 1) friction measurements for skid resistance of the overlay surface; 2) electrical resistivity for waterproofing effectiveness; 3) half-cell for corrosion activity; 4) chloride content for intrusion of corrosive chloride ions; 5) pachometer for rebar depth; 6) pulloff for bond strength; and 7) 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 A.

Reporting

A post-construction report will be issued within 90 days of the 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

		DIST.	DECK AREA (FT.2)	DECK RATING	BID OPENING	CONT. NO.	SYSTEM TYPE	DOLLARS PER SQ. YARD
	FED. AID PROJECTS							
403/7	GRAYS R. ROSBURG	4	5,360	7	02/05/86	3090	DEGUSSA	35
12/915	SNAKE R. CLARKSTON	5	56,940	4	03/05/86	3107	FLEXOGRID	40
82/114S	YAKIMA R.	5	11,370	3	05/07/86	3131	CONCRESSIVE 2020	77
82/115S	NACHES R.	5	11,370	4	05/07/86	3131	CONCRESSIVE 3070	77
900/12W	SR 5 OC	1	13,950	5	08/27/86	3189	FLEXOLITH	60
900/13W	SR 5 OC	1	13,950	4	08/27/86	3189	SIKA PRONTO 19	55
5/316	CUSTER WAY UC	3	6,190	4		L6941T	EPI/FLEX III	---
5/523E	S. 154TH ST. OC	1	7,300	6		L6166	CONKRYL	---
	NON FED. AID PROJECTS							
167/102	THIRD AVE. SW OC	3	7,216	7	01/15/86	3078	FLEXOGR	UNK
167/104	ELLINGSTON RD. OC	3	7,172	7	01/15/86	3078	FLEXOGRID	UNK
167/106	FIRST AVE. N. OC	3	6,424	7	01/15/86	3078	FLEXOGRID	UNK
161/10	SR 512 OC	3	11,120	7	02/26/86	3100	EPI/FLEX III	40
167/21	MILWAUKEE AVE. OC	3	6,864	7	07/23/86	3183	---	43
512/40	SR 167 OC	3	12,806	7	07/23/86	3183	---	43
529/20W	STEAMBOAT SL	1	20,472	5	(06/25/87)	L8471	---	---
529/20E	STEAMBOAT SL	1	21,840	3	(06/25/87)	L8471	---	---
104/5.2	HOOD CANAL E½	3	101,388	4	(07/08/87)	3316	---	32
82/10S	THRALL RD. O-XING	5	18,992	5	N/A	2857	FLEXOLITH	82
101/115	CHEHALIS RIVER BR.	3	14,508	6	N/A	2643	FLEXOGRID	65
101/514	MOTTMAN ROAD O-XING	3	6,640	7	N/A	2945	DEGUSSA	45
16/120	OLYMPIC INTER UC	3	6,417	7	---	---	---	---

19:BR10

THIN OVERLAY EXPERIMENTAL PROJECT +
TESTING AND ANALYSIS COSTS PER 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 Mats Lab (ML).
Analysis of data and final report by Bridge Branch.

*** Multiply all costs shown on this sheet by 7.8 (101,388/13,000 = 7.8) to obtain estimated costs for the Hood Canal Bridge East Half 104/5.2 thin overlay project.

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APPENDIX C

TEST RESULTS

GRAYS RIVER BRIDGE 403/7

PAVEMENT SKID TESTER

DISTRICT 4 CONTROL SECTION 3090 ROUTE 403 WEATHER 1 9/02/86

PATH	POSTD	LANE	# LNS	SURF	MISC	DIRCT	INCLN	TEMP	TRACT FORCE	VERT FORCE	ADJ SKID	UNADJ SKID	SPEED	TEST ODOM	FLOW	LATRL ACCEL	CASST	ERRS
2	40	1	1	6	1	2	625	35	547	1005	538	545	33	905	216	00		
2	40	1	1	6	1	1	334	35	496	1005	494	494	37	1099	250	02		
2	40	1	1	6	1	2	217	34	546	1013	541	540	38	901	241	01		
2	40	1	1	6	1	1	404	33	514	987	519	521	36	1094	235	02		
2	40	1	1	6	1	2	116	32	568	1002	563	567	35	910	227	00		
2	40	1	1	6	1	1	153	32	518	997	516	520	35	1104	235	01		
2	40	1	1	6	1	2	-52	31	555	1000	551	556	34	910	236	00		
2	40	1	1	6	1	1	27	31	525	986	526	533	33	1094	217	01		
2	40	1	1	6	1	2	-71	30	568	1009	558	563	34	901	222	01		
2	40	1	1	6	1	1	-149	30	557	1008	541	553	30	1101	206	00		
2	40	1	1	6	1	2	671	30	562	1019	547	552	34	899	228	01		
2	40	1	1	6	1	1	283	30	506	1011	496	501	34	1096	231	02		
2	40	1	1	6	1	2	259	30	569	1000	565	569	35	903	228	02		
2	40	1	1	6	1	1	358	30	538	1007	529	534	34	1100	217	02		

NORTHBOUND LANE

$\overline{X}$ = 51.7

R = 49.4 – 54.1

SOUTHBOUND LANE

$\overline{X}$ = 55.2

R = 53.8 – 56.5

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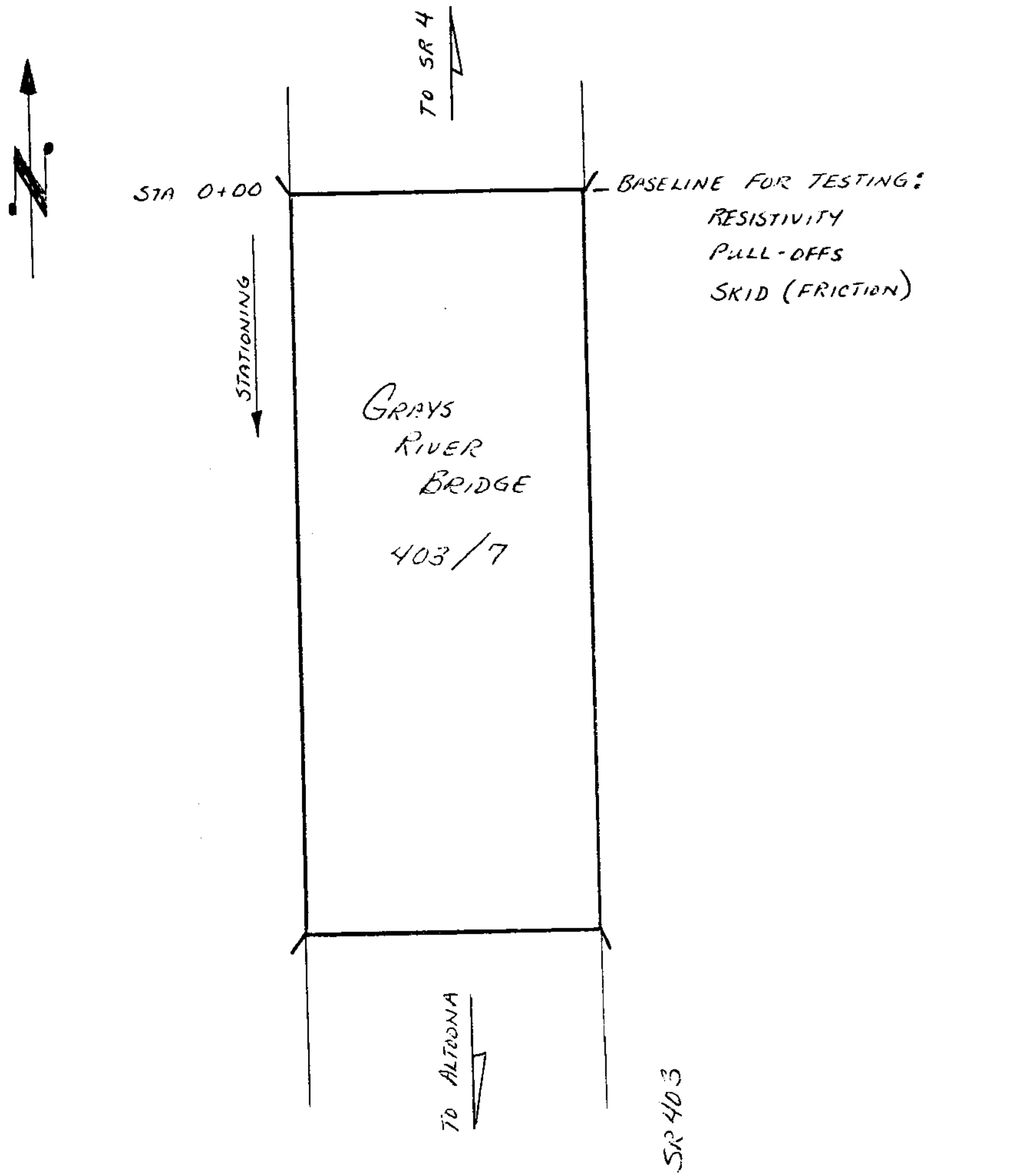
S.R. 403 Made by G.A. OLSON Check by .... Date 08-20-86 Supv. R.L. SCHULTZ



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S.R. 403 Made by G.A. OLSON Check by ______ Date 08-20-86 Supv. R.L. SCHULTZ

BOND PULL OFF TESTS

STA.	OFFSET	THICKNESS	LOAD	P.S.I.	COMMENTS
0+16	7' RT. OF CURB	3/8"	225 lbs.	72	100% Break in old conc.
0+46	21' RT. OF CURB	1/4"	425 lbs.	135	100% " " " "
0+97	6' RT. OF CURB	3/8"	475 lbs.	151	100% " " " "
0+97	22' RT. OF CURB	3/8"	550 lbs.	175	100% " " " "
1+37	21' RT. OF CURB	1/4"	250 lbs.	80	100% " " " "
1+75	6' RT. OF CURB	1/4"	200 lbs.	64	100% " " " "

CREW: R. SCHULTZ
G. OLSON
T. SHOBLOM

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CREW: R. SCHULTZ
G. OLSON
T. SHOBLOM

DECK = 103°F
AIR = 85°F

Less than 2 Ω between all expansion plates.
GROUND @ 1+93 ℄

RESISTIVITY TESTS

CURB 4' 5' 5' 5' 5' 4' CURB

0+00 PVM'T. SEAT	+	+	+	+	+
0+05	∞ +	∞ +	∞ +	∞ +	∞ +
0+10	∞ +	∞ +	∞ +	∞ +	∞ +
0+15	∞ +	∞ +	∞ +	∞ +	∞ +
0+20	∞ +	∞ +	∞ +	+	+
0+25	∞ +	∞ +	∞ +	+	+
0+30	∞ +	∞ +	∞ +	+	+
0+35	∞ +	∞ +	∞ +	+	+
0+40	∞ +	∞ +	∞ +	+	+
0+45	∞ +	∞ +	∞ +	∞ +	∞ +
0+50	∞ +	∞ +	∞ +	∞ +	∞ +
0+55	∞ +	∞ +	∞ +	∞ +	∞ +
0+60	∞ +	∞ +	∞ +	∞ +	∞ +
0+65	∞ +	∞ +	∞ +	∞ +	∞ +

TRUCK CRANE (boxed area, 0+20 to 0+40, last two columns)

Sheet No.

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S.R. 403 Made by G.A. OLSON Check by .... Date 08-20-86 Supv. R.L. SCHULTZ

CURB | 4' | 5' | 5' | 5' | 5' | 4' | CURB

0+70	∞ +	∞ +	∞ +	∞ +	∞ +	
0+73 = Jt.						
0+75	600,000 +	∞ +	∞ +	1.8M +	13M +	
0+80	∞ +	∞ +	∞ +	∞ +	∞ +	
0+85	∞ +	∞ +	∞ +	∞ +	∞ +	
0+90	106,000 +	∞ +	∞ +	∞ +	∞ +	
0+95	1.7M +	∞ +	∞ +	∞ +	∞ +	
1+00	173,000 +	∞ +	∞ +	∞ +	∞ +	LEAK TO CURB
1+05	164,000 +	∞ +	∞ +	∞ +	∞ +	LEAK TO CURB
1+10	∞ +	∞ +	∞ +	∞ +	∞ +	
1+15	∞ +	∞ +	∞ +	∞ +	∞ +	
1+20	∞ +	1.3M +	1.5M +	∞ +	123,000 +	
1+20.5 = Jt.						
1+25	∞ +	∞ +	∞ +	∞ +	∞ +	
1+30	∞ +	∞ +	∞ +	∞ +	∞ +	
1+35	∞ +	∞ +	∞ +	∞ +	∞ +	
1+40	∞ +	∞ +	∞ +	∞ +	∞ +	
1+45	∞ +	∞ +	∞ +	∞ +	∞ +	
1+50	∞ +	∞ +	∞ +	∞ +	∞ +	

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S.R. 403 Made by G. A. OLSON Check by .... Date 08-20-86 Supv. R.L. SCHULTZ

CURB | 4' | 5' | 5' | 5' | 5' | 4' | CURB

1+55	∞	∞	∞	∞	∞
1+60	∞	∞	∞	∞	∞
1+65	∞	∞	∞	∞	∞
1+70	∞	∞	∞	∞	∞
1+75	∞	∞	∞	∞	∞
1+80	∞	∞	∞	∞	∞
1+85	∞	∞	∞	∞	∞
1+90	∞	∞	540,000	1.7M	1.6M

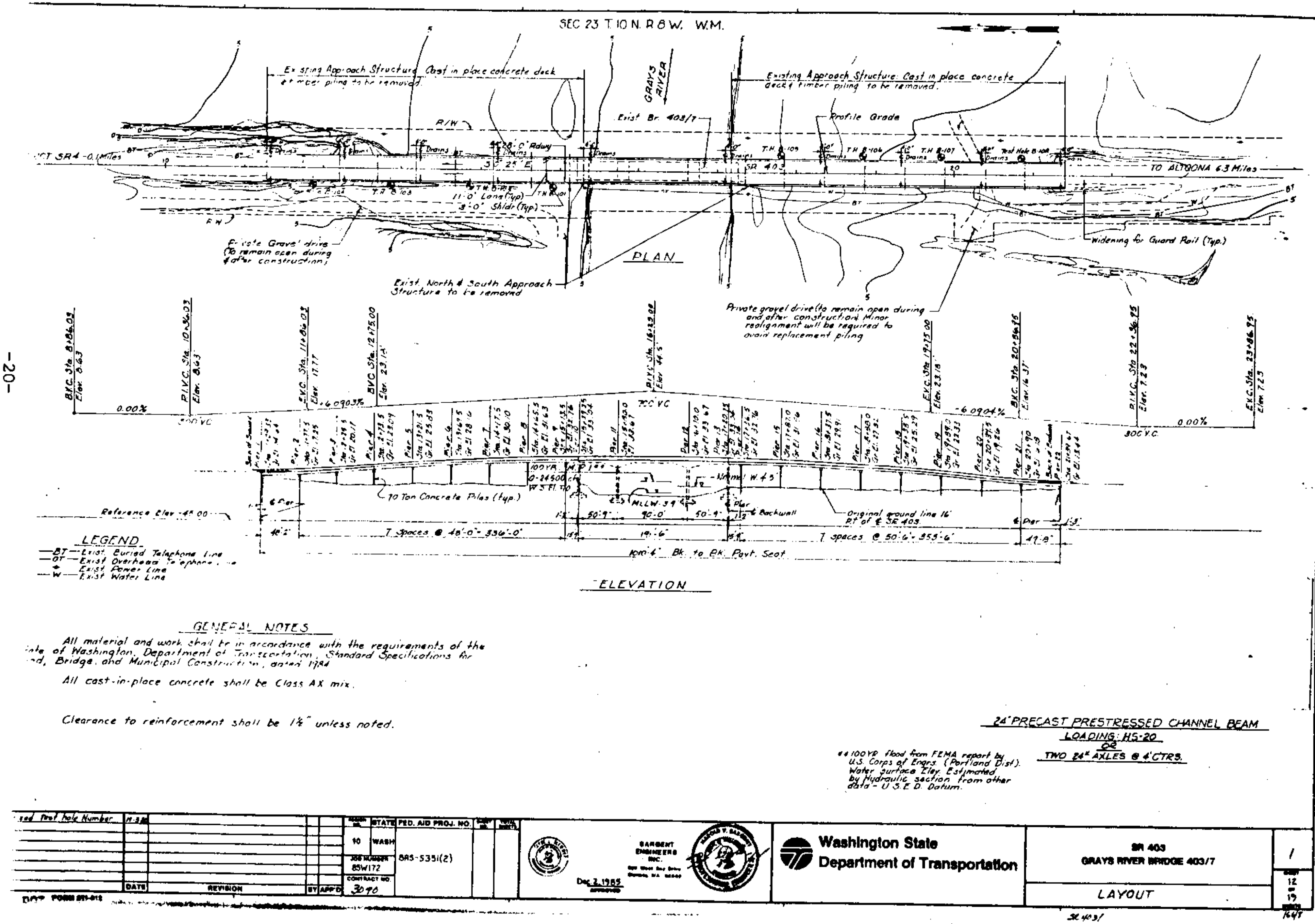
DOT FORM 232-007A REVISED 6/83 -615-

Sheet No.

APPENDIX D

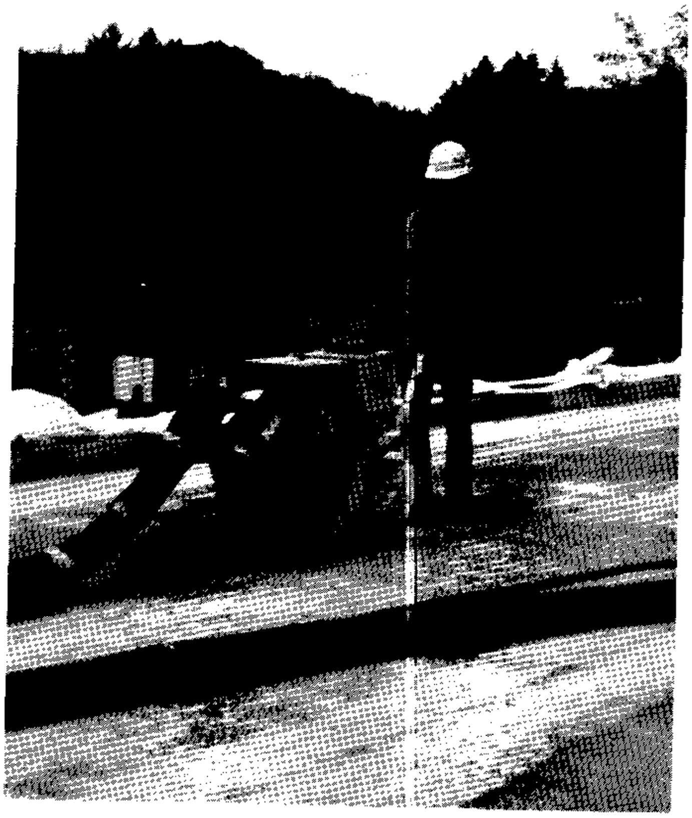
GENERAL LAYOUT

C.S 3550-PROJECT L-8014 ~ DIST. NO. 4 ~ MP 6.43 TO MP 6.52 ~ S.R. 403 ~ GRAYS RIVER BR. APPROACH REPL.



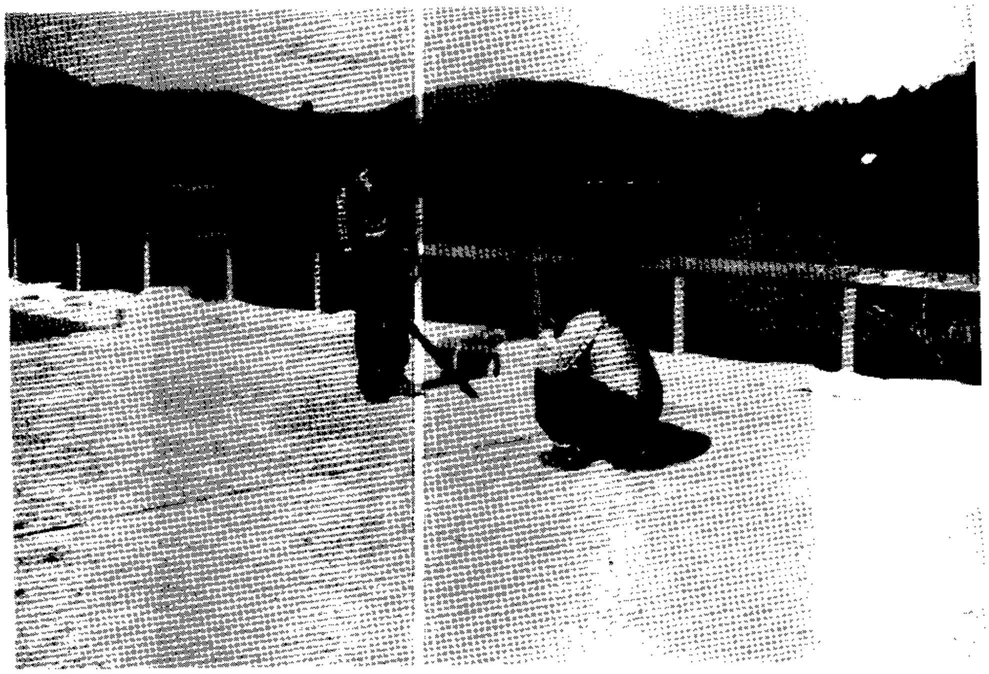
APPENDIX E

GRAYS RIVER PROJECT PHOTOGRAPHS

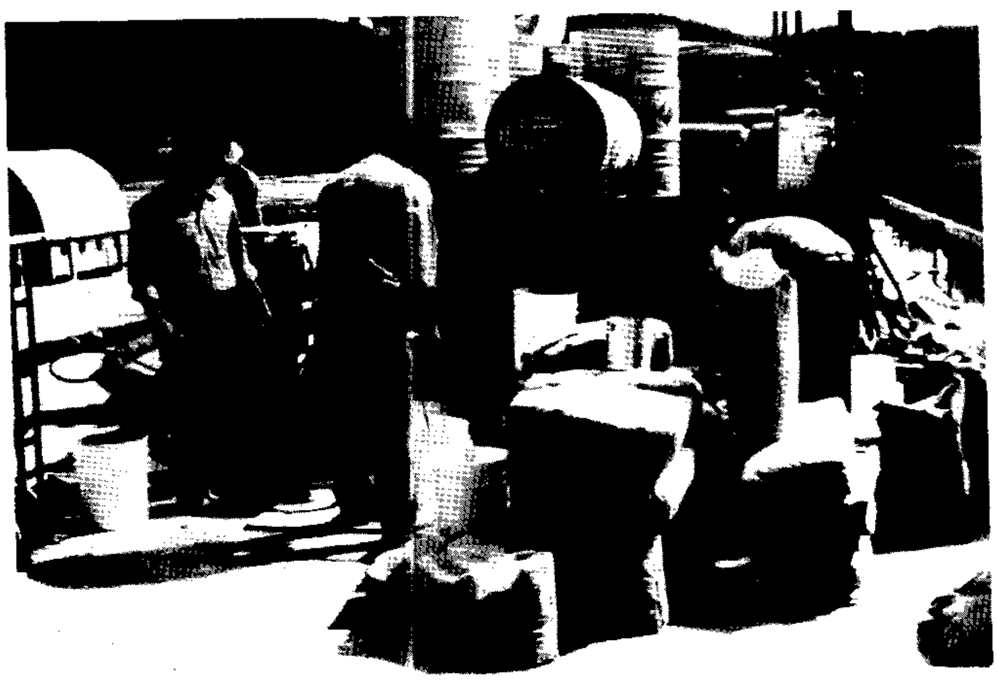


Shotblaster and Vacuuming Existing Deck

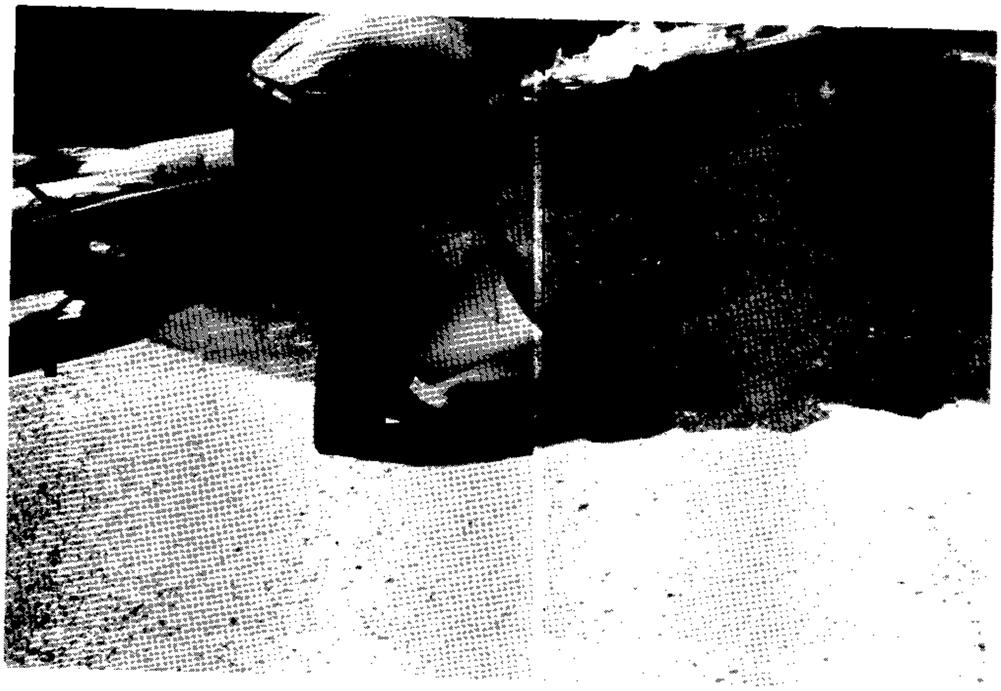
Hand Grinding Hard to Remove Spots



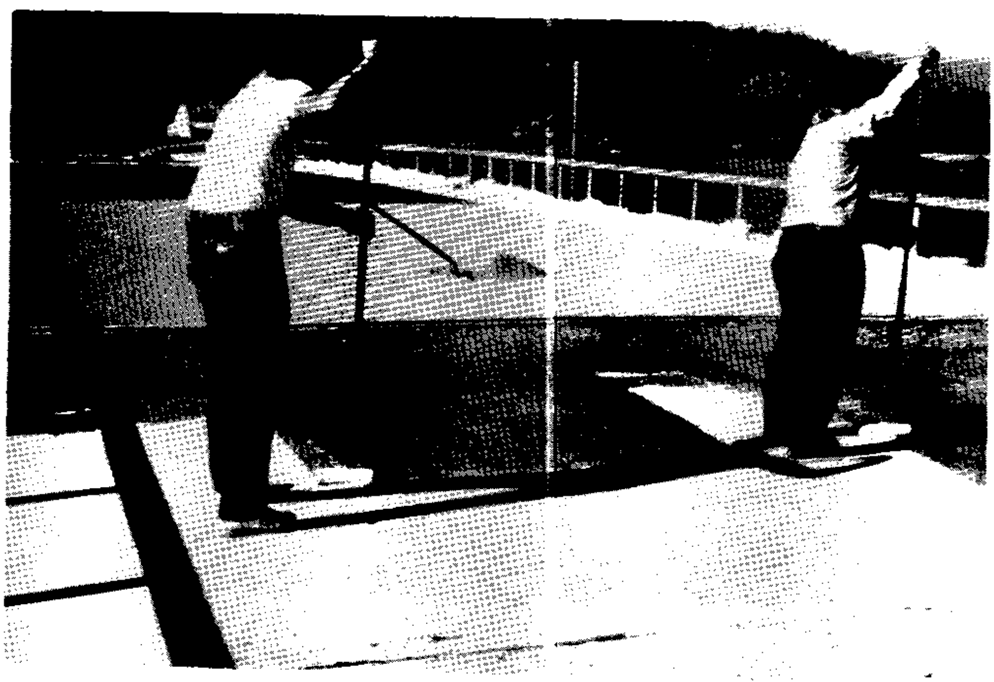
Cleaning Deck by Portable Air Blaster



Mixing Operation On Deck

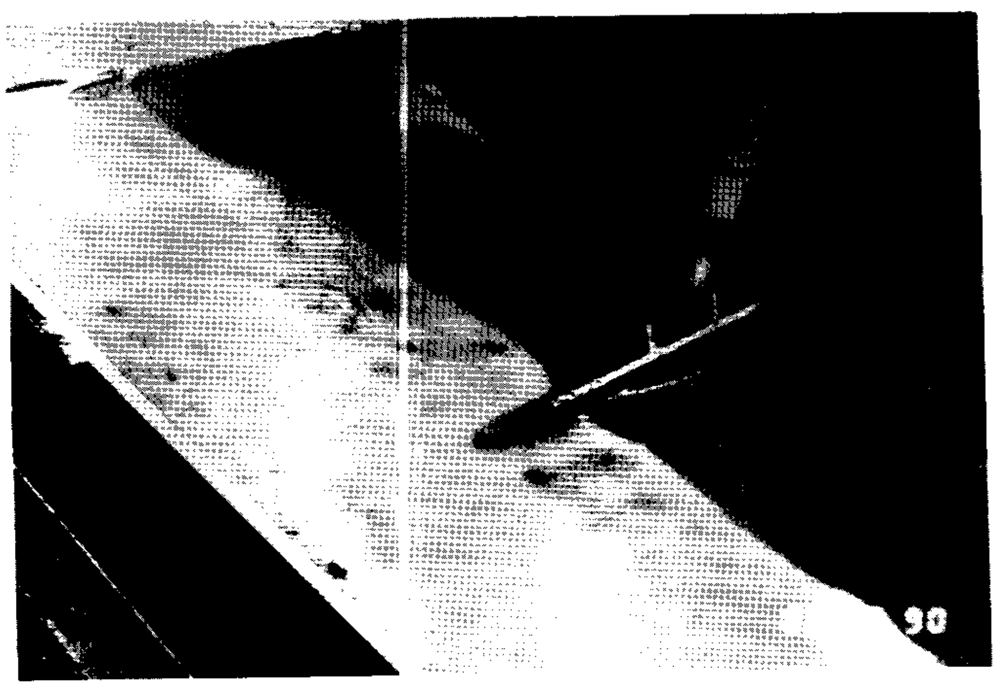


Pouring Primer on Cleaned Deck

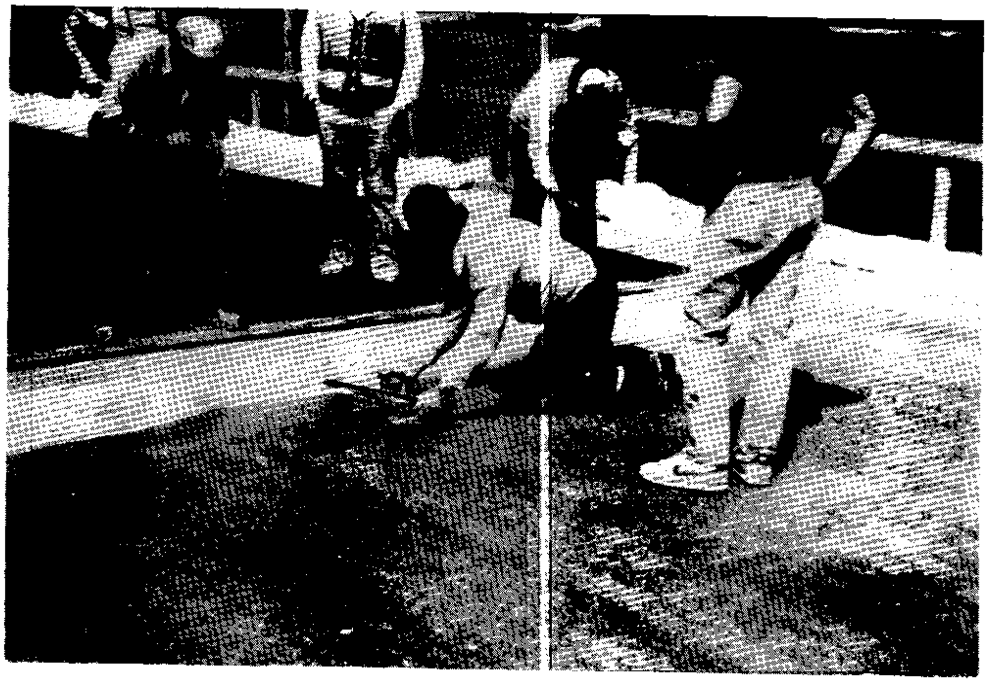


Primer Being Spread on Deck by Paint Roller

Mixed Component A and B With Aggregate
(Polymer Concrete Resin) Being Poured On Deck



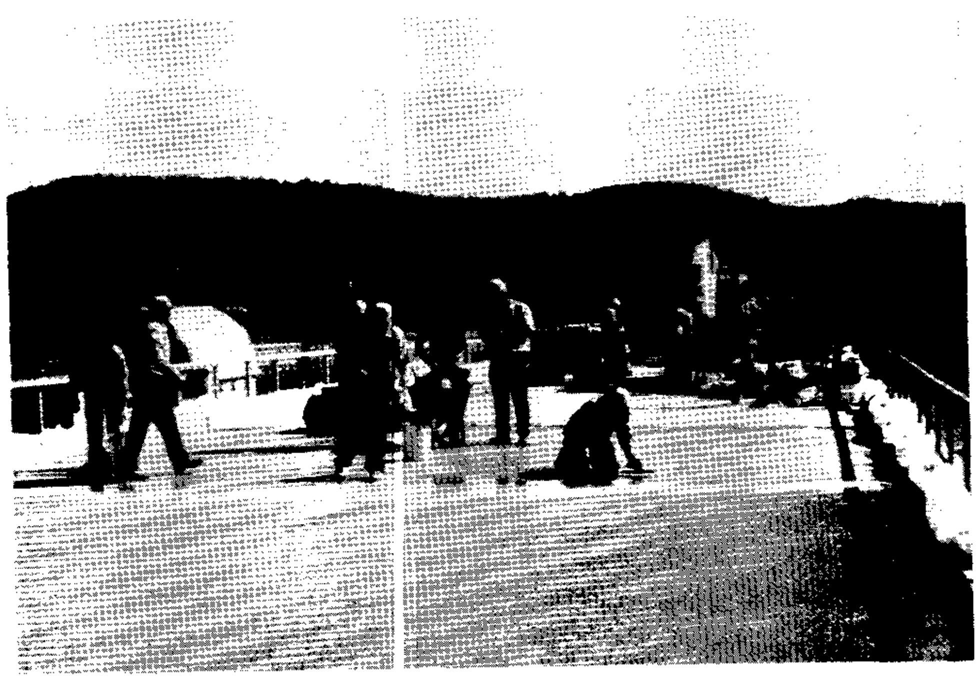
Troweling of Polymer Concrete Resin



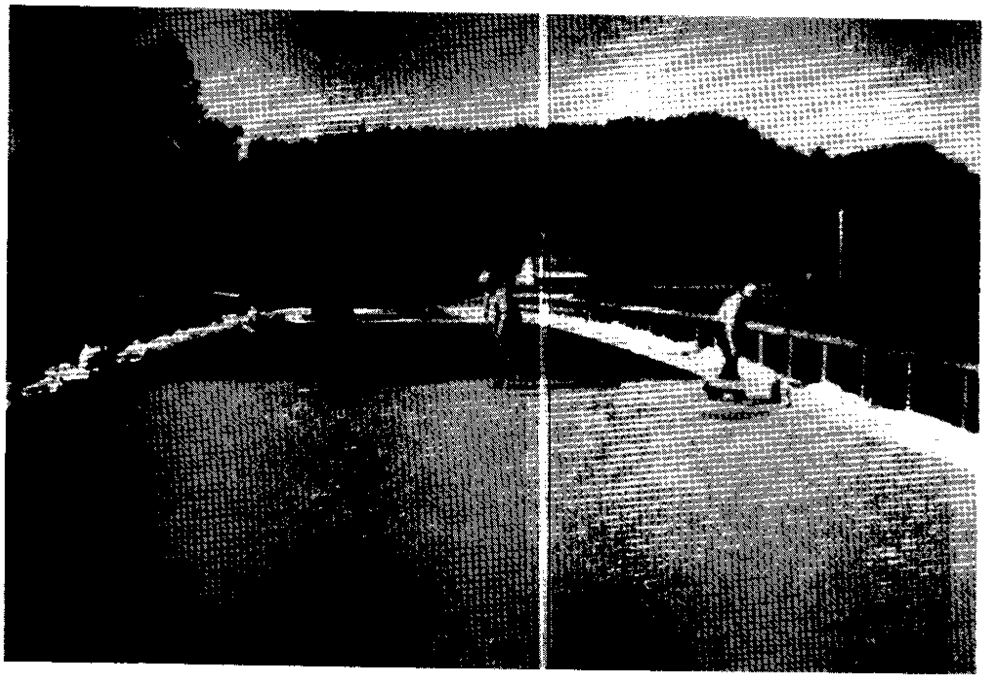
Another View of the Troweling Operation

You Need Good Knees For This Job

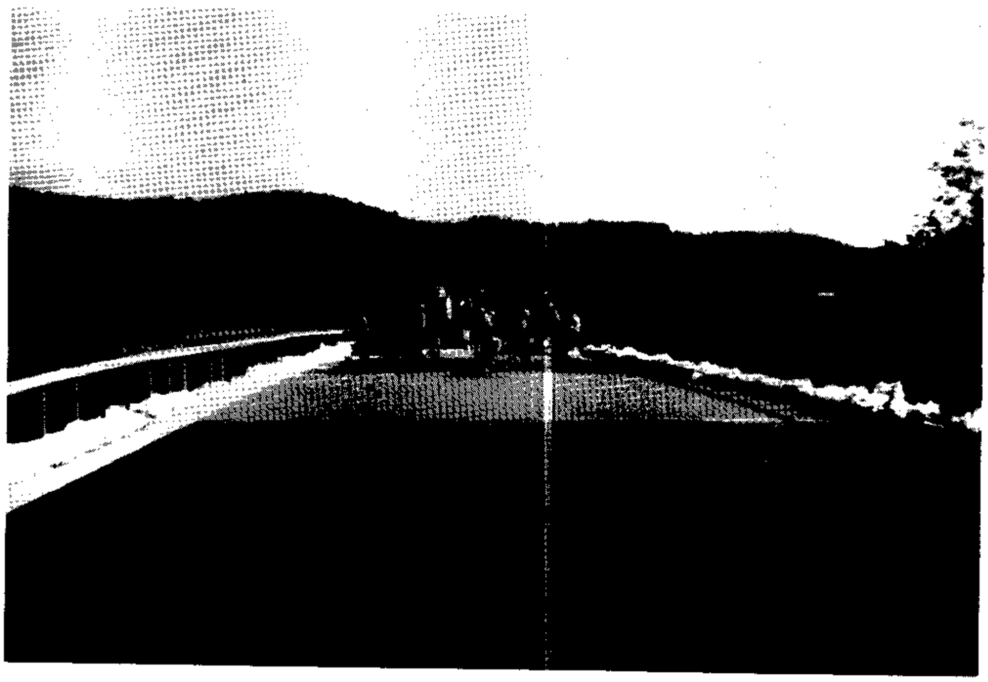
Spreading Aggregate by Hand



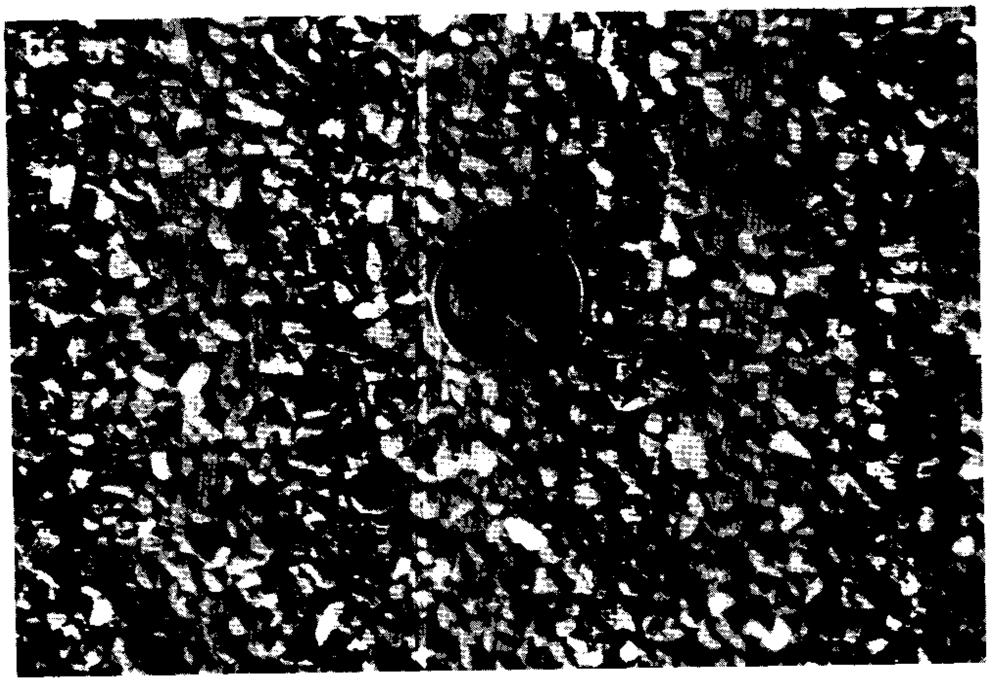
The Entire Crew in Operation



Sweeping Up Excess Aggregate



Finished Overlay in the Foreground



Texture of Finished Overlay