

PlusRide® Asphalt Pavement

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**SR 405, Contract 2768  
S Curve/Cedar River  
Bridge and RR Bridge**

Post Construction Report  
WA-RD 130.1

August 1987



**Washington State Department of Transportation**  
Planning, Research and Public Transportation Division

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

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<p>This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.</p> <p>16. Abstract</p> <p>This is the post construction and one year evaluation Report of PlusRide® being used as the wearing course on a bridge deck overlay under very high traffic volumes.</p> <p>A rubberized Class D Asphalt Concrete Pavement friction course was used on an adjacent bridge to compare against the PlusRide®. The properties evaluated were friction resistance, noise, fatigue properties and deicing characteristics. The friction and noise properties are the same. The PlusRide® has deeper ruts and large areas in the traveled lane have delaminated. The deicing characteristics have not been confirmed. The rubberized class D ACP is performing better than the PlusRide®.</p>			
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**PlusRide® Asphalt Pavement  
SR-405, Contract 2768  
S Curve/Cedar river Bridge and RR Bridge**

by

**R.L. Schultz  
Special Projects Engineer  
Washington State Department of Transportation  
Materials Laboratory**

**Post-Construction Report  
and  
One Year Evaluation**

**Experimental Project WA 84-01**

**Prepared For**

**Washington State Department of Transportation  
and in cooperation with  
U.S. Department of Transportation  
Federal Highway Administration**

**August 1987**

### **Disclaimer**

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification or regulation.

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## SYNOPSIS

PlusRide® was used as an 0.08 ft maintenance overlay on SR-405 from M.P. 3.51 to M.P. 3.81 on the northbound structure. The project was titled S Curve/Cedar River Bridge and RR Bridge. A Rubberized Asphalt Concrete pavement Class D was used on the southbound structure within the same limits. The contract plans called for planing off the existing asphalt system down to the bare concrete surface and placing the above materials as a new roadway surface.

The PlusRide® asphalt is claimed to have the following list of benefits:

1. Safety - Ensures high friction resistance.
2. Noise Resistance - Reduced decibel noise levels
3. Increased Road Life - Increased fatigue properties compared to conventional pavements
4. De-Icing Characteristics - Flexible surface causes breakup of accumulated ice.

All of the features will be evaluated on this installation.

## STUDY SITE

The project is located within the city limits of the city of Renton, Washington on the I-405 corridor, as shown on the accompanying vicinity map. The S Curve/Cedar R. Br. No. 405/18 E & W are located between M.P. 3.51 and M.P. 3.81 of I-405.

## CONSTRUCTION SUMMARY

The paving of both the PlusRide® and the Rubberized Class D ACP was done by Hi-Line Paving Asphalt Co. Inc. of Seattle, Washington. Hi-Line Paving was both the prime and the paving contractor. Bob Linden of All Seasons Surfacing Corporation, Bellevue, Washington was the technical representative for PlusRide® and was present for both the plant and street operations.

The job mixes recommended by All Seasons (PlusRide®) and Arizona Refining (Rubberized Class D) are listed below along with the extraction results for the mixes that were produced for the overlay.

### Aggregate Gradation

#### PLUSRIDE®

Sieve Size	Mix Design % Passing	Extraction Results % Passing	Specifications
3/8"	100	100	100
1/4	73.6	73	60-80
#10	32.4	25	23-38
#30	18.6	16	15-27
#200	9.5	9.3	8-12
Asphalt	8.5	8.2	

RUBBERIZED CLASS D

Sieve Size	Mix Design % Passing	Extraction Results % Passing	Specifications
3/8"	100	100	97-100
#4	36	38	30-50
#8	12	14	5-15
#200	2.5	3.5	2-5
Asphalt	8.5	8.7	

CSS-1 was used for both tack coat and a fog seal on the Class D. An average coverage of 0.87 Gal/sy was distributed by a 1979 ford F-700 with a 1,500 gallon tank and 10 ft bar powered by a 7½ HP Hercules engine. This coverage represented a heavy tack coat and light fog seal.

For the PlusRide®, the rubber granules were added to the aggregate at the 10,000 pound batch plant and dry-mixed for 15 seconds. The AR-4000W was then added and mixed for 25 seconds. The temperature of the mix was maintained between 290°-330°F.

For the Class D Asphalt, the rubber granules were added to the AR-4000W which had been heated to 400°-450°F. This mixture was then agitated and heated for one hour. This mixture was pumped into the aggregate after 7 seconds of dry-mixing. The rubberized asphalt and aggregate were then mixed for 32 seconds. The temperature of the mix was maintained between 280°-305°F.

A Barber Green SA-145 Track Paver placed both types of mix. Compaction was accomplished by a compaction train consisting of a 16 ton Dynapac CC-50 Vibratory Roller (used statically) for breakdown and an 8 ton, steel wheel, Hyster C-340 roller for finish rolling.

The following mat temperatures were observed at rolling:

<u>PLUSRIDE®</u>	<u>RUBBERIZED CLASS D</u>
Breakdown 290°-330°F	275°-300°F
Intermediate 220°-290°F	225°-275°F
Finish 170°-220°F	175°-225°F

Compaction on the PlusRide® was monitored by Nuclear Densometer. And after the first two passes with the Dynapac roller the density was checked and after each additional pass until breakover which occurred between the 6th and 7th pass.

The rubberized Class D compaction was done to the satisfaction of the Engineer, as there was no required density level for this material.

On September 15, 1984 the outside northbound lane was paved with PlusRide® and the outside southbound lane paved with Rubberized Class D. On September 16 the inside northbound lane was paved with PlusRide® and the inside southbound lane paved with Rubberized Class D.

The paving was done at night as required by Contract Traffic Control Provisions. The weather both nights was clear and warm with temperatures between 60°F and 69°F.

The paving was originally scheduled to be done in one night but due to a plant breakdown an additional night was needed to complete the project.

#### COST

The unit contract bid cost was \$50/ton (334 tons) for PlusRide® and \$86.85/ton (354 tons) for the Rubberized Class D ACP.

#### Performance Evaluation

##### FRICITION

The initial friction tests were done November 1984 which was 2 months after the completion of the paving. The friction values on the PlusRide® ranged from 33 to 40 with an average of 38. The friction values for the Rubberized Class D ranged from 31 to 40 with an average of 37. The tests were run again May 1987 and the range for the PlusRide® was 35 to 43 with an average of 40. The values for the Rubberized Class D ranged from 35 to 42 with an average of 39. There is no difference between the two when looking at the friction number. We would usually expect to see numbers in the 50 range when tested after 2½ years of use.

##### NOISE

Noise measurements were made on the inside of an auto traveling at the posted speed limit and the PlusRide® was 1 db noisier than the Rubberized Class D. These measurements were done in 1984 and 1987. The concrete at the south end of the bridge was 6 to 7 db noisier than both the asphalt mixes. There is no discernable difference between the two asphalts but there is between the asphalt and the concrete.

##### FATIGUE

Rut measurements were not taken at the completion of the contract but measurements were taken on May 19, 1987. The rut measurement in the outside wheel path on the PlusRide® was 3/8" deep. The rut measurement in the Rubberized Class "D" was 3/16" deep in the outside wheel path. A small area on the north end of the Rubberized Class D is showing signs of raveling. This area is roughly representative of one truck load of mix. Large areas of the PlusRide® have delaminated in the left wheel path of the outside lane all the way through the job. These areas have been patched back with regular Class B Asphalt Concrete pavement. These areas are shown in the pictures in Appendix A.

##### DENSITY

The Rubberized Class D had a specification to be compacted to the satisfaction of the Engineer. The PlusRide® had a specification to be compacted to 95% to 98% of maximum density (rice density) determined by WSDOT Test Method 705. This density specification was recommended by the Technical Representative at the design stage. The PlusRide® densities were 88% of the required rice density. This could be one of the factors that contributed to why the large areas in the traveled lane had to be patched.

### DE-ICING

We have not been able to confirm any de-icing characteristics of the PlusRide® materials as claimed by the manufacturers.

### CONCLUSION

Because of the large areas of delamination and patching in the outside lane paved with PlusRide®, one would conclude the Rubberized Class D is performing better than the PlusRide®.

K49/006

Appendix A  
Photographs



SR 405

S Curve/Cedar River  
Br. & RR Br. northbound  
between first & second  
expansion joint on Plus  
Ride

Fall 1984



SR 405

S Curve/Cedar river  
Br. & RR Br. northbound  
first expansion joint,  
northbound on Plus Ride

Fall 1984



SR 405

S Curve/Cedar River  
Br. & RR Br. northbound  
start of Plus Ride

Fall 1984

SR 405

S Curve/Cedar River  
Br. & RR Br. northbound  
approaching end of Plus  
Ride

Fall 1984



SR 405

S Curve/Cedar River  
Br. & RR Br. northbound  
end of the Br. in back-  
ground Plus Ride in  
foreground

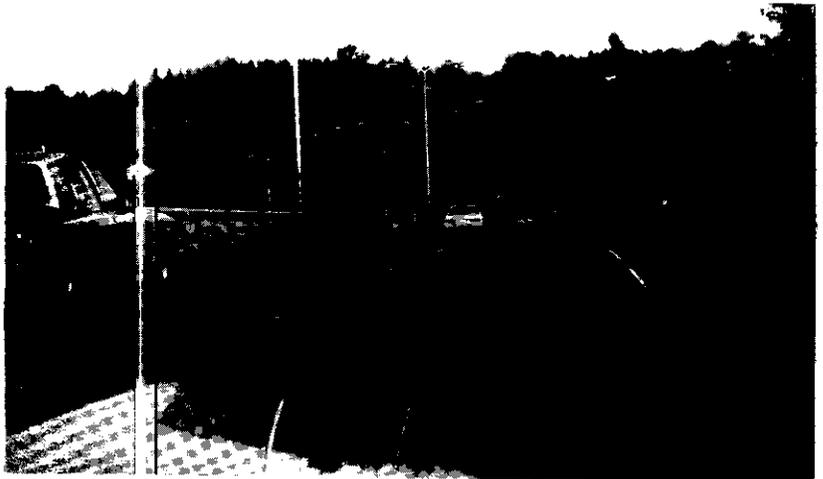
Fall 1984

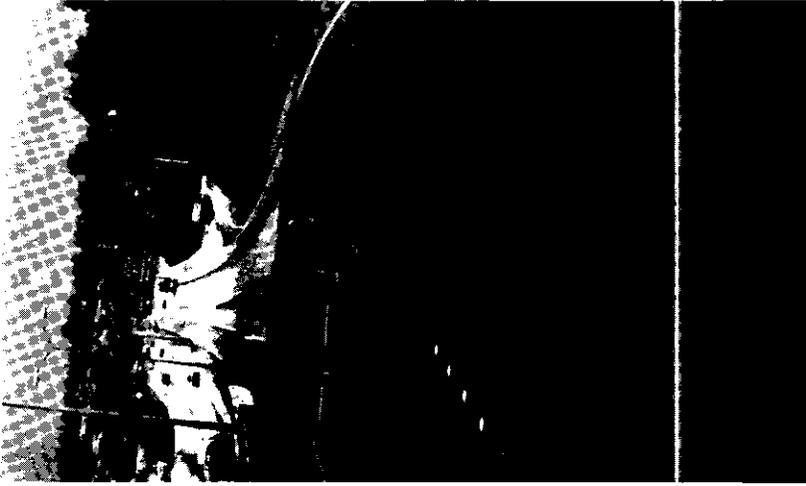


SR 405

S Curve/Cedar River  
Br. & RR Br. northbound  
second expansion joint  
on Plus Ride northbound

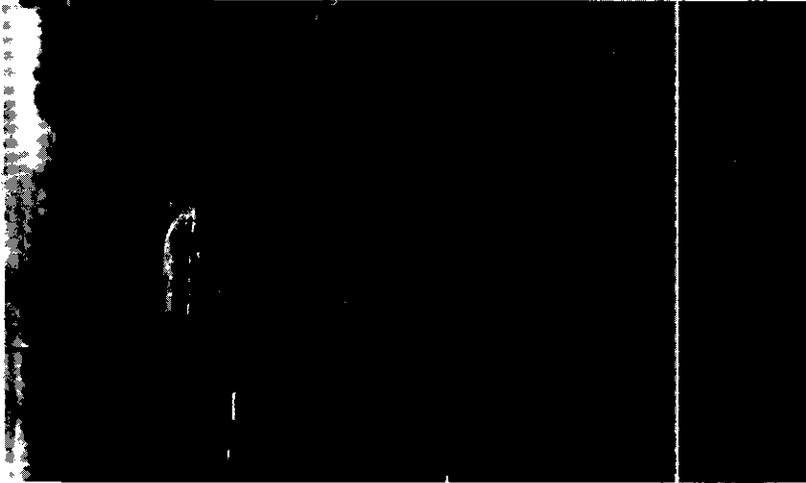
Fall 1984





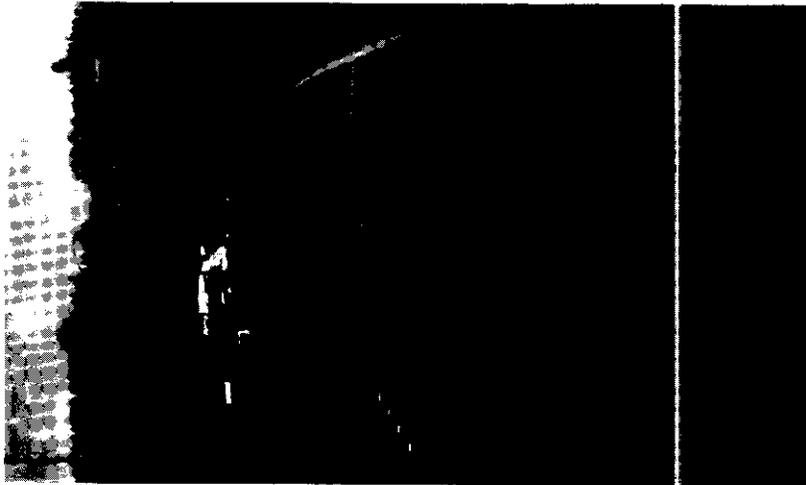
SR 405

S Curve/Cedar River Br. &  
northbound approaching end  
of Br. on Plus Ride  
Spring 1987  
Shows patched areas



SR 405

S Curve/Cedar River Br. &  
RR Br. northbound just past  
third expansion joints on  
Plus Ride  
Spring 1987  
Shows large area that has  
been patched



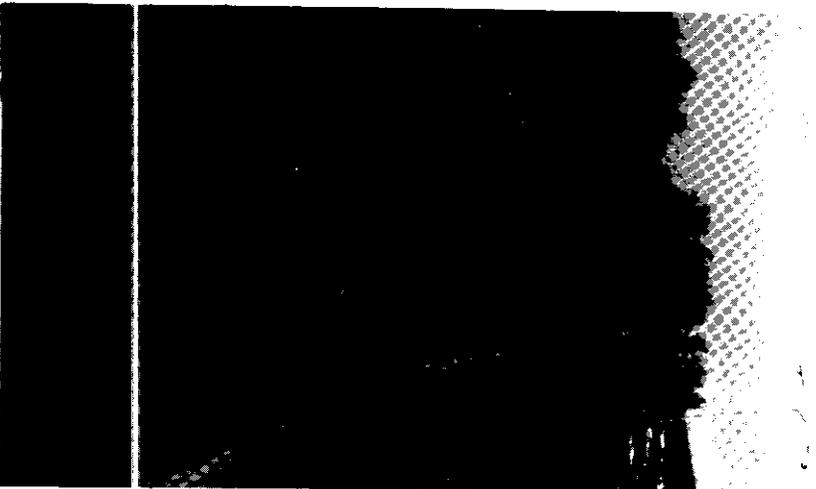
SR 405

S Curve/Cedar River Br. &  
RR Br. northbound third  
expansion join on Plus Ride  
Spring 1987  
Shows patching in outside  
lane



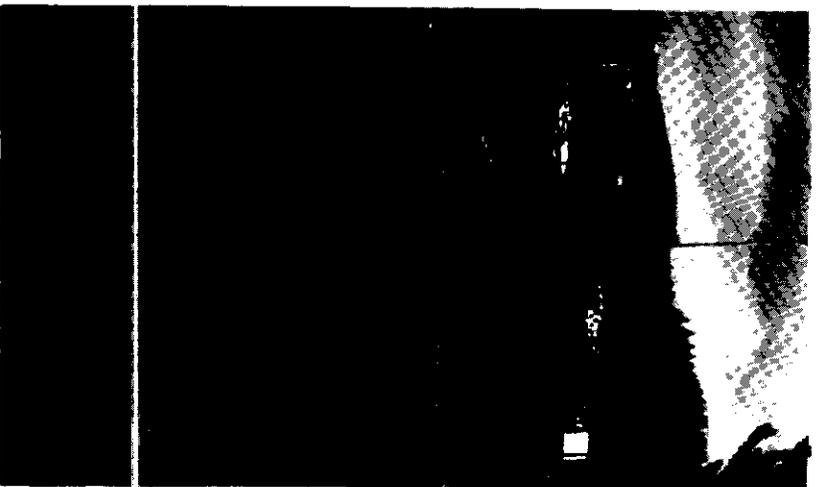
SR 405

S Curve/Cedar River Br. &  
RR Br. northbound, start of  
Plus Ride  
Spring 1987



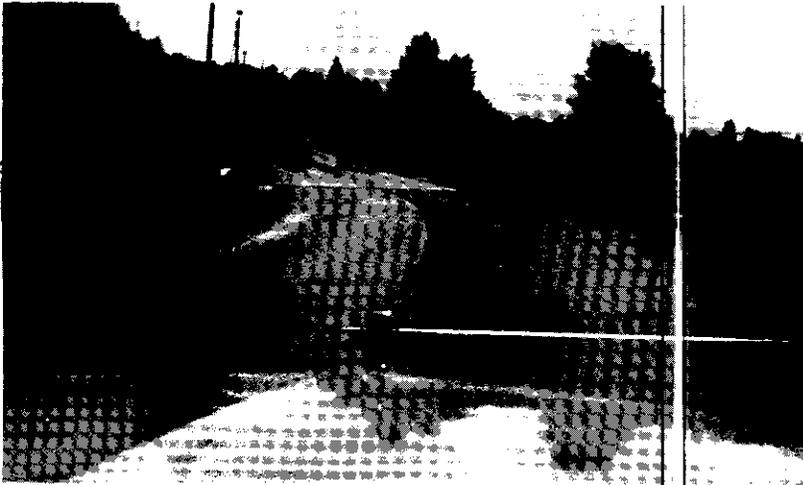
SR 405

S Curve/Cedar River Br. &  
RR Br. northbound just past  
first expansion joint on  
Plus Ride  
Spring 1987  
Shows patching in outside  
lane



SR 405

S Curve/Cedar River Br. &  
RR Br. northbound second  
expansion joint on Plus  
Ride  
Spring 1987  
Shows patching in outside  
lane



SR 405

S Curve/Cedar River  
Br. & RR Br. southbound  
approaching the south  
end of the Rubberized  
Class D

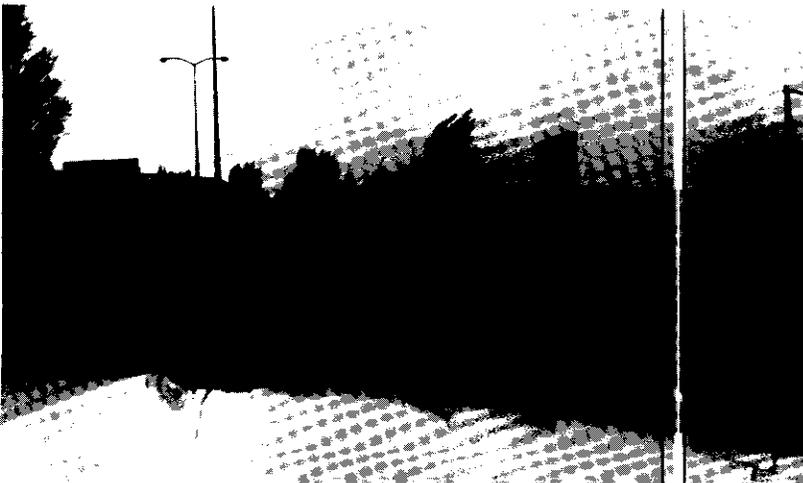
Fall 1984



SR 405

S Curve/Cedar River  
Br. & RR Br. southbound  
middle of Br. on Rubberized  
Class D

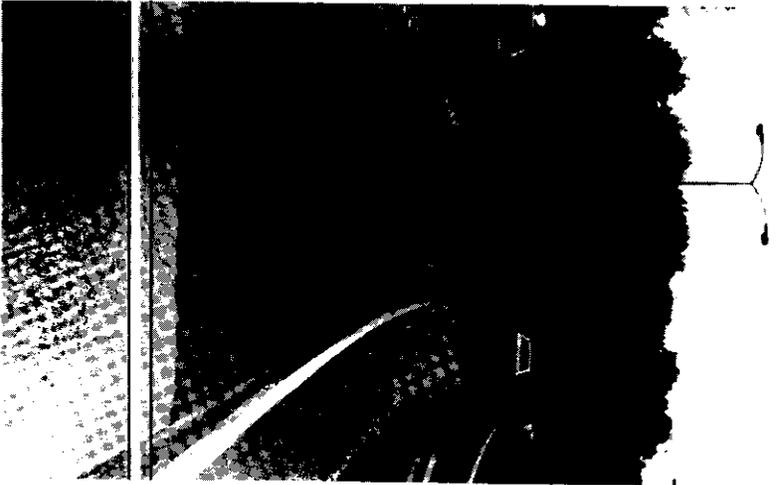
Fall 1984



SR 405

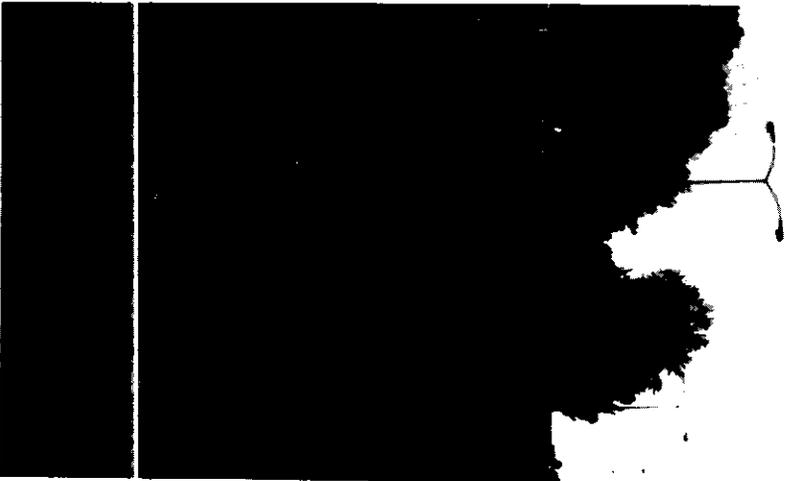
S Curve/Cedar River  
Br. & RR Br. southbound  
second expansion joint  
on Rubberized  
Class D

Fall 1984



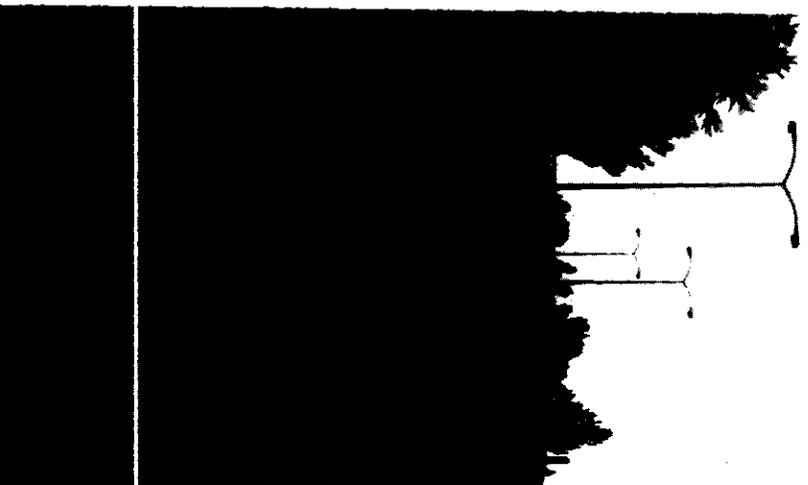
SR 405

S Curve/Cedar River Br. &  
RR Bridge southbound  
beginning of Rubberized  
Class D  
Spring 1987



SR 405

S Curve/Cedar River Br. &  
RR Bridge southbound just  
before first expansion joint.  
Shows some raveling in  
Rubberized Class D in the  
outside lane  
Spring 1987



SR 405

S Curve/Cedar River Br. &  
RR Bridge southbound first  
expansion joint. Shows the  
Rubberized Class D in Good  
Shape  
Spring 1987



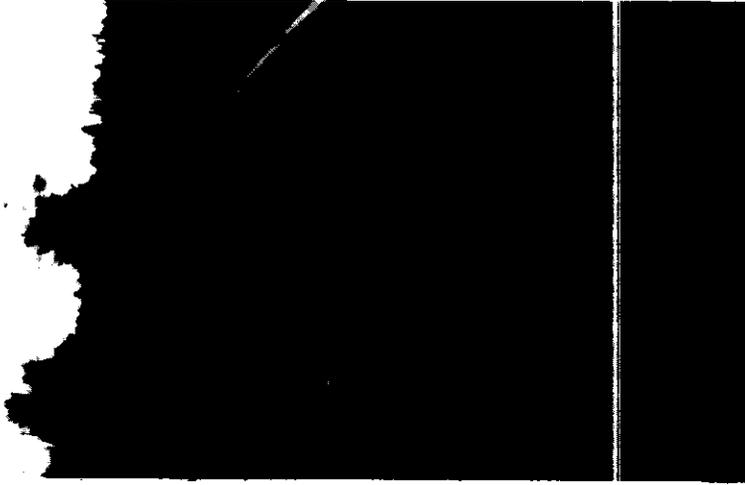
SR 405

S Curve/Cedar River Br. &  
RR Bridge southbound second  
expansion joint on Rubberized  
Class D. Surface looks good



SR 405

S Curve/Cedar River Br. &  
RR Bridge southbound third  
expansion joint on Rubberized  
Class D. Surface looks good



SR 405

S Curve/Cedar River Br. &  
RR Bridge southbound south  
end of bridge on Rubberized  
Class D shows rich strip  
in the outside wheel path

**APPENDIX B**

**MATERIALS SPECIFICATIONS**

When placing tack coat, procedures shall be utilized that will prevent the material from entering the Cedar River. Temporary plugging of bridge drains will be required to conform to the requirement.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading equipment impractical, the paving may be done with other equipment or by hand.

Compaction

The acceptable level of compaction shall average between 95 percent and 98 percent of the maximum density as determined by WSDOT Test Method 705. Control shall be per section 5-04.3(10B) of the standard specifications.

Measurement

Section 5-04.4 of the standard specifications is supplemented with the following:

Measurement of the rubber modified asphalt concrete will be by the ton and will include the granulated rubber, the asphalt cement and any other component of the mix.

Payment

Section 5-04.5 of the standard specifications is supplemented with the following:

The unit contract price per ton for "Rubber Modified ACP Including Paving Asphalt" and the estimated cost for "Mineral Filler" shall be full compensation for furnishing all labor, equipment, materials, and royalties required in the construction of this material as specified.

— RUBBERIZED ASPHALT CONCRETE PAVEMENT CLASS D

This special provision covers the modification of the standard specifications for Class D asphalt concrete to include granulated rubber in the binder phase of the mixture.

The standard specifications for asphalt concrete Class D shall be applicable except for the following changes:

Section 9-02 of the standard specifications is supplemented by the following:

Asphalt

Asphalt shall be AR-4000W conforming to section 9-02.1(4) of the standard specifications.

Granulated Rubber

Granulated rubber shall be free from fabric, wire, or other contaminated materials except that up to four percent of calcium carbonate may be included to prevent particles from sticking together. The rubber shall meet one of the following gradations and shall be at the option of the Contractor:

1. 100% ground vulcanized rubber:

<u>Sieve</u>	<u>Percent Passing</u>
No. 16	95-100
No. 25	0-10

All percentages are by weight.

2. 40% powdered reclaimed devulcanized rubber and 60% ground vulcanized rubber scrap:

<u>Sieve</u>	<u>Percent Passing</u>
No. 8	100
No. 30	60-80
No. 50	15-40
No. 100	0-15

All percentages are by weight.

Section 5-04.3 of the standard specifications is supplemented by the following:

Mixing Asphalt and Rubber

The asphalt and rubber shall be combined as rapidly as possible in the proportions of a minimum of two pounds of rubber to one gallon of asphalt (standard at 400 degrees F), then held for such a time and temperature that the consistency of the mix approaches that of a semi-fluid material. The temperature of the asphalt shall be between 400 degrees F and 450 degrees F prior to mixing. The use of up to nine percent diluent to assist in the mixing of rubber will be permitted. If a diluent is used, it shall have a boiling point of at least 350 degrees F. After reaching the proper consistency, the use of the material shall proceed immediately, and in no case shall the material be held at temperatures in excess of 350 degrees F for more than one hour after reaching that point.

The method and equipment for combining the rubber and asphalt shall be so designed and accessible that the Engineer can

readily determine the percentages, by weight, of each of the two materials being incorporated into the mixture.

For the rubberized asphalt concrete Class D only, the first sentence in the third paragraph of section 5-04.3(8) of the standard specifications is deleted and replaced by the following:

When discharged, the temperature of the mix shall not exceed 325 degrees F.

Section 5-04.5 of the standard specifications is supplemented by the following:

Rubberized asphalt will be measured by the ton in accordance with section 1-09 of the standard specifications and shall include the rubber and diluent. Any conversions from volume to weight shall be calculated on the basis of 7.5 pounds per gallon at 60 degrees F of asphalt rubber material.

Rubberized asphalt concrete will be measured by the ton with no deduction being made for the weight of liquid asphalt, rubber, diluent, blend sand, mineral filler, or any other component of the mixture.

Section 5-04.5 of the standard specifications is supplemented by the following:

16. "Rubberized ACP Class D Including Paving Asphalt", per ton.

The unit contract price per ton for "Rubberized ACP Class D Including Paving Asphalt" shall be full compensation for furnishing all labor, tools, materials, and equipment necessary to complete the work as specified.

#### AVERAGE REFINERY PRICES

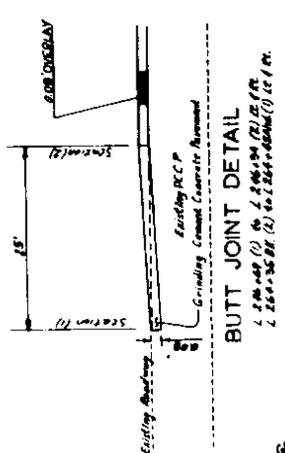
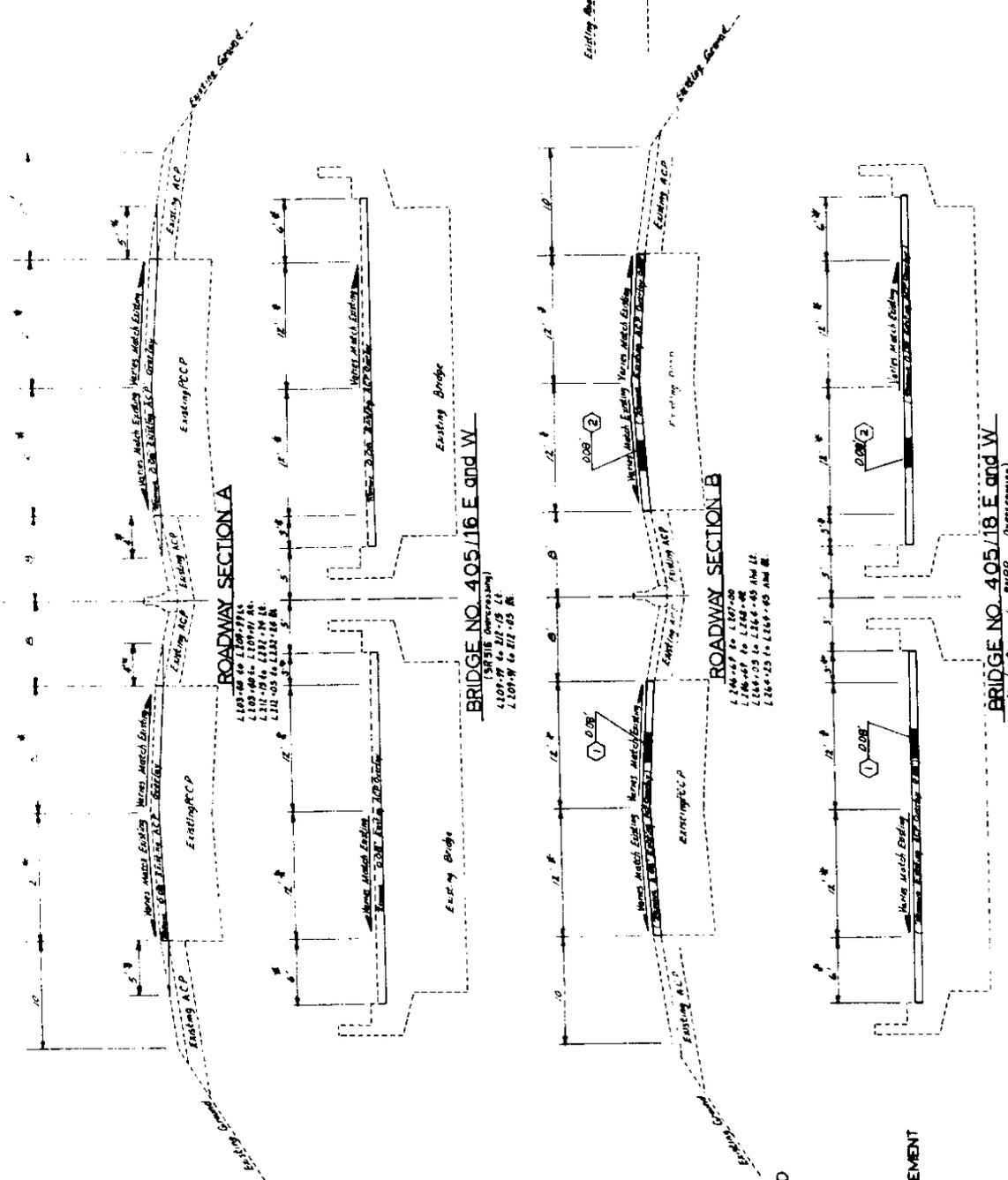
(January 31, 1983)

Within 10 days following award of contract, the Contractor shall provide the State with the name of a single asphalt cement supplier from whom he intends to obtain his asphalt cement for this project. At the end of each month, the State will obtain quoted prices for each day of that month for asphalt cement FOB at the refinery from major suppliers so that a statewide average can be determined.

It shall be the Contractor's responsibility to determine that his proposed supplier has regularly furnished information to the Department's Project Development Office regarding his previous month's daily refinery prices. These prices will be used in accordance with these specifications for determining a statewide average refinery price and information for the previous month must be received by the Department no later than the seventh of each month. Suppliers not

SR 405  
S CURVE/CEDAR R. BR. AND  
RR BR.  
84W096

APPENDIX C  
ROADWAY SECTIONS



- ① RUBBERIZED ACP CLASS D  
COMPACTED DEPTH
- ② RUBBER MODIFIED ACP  
COMPACTED DEPTH  
Plus R & C
- PLANING BITUMINOUS PAVEMENT

STATE	WASH	FED. AID PROJ. NO.	12-405-3(508)
CONTRACT NO.	840026	CONTRACT	
DRAWN BY	D. Johnson	CHECKED BY	P. Price
DESIGNED BY		CHECKED BY	
PROJECT ENGINEER	R. H. Johnson	DATE	11/20/54
APPROVED BY		DATE	



Washington State  
Department of Transportation

BRIDGE NO. 405  
S CURVE/ CEDAR R. BR. AND  
RR BR.

ROADWAY SECTION A/B

**APPENDIX D**

**TEST REPORTS**

No. 13804

WASHINGTON STATE DEPARTMENT OF TRANSPORT.

Materials Laboratory

Dist. Lab. No.: PA-1015-4

Material: RUBBERIZED CL D  
 Brand: \_\_\_\_\_ ID No.: \_\_\_\_\_  
 Control Sample No.: 1 Field Test No.: \_\_\_\_\_  
 Certificate No.: \_\_\_\_\_ Truck/Car No.: \_\_\_\_\_  
 Quant. Represented: \_\_\_\_\_ Produced to Date: \_\_\_\_\_  
 Aggregates: Washed \_\_\_\_\_ Scalped \_\_\_\_\_  
 Stockpile No.: \_\_\_\_\_ Pkt No.: A-338  
 Used at: Sta \_\_\_\_\_ to Sta \_\_\_\_\_  
 Sampled/Tested by: RM  
 Sampled at: BATCH PLANT  
 Date: Sampled 9-15-84 Tested 9-15-84  
 Mix Design Desired: \_\_\_\_\_

Contract No.: 2768  
 Section: S CURVE/CECONE R. BR.  
 F.A. No.: 22-405-2(SOB)  
 C.S. No.: \_\_\_\_\_  
 County: KING  
 Contractor: HI-LINE ASPHALT  
 Subcontractor: \_\_\_\_\_  
 Place: SEATTLE Date: 9-15-84  
 Organization Code: 412344  
 Forwarded by: STATE CAR  
 SPS No.: \_\_\_\_\_

Field: Acceptance  Rejection \_\_\_\_\_ Other \_\_\_\_\_ Based on Field Test No.: \_\_\_\_\_

Field Test Results - Report all screens used: Asphalt in Mix: Design 8.5 % Plan 8.5 % Extract 8.7 %

Screen	Field % Pass	Dist. Lab. % Pass	Spec's
3/8" #4	100	100	100
#10	38	38	45
#20	14	14	15
#40	3.5	3.5	4.5

Miscellaneous	Field	Dist. Lab.
Fracture Fine:		
Fracture Course:		
Sand Equivalent:		
Sieving	<input type="checkbox"/> Wet <input type="checkbox"/> Dry	<input type="checkbox"/> Wet <input type="checkbox"/> Dry

Grams/Lbs. Removed by District Lab: \_\_\_\_\_

Remarks: \_\_\_\_\_ Project Engineer: MILLER

DOT FORM 350-088 REVISED 4/79

White Copy with Sample Yellow Copy for Proj. Files

Phone: (SCAN) \_\_\_\_\_

RECEIVED  
 OCT 1 1984  
 PROJ. ENGR. MILLER

Lab No. PA-1015-4

OF ASPHALT MIXTURE

CL D  
RUBBERIZED

LABORATORY

EXTRACTION ANALYSIS

LABORATORY COMPACTION

SIEVES	% PASS	CLASS E	CLASS B	CLASS
1/2" Square	100	100		
3/8" Square	100	90-100		
3/4" Square	100	67-86	100	
1" Square	100	60-80	90-100	
1 1/2" Square	100		75-90	100
2" Square #4	38	40-62	66-75	80-50
2 1/2" Square #8	13	25-49	32-48	5-15
No. 40		10-23	11-24	
No. 60		6-14	6-15	
No. 200	3.4	2-9	2-7	2-5
Min. Cement %	8.6	2-7	4-7.5	

	RESULTS	RECOMMENDED RANGE
Stabilometer		
Cohesimeter		
Welds Tested		
Calculated		
S/S Ratio		
W/Cu. PL		
Max. Density (Road)		

meets specification requirements - except where marked

- Dist. Eng.
- Lab. Eng.
- Mat'l. Eng.

7897-2

A. J. PETERS, P.E.  
Materials Engineer

Date 9-26-84

By K. E. Whalen / RM

REC'D	FILED
RM	RM
JP	JP

No. 13806

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

To. MATERIALS LABORATORY

Dist. Lab. No.: PA-1012-4

Material: T RIDE

Brand: \_\_\_\_\_ ID No.: \_\_\_\_\_  
Control Sample No.: 1 Field Test No.: \_\_\_\_\_  
Certificate No.: \_\_\_\_\_ Truck/Car No.: \_\_\_\_\_  
Quant. Represented: \_\_\_\_\_ Produced to Date: \_\_\_\_\_  
Aggregates: Washed \_\_\_\_\_ Scalped \_\_\_\_\_  
Stockpile No.: \_\_\_\_\_ Pit No.: A-338  
Used at: Sta \_\_\_\_\_ to Sta \_\_\_\_\_

Contract No.: 2768 SR No.: 405  
Section: S CURVE / CEDAR R. BR.  
F.A. No.: T-405-3(50B)  
C.S. No.: \_\_\_\_\_  
County: KING  
Contractor: HI-LINE ASPHALT  
Subcontractor: \_\_\_\_\_  
Place: SEATTLE Date: 9-15-84  
Organization Code: 412344  
Forwarded by: STATE CAR  
SPS No.: \_\_\_\_\_

Sampled/Tested by: RM  
Sampled at: BATCH PLANT  
Date: Sampled 9-15-84 Tested 9-15-84  
Mix Design Desired: \_\_\_\_\_  
Field: Acceptance  Rejection \_\_\_\_\_ Other \_\_\_\_\_

Based on Field Test No.: \_\_\_\_\_

Field Test Results - Report all screens used:

Asphalt in Mix: Design 8.2 % Plan 8.2 % Extract 8.3 %

Screen	3/8	1/4	10	30	200	S/S
Field % Pass	100	79	27	16	9	
Dist. Lab. % Pass						
Spec's	100	79	27	16	9	

Miscellaneous	Field	Dist. Lab.
Fracture Fine:		
Fracture Course:		
Sand Equivalent:		
Sieving	<input type="checkbox"/> Wet <input type="checkbox"/> Dry	<input type="checkbox"/> Wet <input type="checkbox"/> Dry

Grams/Lbs. Removed by District Lab: \_\_\_\_\_  
Remarks: \_\_\_\_\_

Project Engineer: MILLER/RM

DOT FORM 350-058  
REVISED 8/78

White Copy with Sample  
Yellow Copy for Proj. Files

Phone: (SCAN) \_\_\_\_\_

TEST OF ASPHALT MIXTURE

Lab No. PA-1012-4

MATERIALS LABORATORY

EXTRACTION ANALYSIS

LABORATORY COMPACTION

SIEVES	% PASS	CLASS E	CLASS II	CLASS
1/8" Square	100	100		
3/16" Square	100	90-100		
1/4" Square	79	67-86	100	
3/8" Square	27	60-80	90-100	
1/2" Square	15	-	75-90	100
3/4" Square	9.0	40-62	66-78	60-80
1 No. 10	2.7	25-40	32-46	23-38
1 No. 20	1.5	10-20	11-24	
1 No. 40	0.9	6-14	6-18	15-27
1 No. 60	0.6	3-9	3-7	8-12
1 No. 200	0.2	0-2	0-2	
Asphalt Content %	8.2	3.2-7	4.2-7.5	

	RESULTS	RECOMMENDED RANGE
Shelfometer		
Cohesimeter		
Voies Tested		
Voies Calculated		
S/S Ratio		
Wt./Cu. Ft.		
Max. Density (Rise)		

Material meets specification requirements - except as noted

- DISTRIBUTION:
- Mat'l. Files
  - Proj. Files
  - Dist. Admin. \_\_\_\_\_
  - Proj. Eng. XX Miller
  - Const. Eng. \_\_\_\_\_
  - List Mat'l. Eng. \_\_\_\_\_

T807-1

A. J. PETERS, P.E.  
Materials Engineer

Date 9-26-84 By K. E. Whalen / RM

LAB. MATERIALS ENGR

No. 13807

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

To. MATERIALS LABORATORY

Dist. Lab. No.: B1-1011-4

Material: CL. D W/ RUBBER (20%)

Contract No.: 276B

ID No.:

Section: S CURVE / LEAR R. BR.

Control Sample No.: 2

F.A. No.: E-405-3(SUB)

Certificate No.:

C.S. No.:

Quant. Represented:

County: KING

Aggregates: Washed

Contractor: MI-LINE ASPHALT

Stockpile No.:

Subcontractor:

Used at: Sta to Sta

Place: SEATTLE Date: 9-16-84

Sampled/Tested by: RM

Organization Code: 412344

Sampled at: BATCH PLANT

Forwarded by: STATE CAR

Date: Sampled 9-16-84 Tested 9-16-84

SPS No.:

Mix Design Desired:

Field: Acceptance X Rejection Other Based on Field Test No.:

Field Test Results - Report all screens used:

Asphalt in Mix: Design 8.5% Plan 8.5% Extract 9.1%

Screen	3/8	#4	#8	200	S/S
Field % Pass	100	42	14	3.9	
Dist. Lab. % Pass					
Spec's	100	30/50	5/5	2/5	

Miscellaneous	Field	Dist. Lab.
Fracture Fine:		
Fracture Course:		
Sand Equivalent:		
Sieving	<input type="checkbox"/> Wet <input type="checkbox"/> Dry	<input type="checkbox"/> Wet <input type="checkbox"/> Dry

Grams/Lbs. Removed by District Lab:

Remarks:

Project Engineer: MILLER/KM

DOT FORM 350-056 REVISED 8/80

White Copy with Sample Yellow Copy for Proj. Files

Phone: (SCAN)

TEST OF ASPHALT MIXTURE

FIELD LABORATORY

EXTRACTION ANALYSIS

LABORATORY COMPACTION

SIEVES	% PASS	CLASS E	CLASS B	CLASS
1/4" Square	100	100		
3/8" Square	100	90-100		
1/2" Square	100	67-88	100	
3/4" Square	100	60-80	90-100	
1" Square	100	.	75-90	100
1 1/4" Square	42	40-62	88-78	30-50
2" Square	15	25-40	32-48	5-15
2 1/2" Square		10-23	11-24	
3" Square		6-14	6-15	
3 No. 40		10-23	11-24	
3 No. 60		6-14	6-15	
3 No. 200	4.4	2-6	3-7	2-5
Asphalt Cement %	9.1	3-7	4-9.5	

	RESULTS	RECOMMENDED RANGE
Stabilometer		
Cohesimeter		
Voids Tested Calculated		
S/S Ratio		
Wt./Cu. Ft.		
Max. Density (Rise)		

Material meets specification requirements - except where marked.

DISTRIBUTION:

Matl. Files

Test. Files

Dist. Admin. \_\_\_\_\_

Proj. Eng. XY Miller \_\_\_\_\_

Const. Eng. \_\_\_\_\_

Dist. Mat'l. Eng. \_\_\_\_\_

T807-2

A. J. PETERS, P.E. Materials Engineer

Date 9-26-84

By K. E. Whalen / RM

LAB. MATERIALS ENGR

No. 13808

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

To: MATERIALS LABORATORY

Dist. Lab. No.: B1-1013-4

Material: + RIDE
ID No.:
Control Sample No.: 2
Field Test No.:
Certificate No.:
Truck/Car No.:
Quant. Represented:
Produced to Date:
Aggregates: Washed
Scalped
Stockpile No.:
Pit No.: A-338
Used at: Sta to Sta
Sampled/Tested by: RM
Sampled at: BATCH PLANT
Date: Sampled 9-16-84 Tested 9-16-84
Mix Design Desired:
Field: Acceptance X Rejection Other

Contract No.: 2768
Hdqtrs. Lab. No.:
SF No.: 405
Section: S CURVE / CEAR R. BR.
F.A. No.: E-405-2(508)
C.S. No.:
County: KING
Contractor: HI-LINE ASPHALT
Subcontractor:
Place: SEATTLE Date: 9-16-84
Organization Code: 412344
Forwarded by: STATE CAR
SPS No.:

Field Test Results - Report all screens used:

Asphalt in Mix: Design 8.2 % Plan 8.2 % Extract 8.4 %

Table with columns: Screen, Field % Pass, Dist. Lab. % Pass, Spec's. Rows include 3/8, 1/4, 10, 30, 200, 100, 76, 31, 20, 109, 100, 60, 24, 5, 27, 8, 2.

Table with columns: Miscellaneous, Field, Dist. Lab. Rows include Fracture Fine, Fracture Course, Sand Equivalent, Sieving.

Grams/Lbs. Removed by District Lab:

Remarks:

Project Engineer: MILLER/RM

DOT FORM 350-056 REVISED 8/80

White Copy with Sample Yellow Copy for Proj. Files

Phone: (SCAN)

TEST OF ASPHALT MIXTURE

Lab No. B1-1013-4

FIELD LABORATORY

EXTRACTION ANALYSIS

LABORATORY COMPACTION

Table with columns: SIEVES, % PASS, CLASS E, CLASS B, CLASS. Rows include 1/4" Square, 1/2" Square, 3/8" Square, 1/2" Square, 3/4" Square, 1" Square, 1 1/2" Square, 2" Square, 3" Square, 4" Square, 5" Square, 6" Square, 8" Square, 10" Square, 12" Square, 15" Square, 18" Square, 24" Square, 30" Square, 48" Square, 60" Square, 75" Square, 90" Square, 120" Square, 150" Square, 180" Square, 240" Square, 300" Square, 480" Square, 600" Square, 750" Square, 900" Square, 1200" Square, 1500" Square, 1800" Square, 2400" Square, 3000" Square, 4800" Square, 6000" Square, 7500" Square, 9000" Square, 12000" Square, 15000" Square, 18000" Square, 24000" Square, 30000" Square.

Table with columns: RESULTS, RECOMMENDED RANGE. Rows include Stabilometer, Cohesimeter, Voids Tested, Voids Calculated, S/S Ratio, Wt./Cu. Ft., Max. Density (Rise).

trial meets specification requirements - except where marked

DISTRIBUTION:

Mat'l. Files X
Job'l. Files X
Dist. Admin.
Proj. Eng. XX Miller
Const. Eng.
Dist. Mat'l. Eng.

T807-1

A. J. PETERS, P.E. Materials Engineer

Date 9-26-84 by K. E. Whalen / RM
LAB. MATERIALS ENGR



REQUEST FOR APPROVAL OF MATERIAL SOURCES

39694

SEE REVERSE FOR INSTRUCTIONS

Date 8/1/84

Dist. No. 2768 F.A. No. ER-405-3(508) City/County or S.R. No. 405

Section MP 2.65 TO 3.81 S CURVE/CLDPC F. BL. & RR. BK.

Dist. Item No.	DESCRIPTION OF MATERIAL	SOURCES OF SUPPLY		Approval Action
		Local Supplier	Manufacturer's Brand or PR No.	
3	AC FOR JACK CSS-1	CARBON ASPHALT	RICHMOND BEACH	✓
6	RUBBER MODIFIED ASP Aggregate CL "D" Aggregate CL "G" " " 1/4" MINUS LIQUID RESINANT ARMOX W RUBBER GRANULATES	STONEMAN S/G STONEMAN S/G OR CITY TRANSFER & KENT STONEMAN S/G CHEVRON ASPHALT RUBBER GRANULATES	LEPAC SHOES A338 DIETZGEN PIT B 231 LEPAC SHOES A338 RICHMOND BEACH EURECH	✓ ✓ ✓ ✓ ②
7	RUBBERIZED ASP CL "D" CLASS "D" AGGREGATES	STONEMAN S/G	LEPAC SHOES A338	②
8	MINERAL	J.A. JACK & SONS RECEIVED OCT 1 1984 PROJ. ENGR. MILLER	SEATTLE/DUNSMITH PLANT RECEIVED AUG 3 1984 PROJ. ENGR. MILLER	②

REVISED	NOTED
JPC	SK

Have samples taken sent?

Contractor: HIGHLINE ASPHALT PAVING CO., INC. Submitted by: Michael J. Roman

I, Stephen J. Miller, have reviewed all items above for conformance to contract specifications and requirements and do recommend approval as these items conform thereto ( ) do not concur (Attach comments).

ANY ITEMS FOR WHICH APPROVAL IS BEING SOUGHT AS EQUIVALENT TO A SPECIFIED MATERIAL OR PRODUCT HAVE BEEN CIRCLED. ITEMS FULFILLING A SPECIFICATION OTHER THAN THE APPLICABLE STANDARD SPECIFICATIONS AS AMENDED HAVE BEEN UNDERLINED.

DEPARTMENT OF TRANSPORTATION MATERIALS LABORATORY USE ONLY

- \* Sources of supply for all items checked (✓) in approval column are approved for use on the above improvement provided the materials delivered comply with all specifications.
- Action on items indicated by number in the approval column is identified per the following code:
  1. Source Approved. Approval for Change of Source must be secured from the Headquarters Materials Engineer per Chapter 3.17 of the Construction Manual.
  2. Approval withheld; submit samples for preliminary evaluation.
  3. Approval withheld; submit brand name, name of manufacturer, or treating plant.
  4. Approval withheld; submit Transportation Department pit number (if known) and legal description.
  5. Approval withheld; please submit catalog cuts and/or shop drawings.
  6. Approval withheld;
  7. Source Approved: Acceptance of Materials for project use is to be conditional upon certification of either 100 percent American manufacture or identification of foreign manufacture and materials cost within the permissible limits for the project (See Special Provisions).

Dist. No. 2768 Dist. Area \_\_\_\_\_ Reviewed by \_\_\_\_\_ Project Engineer will submit control samples of material's as covered in Construction Manual, Chapter 9.

Dist. Eng. \_\_\_\_\_ Phone No. 8 234 2183 \_\_\_\_\_ Materials Engineer

Date 9/19/84 By D. P. Green



WASHINGTON STATE  
DEPARTMENT OF TRANSPORTATION

REQUEST FOR APPROVAL OF MATERIAL SOURCES

48783

SEE REVERSE FOR INSTRUCTIONS

Date 9/22/84

Cont. No. 2768 F.A. No. IR-405-3(SOE) City/County or S.R. No. J-405

Location S. CURVE / CEDAR RIVER BY. F.R.R. BRIDGE

Item No.	DESCRIPTION OF MATERIAL	SOURCES OF SUPPLY		Approval Action
		Local Supplier	Manufacturer's Brand or PR No.	
7	RUBBERIZED ACP CLASS "D" INCL. PAVING ASPHALT AR4000 W EXTENDER ASPHALT RUBBER	U.S. OIL ARIZONA Refining ARIZONA Refining	TACOMA COMPLEX JENSTAR C109 & C112. Spartan TBM-24.	✓ ✓ 2, 5 2, 5
6	RUBBER Modified ASPHALT CONCRETE PAVEMENT AR 4000 W	U.S. OIL	TACOMA RECEIVED SEP 21 1984 PROJ. ENGR. MILLER	✓

Contractor:

Submitted by:

Hi-Line ASPHALT  
Stephan J. Miller  
Project Engineer

Michael J. Roman

I, Stephan J. Miller, have reviewed all items above for conformance to contract specifications and requirements and (X) recommend approval as these items conform thereto ( ) do not concur (Attach comments).

ANY ITEMS FOR WHICH APPROVAL IS BEING SOUGHT AS EQUIVALENT TO A SPECIFIED MATERIAL OR PRODUCT HAVE BEEN CIRCLED. ITEMS FULFILLING A SPECIFICATION OTHER THAN THE APPLICABLE STANDARD SPECIFICATIONS, AS AMENDED HAVE BEEN UNDERLINED.

DEPARTMENT OF TRANSPORTATION MATERIALS LABORATORY USE ONLY

- \* Sources of supply for all items checked (✓) in approval column are approved for use on the above improvement provided the materials delivered comply with all specifications.
- Action on items indicated by number in the approval column is identified per the following code:
- Source Approved. Approval for Change of Source must be secured from the Headquarters Materials Engineer per Chapter 3-1.7 of the Construction Manual.
  - Approval withheld; submit samples for preliminary evaluation.
  - Approval withheld; submit brand name, name of manufacturer, or treating plant.
  - Approval withheld; submit Transportation Department pit number (if known) and legal description.
  - Approval withheld; please submit catalog cuts and/or shop drawings.
  - Approval withheld.
  - Source Approved: Acceptance of Materials for project use is to be conditional upon certification of either 100 percent American manufacture or identification of foreign manufacture and materials cost within the permissible limits for the project (See Special Provisions).

REC'D		NOTED
EXPER	NEW	
		del
JDP		JD
JPC		JPC

Dist. File X Dist. Admin. 1 Reviewed by [Signature] Project Engineer will submit control samples of materials as covered in Construction Manual, Chapter 3.  
 Mat'l File X Mat'l Engr. Miller Phone No. 8334 2183  
 Mat'l Engr. Miller  
 District Office X  
 Date 9/17/84 By [Signature]



DAILY REPORT OF ASPHALT PLANT OPERATIONS

District 1  
SR 405 Section S CURVE / CEDAR R. BR. Contract No. 2768

LANT Date 9-13-84 Class Mix "D" Report No. 1  
Batch  Continuous  Drum  Manufacturer STANDARD Capacity 10,000

MIX COMPOSITION  
Bin # 4 3 2 1 ; A-338  
% of Total Mix \_\_\_\_\_  
Wt. Lbs. \_\_\_\_\_ 3660  
Average % Blending Sand included \_\_\_\_\_  
Particle Coating (WSDOT Test 714) 100 %  
Total Batch Wt. or Lbs./Rev. \_\_\_\_\_ 340 4000  
Filler 8.5 Asphalt 340 Total 4000 100%

MIX ANALYSIS Indicate Method — Extraction or Quick Wash With or Without Vacuum Extraction Hot or Cold Bin Analysis

Test #	Bin #1					Bin #2		Bin #3		
	1	2	3	4	5	Screen Size	% Passing	Screen Size	% Passing	
Time	<u>9:30</u>									
Temp. Mix °F	<u>290</u>									
Temp. Asph. °F	<u>345</u>									
Method	<u>Q.P.</u>									
						% Frac.	Job Design	Cl. "D"	Std. Specs. Cl. "B"	Cl. "G"
% Passing 1 1/2"										
1"										
5/8"									100	
3/4"									90-100	100
#4	<u>100</u>							<u>100</u>	75-90	97-100
#10	<u>38</u>							<u>30-50</u>	55-75	80-88
#20	<u>14</u>							<u>5-15</u>	32-48	32-53
#40									11-24	11-24
#80									6-15	6-15
#200	<u>3.5</u>							<u>2.5</u>	3-7	3-7
% Asph	<u>8.7</u>								4.0-7.5	4.0-7.5
Sand/Silt Ratio									5.5-10.5	5.5-10.5
% Moisture										

ASPHALT PERCENTAGES  
Original Design 8.5 %  
Ordered 8.5 %  
Calculated from Production \_\_\_\_\_ %  
By Extraction Test 8.7 %

AGGREGATE WASTED  
Bin No. \_\_\_\_\_ Tons \_\_\_\_\_  
Mix sample sent to Lab today represents 180 Tons Total Production

PRODUCTION  
Plant Started 7:30 A.M.  
Plant Stopped 3:00 A.M.  
Air Temp. 68 A.M. \_\_\_\_\_ P.M.

Our complete analysis is shown by Test # 1 Weather clear  
NOTES: PLANT BROKE DOWN AT 5:00 A.M.

R. Mitchell 9-13-84

DAILY REPORT OF ASPHALT PLANT OPERATIONS

District 1

SR 405 Section S CURVE / CEDAR R. BR. Contract No. 2768

PLANT \_\_\_\_\_ Date 9-16-84 Class Mix "D" Report No. 2

Batch  Continuous  Drum  Manufacturer STANDARD Capacity 10,000

1% COMPOSITION

Bin # 4 3 2 1 A-338 Filler \_\_\_\_\_ Asphalt 8.5 Total 100%  
 % of Total Mix \_\_\_\_\_ Total Batch Wt. or Lbs./Rev. 340 4000  
 Wt. Lbs. \_\_\_\_\_ Particle Coating (WSDOT Test 714) 100 %  
 Average % Blending Sand Included \_\_\_\_\_

EX ANALYSIS

Indicate Method — Extraction or Quick Wash With or Without Vacuum Extraction

Hot or Cold Bin Analysis

Test #	Bin #1					Bin #2		Bin #3	
	1	2	3	4	5	Screen Size	% Passing	Screen Size	% Passing
Time	<u>9:00</u>								
Temp. Mix °F	<u>320</u>								
Temp. Asph. °F	<u>350</u>								
Method	<u>Q.E.</u>								

%	Job Design		Std. Specs.
	Frac.	Design	
% Passing 1 1/2"			Cl. "D"
1"			Cl. "B"
5/8"			Cl. "G"
3/4"			100
3/8"	<u>100</u>		90-100
#40	<u>42</u>		75-90
#60	<u>14</u>		60-88
#80			5-15
#200	<u>3.9</u>		11-24
% Asph	<u>9.1</u>		6-15
Sand/Silt Ratio			3-7
% Moisture			4.0-7.5

ASPHALT PERCENTAGES

AGGREGATE WASTED

PRODUCTION

Original Design 8.5 %  
 Ordered 8.5 %  
 Calculated from Production \_\_\_\_\_ %  
 By Extraction Test 9.1 %

Bin No. \_\_\_\_\_ Tons \_\_\_\_\_

Plant Started 8:30 A.M.  
 Plant Stopped 11:00 P.M.  
 Air Temp. 66 P.M.

Mix sample sent to Lab today represents 168 Tons Total Production

Our complete analysis is shown by Test # 1

Weather clear

NOTES:

R. Mitchell

9-16-84

DAILY REPORT OF ASPHALT PLANT OPERATIONS

SR 405 Section S CURVE / CEDAR R. BR. District 1  
Contract No. 2768

Plant                      Date 9-15-84 Class Mix +RIDE Report No. 1  
Batch  Continuous  Drum  Manufacture: STANDARD Capacity 14000

COMPOSITION  
Bin # 4 RUBBER MINERAL FILLER 1 A-338  
% of Total Mix                       
Wt. Lbs. 120 200 3350  
Average % Blending Sand Included                       
Total Batch Wt. or Lbs. / Rev.                       
Particle Coating (WSDOT Test 714) 100 %

ANALYSIS \* Indicate Method — Extraction or Quick Wash With or Without Vacuum Extraction

Test #	Bin #1					Hot or Cold Bin Analysis							
	1	2	3	4	5	Bin #2		Bin #3					
						Screen Size	% Passing	Screen Size	% Passing	Screen Size	% Passing	Screen Size	% Passing
Time	1:00	5:30											
Temp. Mix °F	290												
Temp. Asph. °F	325												
Method*	Q.E.												

	Bin #1					+RIDE Std. Specs.							
						Cl. "A"	Cl. "B"		Cl. "G"				
% Passing 1 1/2"													
1"													
5/8"													
3/4"										100			
3/8"	100	100								90-100			100
1/2"	79	73								75-90			97-100
#10	27	25								60-80			80-88
#20	16	16								23-38			32-48
#40										15-27			11-24
#80													6-15
#200	9.4	9.3								8-12			6-15
% Asph	8.3	8.2								3-7			3-7
Sand/Sift Ratio										4.0-7.5			4.0-7.5
% Moisture										5.5-10.5			5.5-10.5

ASPHALT PERCENTAGES  
Original Design 8.2 %  
Ordered 8.2 %  
Calculated from Production                      %  
By Extraction Test 8.3 %

AGGREGATE WASTED  
Bin No.                      Tons                       
Tons Total Production 168

PRODUCTION  
Plant Started 11:50 A.M.  
Plant Stopped 3:00 P.M.  
Air Temp. 59 A.M.                      P.M.

Mix sample sent to Lab today represents 1  
Our complete analysis is shown by Test # 1  
Weather clear to pty. cly.  
NOTES: SAMPLE #2 TAKEN 9-15-84 FOR INFORMATION  
PLANT SHUT DOWN AT 3:00 A.M.



WASHINGTON STATE  
DEPARTMENT OF TRANSPORTATION

# DAILY REPORT OF ASPHALT PLANT OPERATIONS

District 1

SR 405 Section S CURVE / CEDAR R. BL. Contract No. 2768

PLANT \_\_\_\_\_ Date 9-16-84 Class Mix TPDE Report No. 2

Batch  Continuous  Drum  Manufacturer STANDARD Capacity 14000

**MIX COMPOSITION**

Bin # 1 Filler 120 Asphalt 200 Total 3350  
 % of Total Mix \_\_\_\_\_ Filler 8.2 Asphalt 100%  
 Wt. Lbs. \_\_\_\_\_ Total Batch Wt. or Lbs. / Rev. 4000

Average % Blending Sand Included \_\_\_\_\_ Particle Coating (WSDOT Test 714) 100 %

**MIX ANALYSIS**

Indicate Method — Extraction or Quick Wash With or Without Vacuum Extraction

**Hot or Cold Bin Analysis**

Test #	Bin #1					Bin #2		Bin #3	
	1	2	3	4	5	Screen Size	% Passing	Screen Size	% Passing
Time	<u>11:45</u>								
Temp. Mix °F	<u>330</u>								
Temp. Asph. °F	<u>375</u>								
Method	<u>Q.E.</u>								

Test #	Bin #1		Bin #2		Bin #3	
	Screen Size	% Passing	Screen Size	% Passing	Screen Size	% Passing
% Passing 1 1/2"						
1"						
5/8"						100
3/8"	<u>100</u>					90-100
1/4"	<u>78</u>					75-90
#10	<u>31</u>					60-88
#40	<u>20</u>					32-48
#80						11-24
#200	<u>10.9</u>					6-15
% Asph	<u>8.4</u>					3-7
Sand / Silt Ratio						4.0-7.5
% Moisture						5.5-10.5

**ASPHALT PERCENTAGES**

Original Design 8.2 %  
 Ordered 8.2 %  
 Calculated from Production \_\_\_\_\_ %  
 By Extraction Test 8.4 %

**AGGREGATE WASTED**

Bin No. \_\_\_\_\_ Tons \_\_\_\_\_

**PRODUCTION**

Plant Started 11:00 A.M.  
 Plant Stopped 1:50 P.M.  
 Air Temp. 60 P.M.

Mix sample sent to Lab today represents 154 Tons Total Production  
 Our complete analysis is shown by Test # 1

Weather clear

**NOTES:**

R. Mitchell 9-16-84

