DEVELOPMENT OF IMPROVED MIX DESIGN

AND CONSTRUCTION PROCEDURES FOR

COLD IN-PLACE RECYCLED PAVEMENTS

1984-1986 Construction Projects

Volume IV - Final Report

by

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DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy presented herein. The contents do not necessarily reflect the official views or policies of the Oregon Department of Transportation.

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APPENDIX A

PROCEDURE USED TO MEASURE SPECIFIC GRAVITY

CHEVRON RESEARCH COMPANY RICHMOND, CALIFORNIA

PROCEDURE - BULK SPECIFIC GRAVITY OF COMPACTED BITUMINOUS MIXTURES USING PARAFILM-COATED SPECIMENS FEBRUARY 12, 1985

Author - H. F. Del Valle

Scope

This method is an improved version of ASTM Method D 1188 for determining the bulk specific gravity of compacted bituminous mixtures.

It describes the use of an elastomeric film instead of a paraffin coating to seal the mixture for weighing in water.

Apparatus

Balance with ample capacity and with sufficient sensitivity to enable the bulk specific gravity of the specimens to be calculated to at least four significant figures (that is, to at least three decimal places). It shall be equipped with a suitable suspension apparatus and basket to permit weighing the specimen while it is suspended from the center of the balance.

Water bath, equipped with an overflow outlet for maintaining a constant water level, for immersing the specimen in water while suspended under the balance. See Figure 1.

Parafilm "M" manufactured by American Can Company. Available from most scientific supply companies.

Test Specimens

Test specimens may be either cylindrically molded bituminous mixtures or field-cored specimens. Specimens shall be free of foreign materials such as seal coat, tack coat, foundation material, soil, paper, or foil.

Wrapping Procedure

With a sharp safety blade, cut two square pieces of parafilm, each of 4 x 4 in. Also, cut one piece of 4 x 8 in. for each sample. Follow the lines on the paper backing. Peel off the parafilm from its backing paper. Stretch out a 4-x 4-in. piece. Place it over one end of the sample. Proceed in the same way for the other end.

Encl. - Figure 1 (RA 850065) Figure 2 (PR 841307-1) Appendix A (PR 841307-2; PR 841307-3,4; PR 841307-9; PR 841307-5,6; PR 841307-7,10) Use the 4-x 8-in. parafilm piece to cover the cylindrical sides. Stretch it out along the length to about 16 in. Immediately wrap around the entire surface. (The parafilm elasticity keeps it taut around the sample.)

With fingers, press around the edges, sealing possible openings. One layer of parafilm will be adequate for most of the samples. If extra protection is needed, add another layer. Use the same procedure as for the first layer. The attached appendix describes the wrapping procedure in detail.

Density Calculations

Weigh the dry, unwrapped, room temperature stabilized specimen. Designate this weight as A.

Weigh the coated specimen in air. Designate this weight as D.

Weigh the coated specimen in water at 25°C (77°F). Designate this weight as E.

Determine the specific gravity of parafilm at $25^{\circ}C$ (77°F) (or assume a value of 0.9) and designate this as F.

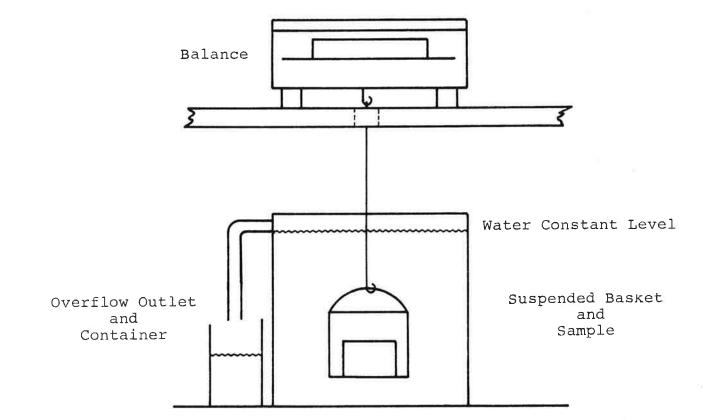
Calculate the bulk specific gravity of the specimen as follows:

Bulk Specific Gravity = A/[D-E-(D-A)/F]

- A = Weight of dry uncoated specimen, g,
- D = Weight of dry specimen plus parafilm
 coat, g,
- E = Weight of the dry specimen plus parafilm coating in water, g, and
- F = Specific gravity of the parafilm at 25°C.

:dad





Chevron Research CompanyRichmond, CaliforniaHFDRA850065



Materials and tools needed. 1.

- Parafilm. a.
- Safety cutting knife. Polyurethane foam mat. b.
- с.
- Polyurethane foam disks. (Not shown.) d.

<u>A P P E N D I X A</u>

WRAPPING PROCEDURE

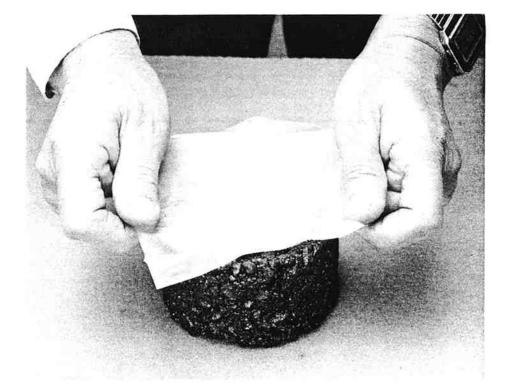


Figure A-1

Step 1. Cut the parafilm over a plywood board; remove the paper backing before stretching the film sheets. Grab the parafilm sheet and stretch it out in both directions one at a time, to about a 6- x 6-in. sheet and place it over one end of the compacted sample. See Figure A-1.

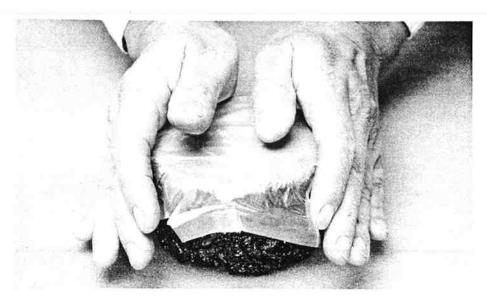


Figure A-2

Step 2. Press on the sides of the film around the sample. This will provide a partial adhesion of the film to the sample wall. See Figure A-2.

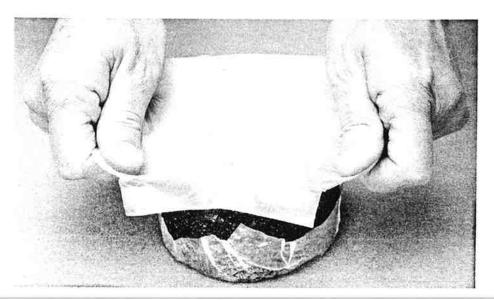


Figure A-3

Step 3. Once one flat end of the sample has been wrapped, turn it over and proceed in the same manner for the opposite end. Work on the polyurethane mat to prevent damage to the film which may occur if it is worked over a hard surface. See Figure A-3.
Chevron Research Company

Chevron Research Company Richmond, California HFD/G PR 841307-3,4

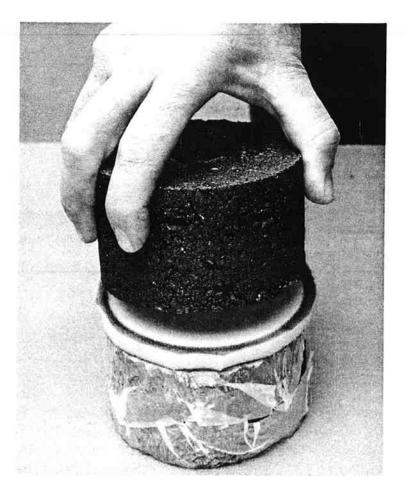


Figure A-4

Step 4. After the sample has been wrapped on both ends, it is necessary to remove air pockets that may be trapped between the sample walls and the film. In order to expel them, proceed as follows: Place the sample on the foam mat, place a 4-in. diameter disk over it, and press with another sample of the same diameter.

This procedure will eliminate all air pockets from both surfaces. See Figure A-4.

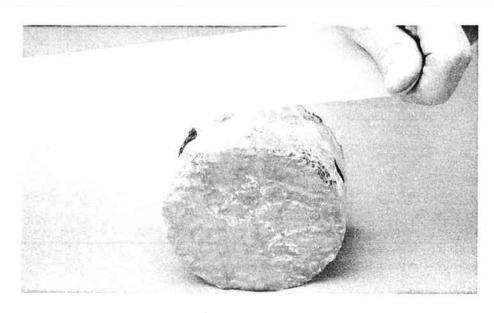


Figure A-5

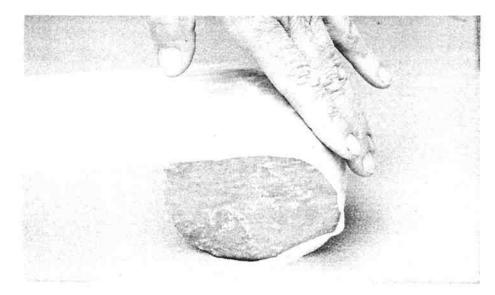


Figure A-6

Step 5. Use the 4- x 8-in. piece of film to wrap around the core. Proceed as follows: Grab the film along the ends and stretch out to about 16 in. Place one end over the sample. Some adhesion will be accomplished. Roll it over in such a way that the stretched film covers the cylindrical side of the sample in about one and one-half turns. See Figures A-5 and A-6. Chevron Research Company Richmond, California

PR 841307-5,6

HFD/G

1-28-85



Figure A-7

Step 6. After the sample has been completely wrapped, proceed to seal the film covering by pressing and folding the edges against the sample. See Figure A-7.



- Figure A-8
- Step 7. Completely wrapped samples should be stored on the polyurethane foam mat to avoid damage to the thin parafilm. When working with a large number of samples stack them one atop another with a polyurethane mat disc between them. See Figure A-8.

Chevron Research Company Richmond, California HFD/G PR 841307-7,10 **APPENDIX B**

FIELD PERFORMANCE DATA

	Mile	Deflection,	mils
Project	Point	1986	1987
MP 79.2 - Wasco Co.	88.00	0.65	0.71
(Warm Springs)	88.19	0.77	0.72
	88.28	0.71	0.67
	88.47	0.63	0.63
	88.56	0.55	0.52
	88.75	0.67	0.68
MP 18.0 - Powell Butte	11.00	1.63	
(Powell Butte Secondary)	11.09	1.60	
Powell Butte - Prineville	12.10	1.83	
(Ochoco Hwy)	12.19	1.72	
	28.52	2.05	2.03
	28.61	1.75	1.63
MP 89.6 - Jct. OR 19	96.91	1.35	
(Ochoco Hwy)	97.00	1.27	
Lakeshore Dr Green-	63.00	1.06	0.85
Springs Jct. (Lake of	63.19	1.17	1.08
the Woods)	63.28	1.34	1.19
·	63.47	1.38	1.12
	63.56	1.26	1.08
	63.75	1.22	1.03
US 97 - OR 39	4.53	1.50	
(Lower Klamath)	4.62	1.44	
Sprague River Rd Bly	23.11	1.93	
(Klamath Falls-Lakeview)	23.20	2.10	
(41.03	1.97	
	41.12	1.54	

Table B.1 - Deflection Measurements *

* As measured by geophone #1 (under & between applied loads)

Table B.2 - Ride Measurements *

			Ride,	in./mile
Project	BMP	EMP	1986	1987
MP 79.2 - Wasco Co.	79.0	96.0	70.0	
(Warm Springs)	96.0	79.0	74.0	
	78.0	92.0		90.8
	91.0	78.0		92.7
Powell Butte - Prineville	10 0	25.0	82.0	
(Ochoco Hwy)	25.0	19.0	81.0	
(cences mwy)	23.0	19.0	81.0	
MP 89.6 - Jct. OR 19	98.3	90.5	80.0	
(Ochoco Hwy)	90.5	98.3	79.0	
Takashawa Du Guaan	60.4	60.7	64.0	
Lakeshore Dr Green-	62.4	68.7	64.0	
Springs Jct. (Lake of	68.7	62.4	60.0	
the Woods)	62.0	67.0		51.7
	68.0	63.0		60.2
Sprague River Rd Bly	35.9	53.6	76.0	
(Klamath Falls-Lakeview)	53.6	35.9	76.0	

* As measured by the Mays ride meter.

Table B.3 - Pavement Condition *

			Cond	ition		
Project	Fall			1987		
MP 79.2 - Wasco Co. (Warm Springs)	2		3		3	& 4
MP 18.0 - Powell Butte (Powell Butte Secondary)	4		2			2
Powell Butte - Prineville (Ochoco Hwy)	2 &	4	2&	4	2	& 4
MP 89.6 - Jct. OR 19 (Ochoco Hwy)	2		1			1
Lakeshore Dr Green- Springs Jct. (Lake of the Woods)	5		1			1
US 97 - OR 39 (Lower Klamath)	2		2			2
Sprague River Rd Bly (KLamath Falls - Lakeview)	4		2			2

* OSHD Condition Rating Scale



Figure B.1 - Typical pavement surface condition of the MP 79.2 - Wasco Co. (Warm Springs) project. Photo was taken at MP 89.7 looking ahead on line on September 4, 1987. Surface is chip sealed.



Figure B.2 - Typical pavement surface condition of the Powell Butte -Prineville (Ochoco Hwy.) project. Photo was taken at MP 11.0 looking ahead on line on September 2, 1987. Surface is chip sealed.



Figure B.3 - Typical pavement surface condition of the MP 89.6 -Jct. OR 19 (Ochoco Hwy) project. Photo was taken at MP 96.4 looking ahead on line on September 9, 1987. Surface is chip sealed.



Figure B.4 - Typical pavement surface condition of the Lakeshore Dr. -Greensprings Jct, (Lake of the Woods) project. Photo was taken at MP 63.36 looking ahead on line on September 17, 1987. Surface is chip sealed.



Figure B.5 - Typical pavement surface condition of the US 97 - OR 39 (Lower Klamath Hwy) project. Photo was taken at MP 3.65 looking ahead on line on September 16, 1987. Surface is chip sealed.



Figure B.6 - Typical pavement surface condition of the Sprague River Rd. - Bly (Klamalth Falls - Lakeview) project. Photo was taken at MP 39.0 looking ahead on line on September 16, 1987. Surface is chip sealed.

Table B.4 - Rut Depth Measurements (1986)

	ء 	1) MF 89.0			
MP	Left	Inside	Inside	Right	
89.60	1/8	1/4	1/8	1/4	
89.75	1/4	1/4	1/8	3/8	
90.00	1/4	3/8	1/8	3/8	
90.25	1/4	1/8	1/8	1/4	
90.50	1/8	1/4	1/8	1/4	
90.75	1/4	1/4	1/8	3/8	
91.00	1/4	3/8	1/8	1/8	
91.25	1/4	3/8	1/8	1/4	
91.50	3/8	3/8	3/8	3/8	
91.75	3/8	3/8	1/4	1/4	
92.00	1/4	1/4	1/8	1/8	
92.25	1/4	3/8	1/8	1/2	
92.50	1/4	3/8	1/4	3/8	
92.75	1/2	1/2	3/8	5/8	
93.00	3/8	3/8	1/4	3/8	
93.25	1/4	1/8	1/4	3/8	
93.50	1/4	3/8	1/8	1/8	
93.75	1/8	1/4	1/8	1/8	
94.00	1/4	1/4	1/4	1/4	
94.25	5/8	3/8	1/4	3/8	
94.50	3/8	3/8	3/8	3/8	
94.75	1/2	1/4	1/4	1/4	
95.00	1/2	3/8	1/4	1/4	
95.25	1/2	3/8	1/8	3/8	
95.50	3/8	1/2	3/8	3/8	
95.75	1/2	1/4	1/4	3/8	
96.00	5/8	1/4	1/4	3/8	
96.25	3/8	3/8	1/4	1/4	
96.50	1/4	3/8	3/8	3/8	
96.75	3/8	1/4	1/8	3/8	
97.00	3/8	3/8	1/4	1/4	
97.25	1/8	1/4	1/8	1/4	
97.50	1/2	1/4	1/4	1/8	
97.75	1/2	1/4	3/8	1/4	
98.00	3/8	1/4	1/4	3/8	
98.30	1/4	1/4	3/8	3/8	

a) MP 89.6 - Jct. OR 19

Project	Sample ID	Average Height (in.)	Resilient Modulus (ksi)	Fatigue Life (reps)			
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 88.45	A4 A5 A1	2.38 2.26 2.40	213 581 122	8482 16856 7769			
MP 18.0 - Powell	C4	2.07	153	18940			
Butte; Powell Butte	C5	2.07	194	11058			
Secondary (Unit C)	C1	2.01	377	51490			
becomaily (onic c)	CT.	2.00	577	51490			
Powell Butte -	D4	1.65	180	*			
Prineville (HFE-150)	D5	*	*	*			
(Unit D) Eastbound	D1	*	*	*			
(
Powell Butte -	:D2	2.50	150	12250			
Prineville (CMS-2S)	:D5	2.37	176	14500			
(Unit D) Westbound	:D4	2.46	198	8114			
MP 89.6 - OR 19;	G4	2.29	364	36566			
Ochoco Hwy (Unit G)	G5	2.19	335	40476			
	G1	2.20	372	22703			
Lakeshore Dr	B4	2.37	397	10713			
Greensprings Jct.;	B5	2.52	607	4585			
Lake of the Woods	Bl	2.36	534	2292			
(Unit B)							
US 97 - OR 39;	:C4	2.58	361	6687			
Lower Klamath	:C5	2.57	327	10108			
(Unit C)	:C1	2.33	237	20620			
Sprague River Rd.;	E4	2.34	416	14844			
Klamath Falls -	E5	2.40	420	17233			
Lakeview (Unit E)	El	2.36	399	16650			

Table C.3 - Resilient Modulus and Fatigue Test Results for Field Cores (Fall 1986)

* Core too thin for proper test

	b)	Lakeshor	e Dr.	- Green	springs J	Jct.	
MP	Left	Inside 1	nside	Right			
62.40	3/8	3/8	0	1/8			
62.50	1/8	1/8	1/8	1/8			
62.75	1/8	1/4	5/8	1/8			
63.00	3/8	1/4	1/8	1/4			
63.25	3/8	3/8	1/8	1/8			
63.50	1/8	1/8	0	1/4			
63.75	1/8	1/4	1/8	3/4			
			ı 3 lar				
64.00	1/8	0	1/4	1/4	1/4	3/8	
64.25	0	1/4	1/8	1/8	1/4	1/8	
64.50	1/4	1/4	1/8	1/8	1/4	3/8	
64.75	1/4	1/4	1/8	1/8	1/8	1/4	
65.00	1/4	1/4	0	1/8	1/8	1/8	
65.25	1/4	1/8	0	0	1/4	1/4	
			4 lar				
65.50	1/8	0	1/8	0	1/8	1/8	0 1/4
65.75	1/4	1/4	1/8	0	0	1/8	1/8 1/8
		End 4	lane	begin 3	lane WB		
66.00	1/8	1/4	1/4	1/8	1/8	1/8	
66.25	1/8	0	1/8	0	1/8	1/4	
		End 3	lane	WB			
66.50	1/8	0	1/8	0			
66.75	1/8	1/8	1/8	1/8			
67.00	3/8	0	1/4	1/8			
67.25	1/8	0	0	1/4			
67.50	1/8	1/8	1/8	1/8			
67.75	1/8	0	0	1/8			
		Begin	3 lan	e WB			
68.00	1/8	Ō	1/8	1/8	1/8	1/8	
68.25	1/8	0	1/8	0	1/4	1/4	
68.50	1/4	1/8	1/8	1/8	1/4	1/4	
	•	End 3				,	
68.75	3/8	1/8	3/8	3/8			

		57 00 57	01(3)		
MP	Left	Inside	Inside	Right	
0.00	3/8	1/2	1/8	1/8	
0.25	1/8	1/8	1/8	1/8	
0.50	1/8	1/8	1/8	1/8	
0.75	1/8	1/8	1/8	1/8	
1.00	1/8	1/8	1/4	1/8	
1.25	1/8	1/8	1/8	1/8	
1.50	1/8	0	1/4	0	
1.75	1/8	1/8	1/8	1/8	
2.00	1/4	1/4	1/4	1/4	
2.25	1/8	1/8	1/8	1/8	
2.50	1/4	1/8	1/8	1/8	
2.75	1/4	1/4	1/8	1/4	
3.00	1/4	1/8	1/4	1/8	
3.25	1/4	1/8	1/8	1/4	
3.50	1/4	1/4	1/8	1/8	
3.75	1/4	1/4	1/8	1/8	
4.00	1/4	1/4	1/4	1/8	
4.25	1/4	1/8	1/8	1/8	
4.50	1/8	1/8	1/8	1/8	
4.75	3/4	1/4	1/8	1/8	
5.00	1/4	1/8	1/8	1/4	
5.25	3/8	1/8	1/8	1/8	
5.50	1/8	1/8	1/4	1/8	
5.75	3/8	1/8	1/8	1/4	
6.00	1/4	1/8	1/4	1/8	
6.25	1/4	1/8	1/8	3/8	
6.50	1/8	1/8	1/4	1/4	

c) US 97 - OR 39

d) Sprague River Rd Bly							
MP	Left	Inside	Inside	Right			
35.80	1/8	1/8	1/4	1/4			
36.00	0	1/8	1/8	1/8			
36.25	3/8	1/8	1/8	1/8			
36.50	1/4	1/4	1/8	1/8			
36.75	0	1/8	0	1/4			
37.00	1/8	1/4	1/8	1/4			
37.25	1/4	1/4	1/8	1/8	¥)		
37.50	1/8	1/8	1/8	1/8			
37.75	1/8	1/4	1/8	1/4			
38.00	1/4	0	1/8	0			
38.25	3/8	1/4	1/4	1/8			
38.50	3/8	1/8	1/4	1/8			
38.75	1/4	1/4	1/8	1/4			
39.00	1/4	1/8	3/8	1/4			
39.25	1/4	1/4	1/4	1/4			
39.50	3/8	1/4	1/4	3/8			
39.75	1/4	3/8	3/8	3/8			
40.00	1/4	1/4	1/4	1/4			
40.25	3/8	3/8	3/8	1/4			
40.50	1/4	1/4	1/8	1/8			
40.75	1/4	3/8	1/4	1/4			
41.00	3/8	1/4	1/4	1/4			
41.25	3/8	5/8	3/8	3/8			
41.50	3/8	3/8	3/8	3/8			
41.75	1/4	1/4	3/8	1/8			
42.00	1/8	1/4	1/8	1/4			
42.25	1/4	1/2	3/8	1/4			
42.50	1/4	1/8	3/8	1/8			
42.75	5/8	1/4	3/8	1/4			
43.00	1/8	1/8	1/8	1/4			
43.25	1/4	3/8	3/8	1/4			
43.50	1/2	1/2	3/8	3/8			
43.75	1/8	1/4	1/2	1/2			
44.00	1/8	1/4	1/4	1/4			
44.25	1/8	1/8	1/8	1/4			
44.50	1/2	1/4	1/2	1/8			
44.75	1/4	1/8	1/4	1/8			
45.00	3/8	1/2	3/8	3/8			
45.25	3/8	1/4	1/8	1/4			
45.50	1/4	1/4	3/8	1/4			
45.75	1/4	1/2	3/8	3/8			
46.00	3/8	3/8	3/8	1/4			
46.25	1/8	1/2	1/4	1/8			
46.50	3/8	1/4	1/4	1/8			
46.75	1/8	1/4	3/8	3/8			
47.00	3/8	1/4	1/4	1/8			

		pragae na	LIGI NUI	511	
MP	Left	Inside	Inside	Right	
47.25	3/8	3/8	1/4	1/4	
47.50	1/4	1/4	1/4	3/8	
47.75	3/8	1/2	3/8	1/4	
48.00	1/2	1/2	3/8	3/8	
48.25	3/8	3/8	1/4	3/8	
48.50	3/8	1/2	1/4	1/4	
48.75	3/8	5/8	1/4	1/8	
49.00	5/8	1/2	1/4	1/2	
49.25	3/8	1/2	1/4	3/8	
49.50	3/8	3/8	1/4	3/8	
49.75	3/8	1/2	3/8	1/2	
50.00	3/8	3/8	3/8	1/8	
50.25	3/8	3/8	1/4	1/8	
50.50	1/8	1/4	1/4	1/4	
50.75	3/8	1/4	1/4	1/8	
51.00	1/4	1/4	1/4	1/4	
51.25	1/8	1/4	1/4	1/4	
51.50	1/8	1/8	1/4	1/4	
51.75	1/4	1/4	1/4	1/4	
52.00	1/4	1/8	1/4	3/8	
52.25	1/4	1/8	1/4	1/4	
52.50	3/8	1/4	1/4	3/8	
52.75	1/4	1/8	3/8	3/8	
53.00	3/8	3/8	3/8	3/8	
53.25	3/8	1/2	1/2	3/8	
53.50	3/8	1/4	3/8	3/8	

d) Sprague River Rd. - Bly

Table B.5 - Rut Depth Measurements (1987)

a) MP 79.2 - Wasco Co.							
MP	Left	Inside	Inside	Right	Comments		
79.00	1/8	0	1/8	1/8			
79.25	Ó 0	1/8	1/4	1/8			
79.50	0	1/8	1/8	1/4	79.6-79.9 SB: Oily,		
79.75	3/8	1/8	1/8	1/4	rough spots.		
80.00	1/4	1/8	1/8	1/4			
80.25	1/8	Ó	1/8	1/4			
80.50	1/4	1/4	1/4	1/8			
80.75	1/8	´ 0	1/8	1/4			
81.00	1/4	1/4	1/8	1/4			
81.25	0	1/4	1/8	1/8			
81.50	1/4	1/8	1/4	1/8			
81.75	1/8	1/8	1/8	1/8			
82.00	38	0	0	1/8			
82.25	1/8	1/8	0	1/4			
82.50	1/8	1/4	1/4	3/8	82.65 NB: Rough spot		
82.75	1/8	1/8	1/8	1/4	100 ft. long.		
83.00	1/4	0	1/8	1/4	-		
83.25	1/4	1/8	1/8	1/4	83.35-83.65 SB: Deep		
83.50	1/8	1/8	5/8	1/2	ruts, rough & oily.		
83.75	1/4	1/8	1/8	0	83.80-84.3 SB: Deep		
84.00	1/8	3/8	3/4	1/2	ruts, rough & oily.		
84.25	1/4	1/8	1/2	3/8			
84.50	1/4	1/4	3/8	1/8	84.9 SB: Rough spot.		
84.75	0	1/8	1/4	1/8			
85.00	1/4	3/8	1/4	0			
85.25							
85.50	1/4	1/4	1/4	1/8			
85.75	1/8	1/4	0	0			
86.00	1/4	1/4	1/8	1/8			
86.25	1/4	3/8	0	1/8			
86.50	1/4	1/4	1/8	0	86.65-86.85 SB: Rough		
86.75	1/8	1/8	1/4	1/8	and oily		
87.00	1/8	1/8	1/8	1/8			
87.25	1/8	1/4	1/4	1/8			
87.50	1/8	1/4	1/4	1/8			
87.75	3/8	1/4	0	1/8			
88.00	1/8	1/4	1/8	0			
88.25	1/4	1/4	1/2	1/8	88.4-89.0 SB: Inter-		
88.50	1/4	3/8	5/8	1/8	mittent rough spots &		
88.75	1/4	1/4	1/4	3/8	ruts.		
89.00	1/8	1/4	1/4	1/4			
89.25	1/8	1/4	1/8	1/8			
89.50	1/4	1/8	1/8	1/4			
89.75	1/8	1/8	1/4	1/4			
90.00	1/8	1/8	1/8	1/4	90.1-90.3 SB: Oily &		
90.25	1/8	1/4	1/2	5/8	ruts.		

a) MP 79.2 - Wasco Co.

		<pre>x) HI 75.2</pre>		co. (cont	
MP	Left	Inside	Inside	Right	Comments
90.50	1/4	3/8	1/4	1/4	
90.75	1/8				
91.00	1/8	,			
91.25	1/4	1/8	1/8		91.4-91.55 SB: Oily &
91.50	1/4	1/4	3/4		-
91.75	3/8	1/8	1/8	•	
92.00	1/4	1/8	1/4	1/8	ruts.
92.25	1/4	1/8	1/8		
92.50	1/8	1/8	1/8	•	
92.75	1/8	1/8	1/8	1/8	
93.00	1/8	1/8	3/4		93.0-93.35 SB:
93.25	1/4	1/8	7/8		
93.50	1/8	1/8	1/4	1/4	5
93.75	1/4	1/8	1/4		
94.00	1/4	1/8	1/2	•	
94.25	1/8	1/4	3/8	1/8	
94.50	1/8	1/8	1/4	•	
94.75	3/8	1/4	1/8		
95.00	1/4	1/8	1/8	1/4	
95.25	1/4	1/4	1/2	1/4	95.25 SB: 150 ft.
95.50	1/8	1/4	1́/8		
95.75	1/8	1/8	1/8	1/4	
96.00	1/4	1/8	1/8	1/8	
96.25	1/4	1/8	3/8	3/8	
96.50	1/8	1/8	1/4	1/4	

a) MP 79.2 - Wasco Co. (continued)

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		b) Powell	Butte -	Prineville	
7.00 $1/4$ $1/8$ $3/8$ $1/8$ 7.25 $1/2$ $1/4$ $1/4$ $1/4$ $1/4$ 7.50 $5/8$ $3/8$ $1/4$ $1/4$ 7.75 $1/4$ $1/8$ $1/4$ $1/8$ 7.85: Soft, oily spot. 8.00 $3/8$ $3/8$ $3/8$ $3/8$ 8.25 $1/8$ $1/4$ $1/4$ $1/8$ $1/8$ 8.50 $1/4$ $1/4$ $1/4$ $1/8$ $1/8$ 8.75 $1/8$ $1/4$ $1/4$ $1/8$ $1/8$ 9.00 $3/8$ $1/4$ $1/4$ $1/8$ $1/8$ 9.25 $3/8$ $1/4$ $1/8$ $3/8$ 9.50 $1/4$ $3/8$ $1/4$ $1/8$ 9.75 $1/8$ $1/4$ $1/4$ $1/4$ $1/4$ 10.00 $3/8$ $3/8$ $1/4$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ $1/4$ 11.00 $3/8$ $3/8$ $1/4$ $1/4$ 11.00 $3/8$ $3/8$ $1/4$ $1/4$ 12.50 $1/4$ $3/8$ $3/8$ $1/2$ Fat spots. 11.50 $1/4$ $3/8$ $3/8$ $1/4$ $1/4$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 13.00 $5/8$ $1/4$ $1/4$ $3/8$ $1/4$ 14.10 $3/8$ $3/8$ $3/8$ $1/4$ 14.25 $1/2$ $1/4$ $1/4$ $1/4$ $1/4$ 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 16.25 $3/8$ $3/8$ $3/8$ $3/8$ $1/8$ 17.75 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 17.75 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 18.175 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 19.175 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 10.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.55 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.55 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.65 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.75 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.60 $1/4$ $3/8$ $3/8$ $3/8$ $3/8$ 10.60 $1/4$ $3/8$ $3/8$ $3/8$ $3/8$ 10.60 $1/4$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.60 $1/4$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.60 $1/4$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 10.60 $1/4$ $3/8$ $3/8$ $3/8$ $3/8$	MP	Left	Inside	Inside	Right	Comments
7.25 $1/2$ $1/4$ $1/4$ $1/4$ 7.50 $5/8$ $3/8$ $1/4$ $1/4$ 7.75 $1/4$ $1/8$ $1/4$ $1/8$ 8.00 $3/8$ $3/8$ $3/8$ $3/8$ 8.25 $1/8$ $1/4$ $1/8$ $1/8$ 7.85: Soft, oily spot. 8.50 $1/4$ $1/4$ $1/8$ $1/8$ 8.75 $1/8$ $1/4$ $1/8$ $1/8$ 9.00 $3/8$ $1/4$ $1/4$ $1/8$ $1/8$ 9.25 $3/8$ $1/4$ $1/8$ $1/8$ 9.50 $1/4$ $3/8$ $1/4$ $1/8$ $3/8$ 9.50 $1/4$ $3/8$ $1/4$ $1/8$ $3/8$ 9.50 $1/4$ $3/8$ $1/4$ $1/4$ 10.00 $3/8$ $3/8$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ 11.25 $3/8$ $3/8$ $1/4$ $1/8$ 11.25 $3/8$ $3/8$ $1/4$ $1/8$ 11.25 $3/8$ $3/8$ $1/4$ $3/8$ $3/8$ $1/2$ 11.50 $1/4$ $3/8$ $3/8$ $1/4$ $3/8$ 12.00 $1/2$ $1/4$ $1/4$ $3/8$ $3/8$ $1/4$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ 14.10 $3/8$ $3/8$ $1/4$ $3/8$ $1/4$ 14.10 $3/8$ $3/8$ $1/4$ $3/8$ $1/4$ 15.00 $5/8$ $1/4$ $3/8$ $3/8$ $1/8$ 16.175 $1/4$ $1/4$ $3/8$ $1/4$ 17.5 $3/8$ $3/8$ $3/8$ $1/4$ 17.5 $3/8$ $1/4$ $3/8$ $1/4$ 17.5 $3/8$ $1/4$ $3/8$ $1/4$ 17.5 $3/8$ $1/4$ $3/8$ $1/4$ 17.5 $3/8$ $1/4$ $3/8$ $1/4$ 17.5 $3/8$ $3/8$ $3/8$ $3/8$ 17.1 3.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 17.2 $1/2$ $1/2$ $1/2$ $3/8$ 17.5 $3/8$ $1/4$ $3/8$ $3/8$ $3/8$ 17.4 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 17.4 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 17.4 15.00 $3/8$ $3/8$ $3/8$ Patch Patch 15.55 $3/8$ $3/8$ $3/8$ Patch Patch 15.50 $3/8$ $3/8$ $3/8$ Patch Patch 15.50 $3/8$ $3/8$ Patch Patch 15.60 $1/4$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch	6.80	1/8	1/8	1/4	1/8	
7.50 $5/8$ $3/8$ $1/4$ $1/4$ $1/4$ 7.75 $1/4$ $1/8$ $1/4$ $1/8$ 7.85 : Soft, oily spot.8.00 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 8.25 $1/8$ $1/4$ $1/4$ $1/8$ 8.75 $1/8$ $1/4$ $1/4$ $1/8$ 9.00 $3/8$ $1/4$ $1/8$ $1/8$ 9.10 $3/8$ $1/4$ $1/8$ $1/8$ 9.25 $3/8$ $1/4$ $1/8$ $3/8$ 9.75 $1/8$ $1/4$ $1/4$ 10.00 $3/8$ $3/8$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ 10.50 $1/4$ $3/8$ $3/8$ 10.75 $1/4$ $1/8$ $1/4$ 11.00 $3/8$ $3/8$ $1/2$ 11.25 $3/8$ $3/8$ $3/8$ 12.00 $1/2$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ 13.00 $5/8$ $1/4$ $3/8$ 14.25 $1/2$ $1/2$ $1/2$ 13.25 $3/8$ $1/4$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ 14.25 $1/2$ $1/2$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/$	7.00	1/4	1/8			
7.75 $1/4$ $1/8$ $1/4$ $1/8$ 7.85: Soft, oily spot. 8.00 $3/8$ $3/8$ $3/8$ $3/8$ 8.25 $1/8$ $1/4$ $1/4$ $1/8$ $1/8$ 8.50 $1/4$ $1/4$ $1/4$ $1/8$ $1/8$ 8.75 $1/8$ $1/4$ $1/4$ $1/8$ $1/8$ 9.00 $3/8$ $1/4$ $1/8$ $1/8$ $1/8$ 9.25 $3/8$ $1/4$ $1/8$ $1/8$ $1/4$ 9.75 $1/8$ $1/4$ $1/8$ $3/8$ 9.75 $1/8$ $1/4$ $1/4$ $1/8$ $3/8$ 9.75 $1/8$ $1/8$ $1/4$ $1/4$ $1/4$ 10.00 $3/8$ $3/8$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ 11.00 $3/8$ $3/8$ $1/4$ $1/4$ 11.00 $3/8$ $3/8$ $1/4$ $1/4$ 11.00 $3/8$ $3/8$ $1/4$ $1/4$ 11.25 $3/8$ $3/8$ $1/4$ $3/8$ 10.75 $1/4$ $1/8$ $3/8$ $1/6$ 11.75 $1/4$ $1/4$ $1/8$ $1/8$ 12.25 $3/8$ $1/4$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 13.00 $5/8$ $1/4$ $1/4$ $1/4$ $1/4$ 13.00 $5/8$ $1/4$ $3/8$ $3/8$ $1/2$ 13.25 $3/8$ $1/4$ $1/4$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/8$ 14.75 $1/4$ $1/4$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/8$ 14.75 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 13.50 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 14.75 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 14.75 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.50 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.50 $3/8$ $3/8$ $3/8$ Patch Patch 15.55 $3/8$ $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch	7.25	1/2	1/4			
8.00 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 8.25 $1/8$ $1/4$ $1/4$ $1/8$ $1/8$ 8.50 $1/4$ $1/4$ $1/4$ $1/8$ $1/8$ 8.75 $1/8$ $1/4$ $1/4$ $3/8$ $1/8$ 9.00 $3/8$ $1/4$ $1/8$ $3/8$ 9.25 $3/8$ $1/4$ $1/8$ $1/4$ $1/4$ 10.00 $3/8$ $3/8$ $1/4$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ $1/4$ 10.25 $3/8$ $3/8$ $1/4$ $1/4$ 10.50 $1/4$ $3/8$ $3/8$ $1/4$ $1/4$ 10.75 $1/4$ $1/8$ $1/4$ $1/4$ 11.00 $3/8$ $3/8$ $1/4$ $1/8$ 11.25 $3/8$ $3/8$ $1/4$ $1/8$ 11.25 $3/8$ $3/8$ $1/4$ $3/8$ 11.25 $3/8$ $3/8$ $1/4$ $3/8$ 11.25 $3/8$ $3/8$ $1/4$ $3/8$ 12.00 $1/2$ $1/4$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $3/8$ $1/2$ Fat spots. 13.50 $1/4$ $3/8$ $3/8$ $1/2$ Fat spots. 14.50 $1/4$ $3/8$ $3/8$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ $1/4$ $1/4$ 13.00 $5/8$ $1/4$ $1/4$ $1/4$ $1/4$ 14.10 $3/8$ $3/8$ $3/8$ $1/2$ 13.25 $3/8$ $1/4$ Patch Patch 13.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 14.25 $1/2$ $1/2$ $1/2$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/8$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.00 $5/8$ $1/4$ $3/8$ $1/4$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 16.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 17.55 $3/8$ $1/4$ Patch Patch 15.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ Patch Patch 15.50 $3/8$ $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ Patch Patch 15.75 $3/8$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch 16.00 $1/4$ $3/8$ Patch Patch	7.50	5/8	3/8	1/4	1/4	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	7.75	1/4	1/8	1/4	1/8	7.85: Soft, oily spot.
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11.25 $3/8$ $3/8$ $3/8$ $1/2$ Fat spots.11.50 $1/4$ $3/8$ $3/8$ $1/8$ 11.75 $3/8$ $3/8$ $3/8$ $3/8$ 12.00 $1/2$ $1/4$ $1/4$ $1/8$ 12.25 $3/8$ $1/4$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ 12.75 $1/4$ $1/4$ $3/8$ $1/4$ 13.00 $5/8$ $1/4$ $3/8$ $1/2$ 13.25 $3/8$ $1/4$ PatchPatch13.50 $3/8$ $3/8$ $3/8$ $1/8$ 13.75 $3/8$ $1/4$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ 14.25 $1/2$ $1/2$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ Patch15.55 $3/8$ $3/8$ Patch15.75 $3/8$ $3/8$ Patch15.75 $3/8$ $3/8$ Patch16.00 $1/4$ $3/8$ Patch16.250 $1/4$ Patch		1/4	1/8	1/4	1/4	
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12.25 $3/8$ $1/4$ $3/8$ $1/4$ 12.50 $3/8$ $1/4$ $1/4$ $1/4$ 12.75 $1/4$ $1/4$ $3/8$ $1/4$ 13.00 $5/8$ $1/4$ $3/8$ $1/2$ 13.25 $3/8$ $1/4$ PatchPatch 13.50 $3/8$ $3/8$ $3/8$ $1/8$ 13.75 $3/8$ $1/4$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ $3/8$ 14.25 $1/2$ $1/2$ $1/2$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ Patch 15.55 $3/8$ $1/4$ Patch 15.50 $3/8$ $1/4$ Patch 15.75 $3/8$ $3/8$ Patch 16.00 $1/4$ $3/8$ Patch 16.25 0 $1/4$ Patch				3/8	3/8	
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12.75 $1/4$ $1/4$ $3/8$ $1/4$ 13.00 $5/8$ $1/4$ $3/8$ $1/2$ 13.25 $3/8$ $1/4$ PatchPatch 13.50 $3/8$ $3/8$ $3/8$ $1/8$ 13.75 $3/8$ $1/4$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ $3/8$ 14.25 $1/2$ $1/2$ $1/2$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ $3/8$ 14.75 $3/8$ $1/4$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ Patch 15.25 $3/8$ $3/8$ Patch 15.50 $3/8$ $1/4$ Patch 15.75 $3/8$ $3/8$ Patch 16.00 $1/4$ $3/8$ Patch 16.25 0 $1/4$ Patch				3/8	1/4	
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13.25 $3/8$ $1/4$ PatchPatch13.50 $3/8$ $3/8$ $3/8$ $1/8$ 13.75 $3/8$ $1/4$ $1/2$ $1/2$ 14.00 $3/8$ $3/8$ $3/8$ $3/8$ 14.25 $1/2$ $1/2$ $1/2$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $3/8$ 14.50 $3/8$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ Patch15.25 $3/8$ $3/8$ Patch15.50 $3/8$ $1/4$ Patch15.75 $3/8$ $3/8$ Patch16.00 $1/4$ $3/8$ Patch16.250 $1/4$ Patch			•			
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14.75 $3/8$ $1/4$ $3/8$ $1/4$ 15.00 $3/8$ $3/8$ PatchPatch 15.25 $3/8$ $3/8$ PatchPatch 15.50 $3/8$ $1/4$ PatchPatch 15.75 $3/8$ $3/8$ PatchPatch 16.00 $1/4$ $3/8$ PatchPatch 16.25 0 $1/4$ PatchPatch		1/2	1/2	1/2	3/8	
15.00 $3/8$ $3/8$ PatchPatch 15.25 $3/8$ $3/8$ PatchPatch 15.50 $3/8$ $1/4$ PatchPatch 15.75 $3/8$ $3/8$ PatchPatch 16.00 $1/4$ $3/8$ PatchPatch 16.25 0 $1/4$ PatchPatch	14.50	3/8	3/8	3/8	3/8	
15.253/83/8PatchPatch15.503/81/4PatchPatch15.753/83/8PatchPatch16.001/43/8PatchPatch16.2501/4PatchPatch						
15.503/81/4PatchPatch15.753/83/8PatchPatch16.001/43/8PatchPatch16.2501/4PatchPatch						
15.753/83/8PatchPatch16.001/43/8PatchPatch16.2501/4PatchPatch						
16.00 1/4 3/8 Patch Patch 16.25 0 1/4 Patch Patch						
16.25 0 1/4 Patch Patch						
		1/4				
16.50 1/4 1/4 1/4 1/8						
	16.50	1/4	1/4	1/4	1/8	

b) Powell Butte - Prineville

MP	Left	Inside	Inside	Right	
89.60	1/8	1/4	1/8	1/4	
89.75	1/4	1/4	1́/8	3/8	
90.00	1/4	3/8	1/8	3/8	
90.25	1/4	1/8	1/8	1/4	
90.50	1/8	1/4	1/8	1/4	
90.75	1/4	1/4	1/8	3/8	
91.00	1/4	3/8	1/8	1/8	
91.25	1/4	3/8	1/8	1/4	
91.50	3/8	3/8	3/8	3/8	
91.75	3/8	3/8	1/4	1/4	
92.00	1/4	1/4	1/8	1/8	
92.25	1/4	3/8	1/8	1/2	
92.50	1/4	3/8	1/4	3/8	
92.75	1/2	1/2	3/8	5/8	
93.00	3/8	3/8	1/4	3/8	
93.25	1/4	1/8	1/4	3/8	
93.50	1/4	3/8	1/8	1/8	
93.75	1/8	1/4	1/8	1/8	
94.00	1/4	1/4	1/4	1/4	
94.25	5/8	3/8	1/4	3/8	
94.50	3/8	3/8	3/8	3/8	
94.75	1/2	1/4	1/4	1/4	
95.00	1/2	3/8	1/4	1/4	
95.25	1/2	3/8	1/8	3/8	
95.50	3/8	1/2	3/8	3/8	
95.75	1/2	1/4	1/4	3/8	
96.00	5/8	1/4	1/4	3/8	
96.25	3/8	3/8	1/4	1/4	
96.50	1/4	3/8	3/8	3/8	
96.75	3/8	1/4	1/8	3/8	
97.00	3/8	3/8	1/4	1/4	
97.25	1/8	1/4	1/8	1/4	
97.50	1/2	1/4	1/4	1/8	
97.75	1/2	1/4	3/8	1/4	
98.00	3/8	1/4	1/4	3/8	
98.30	1/4	1/4	3/8	3/8	

c) MP 89.6 - Jct. OR 19

	u)	Lakesho	ie Di.	- Green	springs a	JCL.		
MP	Left	Inside	Inside	Right				
62.40	3/8	3/8	0	1/8				
62.50	1/8	1/8	1/8	1/8				
62.75	1/8	1/4	5/8	1/8				
63.00	3/8	1/4	1/8	1/4				
63.25	3/8	3/8	1/8	1/8				
63.50	1/8	1/8	´ 0	1/4				
63.75	1/8	1/4	1/8	3/4				
		Begi	n 3 laı					
64.00	1/8	ō	1/4	1/4	1/4	3/8		
64.25	0	1/4	1/8	1/8	1/4	1/8		
64.50	1/4	1/4	1/8	1/8	1/4	3/8		
64.75	1/4	1/4	1/8	1/8	1/8	1/4		
65.00	1/4	1/4	0	1/8	1/8	1/8		
65.25	1/4	1/8	0	0	1/4	1/4		
		Begi	n 4 lar	ne				
65.50	1/8	0	1/8	0	1/8	1/8	0	1/4
65.75	1/4	1/4	1/8	0	0	1/8	1/8	1/8
		End	4 lane	begin 3	lane WB			
66.00	1/8	1/4	1/4	1/8	1/8	1/8		
66.25	1/8	0	1/8	0	1/8	1/4		
		End (3 lane	WB				
66.50	1/8	0	1/8	0				
66.75	1/8	1/8	1/8	1/8				
67.00	3/8	0	1/4	1/8				
67.25	1/8	0	0	1/4				
67.50	1/8	1/8	1/8	1/8				
67.75	1/8	0	0	1/8				
			n 3 lar					
68.00	1/8	0	1/8	1/8	1/8	1/8		
68.25	1/8	0	1/8	0	1/4	1/4		
68.50	1/4	1/8	1/8	1/8	1/4	1/4		
			3 lane					
68.75	3/8	1/8	3/8	3/8				

d) Lakeshore Dr. - Greensprings Jct.

		-,	011 0 0		
MP	Left	Inside	Inside	Right	
0.00	3/8	1/2	1/8	1/8	
0.25	1/8	1/8	1/8	1/8	
0.50	1/8	1/8	1/8	1/8	
0.75	1/8	1/8	1/8	1/8	
1.00	1/8	1/8	1/4	1/8	
1.25	1/8	1/8	1/8	1/8	
1.50	1/8	0	1/4	0	
1.75	1/8	1/8	1/8	1/8	
2.00	1/4	1/4	1/4	1/4	
2.25	1/8	1/8	1/8	1/8	
2.50	1/4	1/8	1/8	1/8	
2.75	1/4	1/4	1/8	1/4	
3.00	1/4	1/8	1/4	1/8	
3.25	1/4	1/8	1/8	1/4	
3.50	1/4	1/4	1/8	1/8	
3.75	1/4	1/4	1/8	1/8	
4.00	1/4	1/4	1/4	1/8	
4.25	1/4	1/8	1/8	1/8	
4.50	1/8	1/8	1/8	1/8	
4.75	3/4	1/4	1/8	1/8	
5.00	1/4	1/8	1/8	1/4	
5.25	3/8	1/8	1/8	1/8	
5.50	1/8	1/8	1/4	1/8	
5.75	3/8	1/8	1/8	1/4	
6.00	1/4	1́/8	1/4	1/8	
6.25	1/4	1/8	1/8	3/8	
6.50	1/8	1/8	1/4	1/4	
	/ -	_, -	-, -	_, _	

e) US 97 - OR 39

	I) 2	sprague Ri	lver Ra	· BIY	
MP	Left	Inside	Inside	Right	
35.80	1/8	1/8	1/4	1/4	
36.00	Ó	1/8	1/8	1/8	
36.25	3/8	1/8	1/8	1/8	
36.50	1/4	1/4	1/8	1/8	
36.75	Ó	1/8	0	$\frac{1}{4}$	
37.00	1/8	$\frac{1}{4}$	1/8	1/4	
37.25	1/4	1/4	1/8	1/8	
37.50	1/8	1/8	1/8	1/8	
37.75	1/8	$\frac{1}{4}$	1/8	$\frac{1}{4}$	
38.00	1/4	0	1/8	-, -	
38.25	3/8	1/4	$\frac{1}{4}$	1/8	
38.50	3/8	1/8	$\frac{1}{4}$	1/8	
38.75	1/4	1/4	1/8	1/4	
39.00	1/4	1/8	3/8	1/4	
39.25	1/4	1/4	1/4	1/4	
39.50	3/8	$\frac{1}{1/4}$	1/4	3/8	
39.75	1/4	3/8	3/8	3/8	
40.00	$\frac{1}{4}$	1/4	1/4	1/4	
40.25	3/8	3/8	3/8	1/4	
40.50	1/4	1/4	1/8	1/8	
40.75	$\frac{1}{4}$	3/8	1/4	1/4	
41.00	3/8	1/4	1/4	1/4	
41.25	3/8	5/8	3/8	3/8	
41.50	3/8	3/8	3/8	3/8	
41.75	1/4	1/4	3/8	1/8	
42.00	1/8	1/4	1/8	1/4	
42.25	1/4	1/2	3/8	1/4	
42.50	1/4	1/8	3/8	1/4 1/8	
42.75	5/8	1/3	3/8	1/8	
43.00	1/8	1/4	1/8	$\frac{1}{4}$ 1/4	
43.25	1/4	3/8	3/8	1/4 1/4	
43.50	1/2	1/2	3/8		
43.75	1/8	1/2	1/2	3/8	
44.00	1/8	1/4	1/2	1/2	
44.25	1/8	1/4	1/4	1/4 1/4	
44.50	1/2	1/8	1/2	1/4	
44.75	1/2 1/4	1/8	$\frac{1}{2}$ 1/4	1/8	
45.00	3/8	1/2	3/8	3/8	
45.25	3/8	1/2	•		
45.50	1/4	1/4	1/8 3/8	1/4	
45.75	1/4	1/4 $1/2$	3/8	$\frac{1}{4}$	
46.00	3/8	3/8		3/8 1/4	
46.25	1/8		3/8 1/4		
46.50	3/8	1/2 1/4	1/4 1/4	1/8	
46.75	1/8	1/4		1/8	
47.00	-		3/8	3/8	
-7.00	3/8	1/4	1/4	1/8	

f) Sprague River Rd. - Bly

	I) Spray	Jue Kivei	Ku. – Bly	(concinued	/
MP	Left	Inside	Inside	Right	
47.25	3/8	3/8	1/4	1/4	
47.50	1/4	1/4	1/4	3/8	
47.75	3/8	1/2	3/8	1/4	
48.00	1/2	1/2	3/8	3/8	
48.25	3/8	3/8	1/4	3/8	
48.50	3/8	1/2	1/4	1/4	
48.75	3/8	5/8	1/4	1/8	
49.00	5/8	1/2	1/4	1/2	
49.25	3/8	1/2	1/4	3/8	
49.50	3/8	3/8	1/4	3/8	
49.75	3/8	1/2	3/8	1/2	
50.00	3/8	3/8	3/8	1/8	
50.25	3/8	3/8	1/4	1/8	
50.50	1/8	1/4	1/4	1/4	
50.75	3/8	1/4	1/4	1/8	
51.00	1/4	1/4	1/4	1/4	
51.25	1/8	1/4	1/4	1/4	
51.50	1/8	1/8	1/4	1/4	
51.75	1/4	1/4	1/4	1/4	
52.00	1/4	1/8	1/4	3/8	
52.25	1/4	1/8	1/4	1/4	
52.50	3/8	1/4	1/4	3/8	
52.75	1/4	1/8	3/8	3/8	
53.00	3/8	3/8	3/8	3/8	
53.25	3/8	1/2	1/2	3/8	
53.50	3/8	1/4	3/8	3/8	

f) Sprague River Rd. - Bly (continued)

APPENDIX C

FIELD CORE DATA

Project	Sample ID	Bulk Specific Gravity		Percent Voids
MP 79.2 - Wasco Co.;	A1	2.125	2.478	14.2
Warm Springs	A2	2.180	2.478	12.0
(Unit A)	A3	2.175	2.478	12.2
MP 18.0 - Powell	C1	1.963	2.343	16.2
Butte; Powell Butte	C2	2.044	2.343	12.8
Secondary (Unit C)	C3	2.060	2.343	12.1
Powell Butte -	D1	2.054	2.377	13.6
Prineville (HFE-150)	D2	2.006	2.377	15.6
(Unit D) Eastbound	D3	1.982	2.377	16.6
Powell Butte -	:D1	2.102	2.411	12.8
Prineville (CMS-2S)	:D2	2.125	2.411	11.9
(Unit D) Westbound	:D3	2.137	2.411	11.4
MP 89.6 - OR 19; Ochoco Hwy (Unit G)	G1 G2 G3	2.131 2.146 2.147	2.452 2.452 2.452	13.1 12.5 12.4
Lakeshore Dr Greensprings Jct.; Lake of the Woods (Unit B)	B1 B2 B3	2.083 2.030 2.063	2.311 2.311 2.311	9.9 12.2 10.7
US 97 - OR 39;	:C1	2.036	2.262	10.0
Lower Klamath	:C2	2.054	2.262	9.2
(Unit C)	:C3	2.024	2.262	10.5
Sprague River Rd.;	E1	2.165	2.380	9.0
Klamath Falls -	E2	2.158	2.380	9.3
Lakeview (Unit E)	E3	2.171	2.380	8.8

Table C.1 - Gravity Data for Field Cores (Fall 1986)

* Determined at ODOT

		Bulk		
	Sample		Rice	
Project	ID	Gravity	Gravity *	Voids
MP 79.2 - Wasco Co.;	A11	2.309	2.522	8.4
Warm Springs	A12	2.355	2.522	6.6
(Unit A) MP 88.45	A13	2.328	2.522	7.7
	A14	2.334	2.522	7.5
	A15	2.338	2.522	7.3
	A16	2.335	2.522	7.4
MP 79.2 - Wasco Co.;	A21	2.376	2.586	8.1
Warm Springs	A22	2.384	2.586	7.8
(Unit A) MP 90.4	A23	2.384	2.586	7.8
	A24	2.378	2.586	8.0
	A25	2.367	2.586	8.5
	A26	2.366	2.586	8.5
MP 79.2 - Wasco Co.;	A31	2.404	**	**
Warm Springs	A32	2.411	**	**
(Unit A) MP 90.6	A33	2.409	**	**
	A34	2.406	**	**
	A35	2.407	* *	* *
	A36	2.402	* *	* *
MP 79.2 - Wasco Co.;	A41	2.374	2.571	7.7
Warm Springs	A42	2.382	2.571	7.4
(Unit A) MP 93.1	A43	2.393	2.571	6.9
	A44	2.381	2.571	7.4
	A45	2.384	2.571	7.3
	A46	2.37	2.571	7.8
MP 79.2 - Wasco Co.;	A51	2.431	* *	* *
Warm Springs	A52	2.434	* *	* *
(Unit A) MP 93.4	A53	2.432	**	* *
	A54	2.422	* *	* *
	A55	2.416	**	**
	A56	2.442	* *	* *
Powell Butte -	D21	2.321	2.496	7.0
Prineville (HFE-150)	D22	2.328	2.496	6.7
(Unit D) Eastbound	D23	2.341	2.496	6.2
	D24	2.244	2.496	10.1
	D25	2.345	2.496	6.0
	D26	2.350	2.496	5.8

Table C.2 - Gravity Data for Field Cores (Fall 1987)

	(Fall	1987)		
Project	Sample ID	Bulk Specific Gravity	Rice Gravity *	Percent Voids
Powell Butte - Prineville (CMS-2S) (Unit D) Westbound	D11 D12 D13 D14 D15 D16	2.321 2.310 2.320 2.319 2.316 2.302	2.511 2.511 2.511 2.511 2.511 2.511 2.511	7.6 8.0 7.6 7.6 7.8 8.3
MP 89.6 - OR 19; Ochoco Hwy (Unit G)	G1 G2 G3 G4 G5 G6	2.227 2.245 2.256 2.231 2.264 2.254	2.468 2.468 2.468 2.468 2.468 2.468 2.468	9.8 9.0 8.6 9.6 8.3 8.7
Lakeshore Dr Greensprings Jct.; Lake of the Woods (Unit B)	B1 B2 B3 B4 B5 B6	2.094 2.099 2.084 2.101 2.089 2.082	2.482 2.482 2.482 2.482 2.482 2.482 2.482	15.6 15.4 16.0 15.4 15.8 16.1
US 97 - OR 39; Lower Klamath (Unit C)	C1 C2 C3 C4 C5 C6	2.174 2.181 2.174 2.166 2.154 2.158	2.358 2.358 2.358 2.358 2.358 2.358 2.358	7.8 7.5 7.8 8.1 8.7 8.5
Sprague River Rd.; Klamath Falls - Lakeview (Unit E)	E1 E2 E3 E4 E5 E6	2.294 2.253 2.277 2.295 2.274 2.264	2.437 2.437 2.437 2.437 2.437 2.437 2.437	5.9 7.6 6.6 5.8 6.7 7.1

Table C.2 (continued) - Gravity Data for Field Cores (Fall 1987)

* Determined at ODOT ** Not Available

	res (Fall	1987)		
Project	Sample ID	Average Height (in.)	Resilient Modulus (ksi)	Fatigue Life (reps)
MP 79.2 - Wasco Co.;	A11	2.54	227	70449
Warm Springs	A12	2.37	257	39264
(Unit A) MP 88.45	A13	2.66	243	40316
MP 79.2 - Wasco Co.;	A21	2.22	316	26348
Warm Springs	A22	2.63	227	66025
(Unit A) MP 90.4	A23	2.25	272	33290
MP 79.2 - Wasco Co.;	A31	1.74	249	40571
Warm Springs	A32	1.52	305	21003
(Unit A) MP 90.6	A33	1.78	359	30403
(onic A) M Solo	N33	1.70	333	50105
MP 79.2 - Wasco Co.;	A41	1.90	329	*
Warm Springs	A42	1.83	386	36872
(Unit A) MP 93.1	A43	1.45	392	*
MP 79.2 - Wasco Co.;	A51	2.41	527	26777
Warm Springs	A52	2.62	430	20403
(Unit A) MP 93.4	A53	2.47	443	27092
Powell Butte -	D21	2.34	464	33038
Prineville (HFE-150)	D22	2.49	443	22140
(Unit D) Eastbound	D23	2.49	475	47665
Powell Butte -	D11	1.86	469	34997
Prineville (CMS-2S)	D12	1.96	444	29568
(Unit D) Westbound	D13	1.78	462	32411
MP 89.6 - OR 19;	Gl	2.34	539	60244
Ochoco Hwy (Unit G)	G2	1.84	593	79855
concee may (onice c)	G3	1.72	629	77316
	54		-1-	22106
Lakeshore Dr	B1	1.23	515	33186
Greensprings Jct.;	B2	2.45	437	40256
Lake of the Woods (Unit B)	B3	2.54	560	29341
US 97 - OR 39;	C1	1.81	498	49683
Lower Klamath	C2	2.14	442	*
(Unit C)	C3	1.93	477	58969
Sprague River Rd.;	E1	2.31	426	28350
Klamath Falls -	E2	2.30	424	38514
Lakeview (Unit E)	E3	2.40	466	37610

Table C.4 - Resilient Modulus and Fatigue Test Results for Field Cores (Fall 1987)

* Equipment Failure / No Test Results

(1411 1)	00)			
Project	Sample ID	Average Height (in.)	Marshall Stability (lbs)	Flow (in/1000)
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 88.45	A2 A3 A6	2.55 2.39 2.52	699 612 772	54 57 65
MP 18.0 - Powell	C2	* * *	***	* * *
Butte; Powell Butte	C2 C3	1.88	281	21
Secondary (Unit C)	C6	1.95	327	24
Secondary (onic c)	0	1.95	J27	24
Powell Butte -	D2	1.75	222	24
Prineville (HFE-150)	D3	1.80	218	20
(Unit D) Eastbound	D6	1.68	239	16
(onic b) habeboand	Do	1.00	255	10
Powell Butte -	*D1*	2.38	242	14
Prineville (CMS-2S)	*D3*	2.32	247	33
(Unit D) Westbound	*D6*	2.66	319	29
(
MP 89.6 - OR 19;	G2	2.12	424	18
Ochoco Hwy (Unit G)	G3	2.35	513	20
	G6	2.31	439	23
Lakeshore Dr	B2	2.38	531	23
Greensprings Jct.;	B3	2.78	719	44
Lake of the Woods	B6	2.58	565	19
(Unit B)				
US 97 - OR 39;	*C2*	2.30	498	22
Lower Klamath	*C3*	2.35	443	22
(Unit C)	*C6*	2.55	339	17
	-			
Sprague River Rd.;	E2	2.51	738	18
Klamath Falls -	E3	2.41	935	15
Lakeview (Unit E)	E6	2.42	706	19

Table C.5 - Marshall Stability Test Results for Field Cores (Fall 1986)

*** No Test Results

(Fall 19	87)			
Project	Sample ID	Average Height (in.)	Stability	Flow (in/1000)
MP 79.2 - Wasco Co.;		2.58	895	16
Warm Springs (Unit A) MP 88.45	A15	2.44	919	20
(UNIC A) MP 88.45	A16	2.60	768	22
MP 79.2 - Wasco Co.;	A24	1.89	902	19
Warm Springs	A25	1.96	814	20
(Unit A) MP 90.4	A26	1.99	833	21
MP 79.2 - Wasco Co.;	A34	1.96	1037	18
Warm Springs	A35	1.64	1064	16
(Unit Ā) MP 90.6	A36	1.79	942	16
MP 79.2 - Wasco Co.;	A44	1.73	1020	18
Warm Springs	A45	1.87	894	24
(Unit A) MP 93.1	A46	1.87	790	19
		1.07	,,,,	17
MP 79.2 - Wasco Co.;	A54	2.37	1406	13
Warm Springs	A55	2.32	1241	13
(Unit A) MP 93.4	A56	2.53	1152	15
Powell Butte -	D24	1.68	394	13
Prineville (HFE-150)	D25	2.41	1226	20
(Unit D) Eastbound	D26	2.51	1283	18
Powell Butte -	D14	1.69	891	15
Prineville (CMS-2S)	D15	1.91	667	17
(Unit D) Westbound	D16	2.10	636	22
MP 89.6 - OR 19;	G4	1 05	0.05	1.0
Ochoco Hwy (Unit G)	G5	1.95 2.38	835 773	16 21
concect may (onic d)	G6	1.56	1060	14
	90	1.50	1000	14
Lakeshore Dr	B4	2.48	638	20
Greensprings Jct.;	B5	2.52	585	19
Lake of the Woods (Unit B)	B6	2.52	620	19
US 97 - OR 39;	C4	2.08	1024	18
Lower Klamath	C5	1.81	1062	16
(Unit C)	C6	1.91	1009	20
Sprague River Rd.;	E4	2.32	1038	24
Klamath Falls -	E5	2.32	976	18
Lakeview (Unit E)	E6	2.20	932	18
,		2.20	774	10

Table C.6 - Marshall Stability Test Results for Field Cores (Fall 1987)

	Asphalt Percent Passing * Content							
Project	(%)		1/2"	3/8"	1/4"	#10	#40	#200
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 88.45	6.3	100	92	81	66	36	19	9.8
MP 18.0 - Powell Butte; Powell Butte Secondary (Unit C)	9.4	100	95	82	65	42	22	7.7
Powell Butte - Prineville (HFE-150) (Unit D) Eastbound	6.6	100	100	98	88	46	21	10.3
Powell Butte - Prineville (CMS-2S) (Unit D) Westbound	6.2	100	99	93	82	45	21	9.5
Lakeshore Dr Greensprings Jct.; Lake of the Woods (Unit B)	6.4	100	93	83	67	35	17	8.1
Sprague River Rd.; Klamath Falls - Lakeview (Unit E)	10.5	100	98	94	83	46	21	11.3

Table C.7 - Gradation and Asphalt Content for Field Cores (Fall 1986)

* U.S. Standard Sieve

	Asphalt Content			Perc	ent Pa	ssing	*	
Project	(%)			3/8"	1/4"	#10 	#40	#200
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 88.45	6.9	100	91	82	69	39	20	9.1
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 90.4	6.4	100	92	82	70	39	20	9.9
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 90.6	6.5	99	92	83	69	39	20	9.8
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 93.1	6.4	100	91	79	64	35	18	8.3
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 93.4	7.3	100	94	85	72	41	20	9.4
Powell Butte - Prineville (HFE-150) (Unit D) Eastbound	6.3	100	99	95	84	50	23	6.3
Powell Butte - Prineville (CMS-2S) (Unit D) Westbound	6.3	100	99	91	81	46	21	8.2
MP 89.6 - OR 19; Ochoco Hwy (Unit G)	6.1	100	97	90	74	40	19	6.1
Lakeshore Dr Greensprings Jct.; Lake of the Woods (Unit B)	6.8	100	89	80	67	36	17	7.0
US 97 - OR 39; Lower Klamath (Unit C)	7.7	100	94	83	71	40	21	6.6
Sprague River Rd.; Klamath Falls - Lakeview (Unit E)	6.7	100	94	86	74	40	18	8.8

Table C.8 - Gradation and Asphalt Content for Field Cores (Fall 1987)

* U.S. Standard Sieve

Project	Content	Penetration @ 77 F (dmm)	@ 140 F	
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 88.45	6.3	20	13959	746
MP 18.0 - Powell Butte; Powell Butte Secondary (Unit C)	9.4	22	13507	664
Powell Butte - Prineville (HFE-150) (Unit D) Eastbound	6.6	13	32893	990
Powell Butte - Prineville (CMS-2S) (Unit D) Westbound	6.2	20	10924	611
Lakeshore Dr Greensprings Jct.; Lake of the Woods (Unit B)	6.4	7	100000+	1501
Sprague River Rd.; Klamath Falls - Lakeview (Unit E)	10.5	21	10491	548

Table C.9 - Asphalt Properties for Field Cores (Fall 1986)

	Asphalt	Penetration	Absolute Viscosity	Kinematic Viscosity
Project	Content	@ 77 F	@ 140 F (poises)	@ 275 F
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 88.45	6.9	35	6420	579
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 90.4	6.4	29	10600	704
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 90.6	6.5	20	20400	926
MP 79.2 - Wasco Co.; Warm Springs (Unit A) MP 93.1	6.4	35	7430	631
Powell Butte - Prineville (HFE-150) (Unit D) Eastbound	6.3	23	9700	655
Powell Butte - Prineville (CMS-2S) (Unit D) Westbound	6.3	19	12700	690
MP 89.6 - OR 19; Ochoco Hwy (Unit G)	6.1	11	69600	1538
Lakeshore Dr Greensprings Jct.; Lake of the Woods (Unit B)	6.8	8	67290	1577
US 97 - OR 39; Lower Klamath (Unit C)	7.7	16	28120	1052
Sprague River Rd.;	6.7	29	7090	480
Klamath Falls - Lakeview (Unit E)				

Table C.10 - Asphalt Properties for Field Cores (Fall 1987)

APPENDIX D

LABORATORY PREPARED SAMPLE DATA

Project	Oil/Water (%)	Sample ID	Bulk Sp.Gr.	Rice Sp.Gr.	Voids (%)	Notes
√arm	0.5/3.5	1G	2.190	2.609	16.1	Long-Term Modulus Sample
Springs	,	1H	2.178	2.609	16.5	
		11	2.150	2.609	17.6	
		2A	2.111	2.469	14.5	
		2B	2.094	2.469	15.2	
		2C	2.087	2.469	15.5	
		2D	2.192	2.469	11.2	
		2E	2.129	2.469	13.8	
		2F	2.172	2.469	12.0	
		2G	2.212	2.469	10.4	
		2H	2.185	2.469	11.5	
		21	2.163	2.469	12.4	
		2J	2.205	2.469	10.7	
		2 K	2.153	2.469	12.8	
		ЗA	2.075	2.469	16.0	
		3B	2.066	2.469	16.3	
		3C	2.064	2.469	16.4	Long-Term Modulus Sample
		3D	2.102	2.469	14.9	Long-Term Modulus Sample
		3E	2.045	2.469	17.2	
		ЗF	2.091	2.469	15.3	
		3G	2.110	2.469	14.5	
		ЗH	2.077	2.469	15.9	
		ЗК	2.107	2.469	14.7	
	1.0/3.0	1E2	2.327	2.550	8.7	
		1F2	2.330	2.550	8.6	
		1G2	2.294	2.550	10.0	Long-Term Modulus Sample
		1H2	2.366	2.550	7.2	Long-Term Modulus Sample
		2A2	2.312	2.550	9.3	
		2B2	2.202	2.550	13.6	
		2C2	2.290	2.550	10.2	
		2D2	2.293	2.550	10.1	
		2E2	2.322	2.550	8.9	
		2F2	2.332	2.550	8.5	
		212	2.265	2.550	11.2	
		2J2	2.232	2.550	12.5	
		3A2	2.233	2.548	12.4	
		3B2	2.150	2.548	15.6	
		3C2	2.169	2.548	14.9	
		3D2	2.187	2.548	14.2	
		3E2	2.146	2.548	15.8	
		3F2	2.215	2.548	13.1	
		3G2	2.156	2.548	15.4	
		3H2	2.149	2.548	15.7	
		312	2.192	2.548	14.0	Long-Term Modulus Sample

Table D	.1 (continu		vity Dat 11 1986)	a for I	aborato	ory Prepared Samples
Project	Oil/Water (%)	Sample ID	Bulk Sp.Gr.	Rice Sp.Gr.		Notes
Warm Springs	1.5/2.5	1E3 1F3 1G3 1H3 1I3	2.233 2.205 2.201 2.250 2.232	2.478 2.478 2.478 2.478 2.478 2.478	9.9 11.0 11.2 9.2 9.9	Long-Term Modulus Sample
		1J3 2A3 2B3 2C3 2D3 2E3 2F3	2.252 2.257 2.246 2.254 2.263 2.267 2.250	2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478	9.1 8.9 9.4 9.0 8.7 8.5 9.2	Long-Term Modulus Sample
l J		2F3 2H3 3A3 3B3 3C3 3D3 3G3 3H3 3H3 3J3 3J3 3X3	2.230 2.232 2.087 2.116 2.135 2.143 2.052 2.089 2.171 2.092 2.177	2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478	9.2 9.9 15.8 14.6 13.8 13.5 17.2 15.7 12.4 15.6 12.1	Long-Term Modulus Sample

Table D.1 (continu		avity Da all 198		Laborat	tory Prepar	ed Sample	es
Oil/Water Project (%)	Sample ID	Bulk Sp.Gr.	Rice Sp.Gr.	Voids (%)	Notes		
Lake of 1.4/2.6 the Woods	1A 1B 1C 1D	2.139 2.096 2.094 2.073	2.500 2.500 2.500 2.500 2.500	14.4 16.2 16.2 17.1	Long-Term Long-Term		-
	1H 1I 2A 2B 2C	1.996 1.966 1.995 2.002 1.980	2.500 2.500 2.500 2.500 2.500	20.2 21.4 20.2 19.9 20.8			
	2D 2G 2H 2I	1.991 1.966 2.107 2.048	2.500 2.500 2.500 2.500	20.4 21.4 15.7 18.1			
	3A 3B 3C 3D 3F	2.036 2.079 2.033 2.030	2.500 2.500 2.500 2.500	18.6 16.8 18.7 18.8	Leng Moren	Madulua	Comple
	3G 3H	2.042 1.971 2.033	2.500 2.500 2.500	18.3 21.2 18.7	Long-Term	Modulus	sambre
1.4/3.1	1 2 3 4	2.087 2.126 2.060 2.065	2.500 2.500 2.500 2.500	16.5 15.0 17.6 17.4			
<u>]</u>	5 6 7 8	2.003 2.105 2.012 1.989	2.500 2.500 2.500 2.500	19.9 15.8 19.5 20.4			
]	9 10 11 12	2.087 2.048 2.101 2.018	2.500 2.500 2.500 2.500	16.5 18.1 16.0 19.3			
	13 14 15 16	2.034 2.170 1.998 2.050	2.500 2.500 2.500 2.500	18.6 13.2 20.1 18.0			
	19 20 21 22	2.115 2.009 2.167 1.994	2.500 2.500 2.500 2.500	15.4 19.6 13.3 20.2	Long-Term Long-Term		
1	25	2.002	2.500	19.9	Long-Term		

(Project	Dil/Water (%)	ĪD	Sp.Gr.	Rice Sp.Gr.		Notes		
ake of	1.9/2.6	1	2.056		17.8			
the Woods		2	2.095					
		3	2.043	2.500				
		4	2.084	2.500				
		7	2.042	2.500				
		8	2.068	2.500				
		9	2.066	2.500				
		10	2.058	2.500				
		13	2.025	2.500				
		14	2.077	2.500				
		15	2.072	2.500				
		16 17	2.045	2.500	18.2			
		17 18	2.046 2.048	2.500 2.500	18.2			
		19	2.048	2.500	18.1			
		20	2.073	2.500	18.0 17.1			
		21	2.028	2.500	18.9			
		22	2.023	2.500	18.3			
		24	2.068	2.500	17.3	Long-Term	Modulus	Sample
		25	2.093	2.500		-		-
		26	2.062	2.500	17.5	Long-Term		-
	2.4/2.1	2	1.969	2.500	21.2			
		3	2.014	2.500	19.4			
		4	2.013	2.500	19.5			
		7	2.007	2.500	19.7			
		8	1.909	2.500	23.6			
		11	1.999	2.500	20.0			
		12	1.988	2.500	20.5			
		13	1.980	2.500	20.8			
		14	1.982	2.500	20.7			
		15	2.045	2.500	18.2			
		16	2.027	2.500	18.9			
		17	1.973	2.500	21.1			
		18	2.067	2.500	17.3			
		19 20	2.016	2.500	19.4			
		20 21	2.008	2.500	19.7			
		21	2.025	2.500	19.0			
		22	2.066 2.022	2.500	17.4			
		23	1.951	2.500 2.500	19.1 22.0			
		24	2.032	2.500	18.7			
		26	2.052	2.500	17.4			
		28	2.084	2.500	17.4 18.6	I ong_morm	Moduluc	Cample
		30	2.038	2.500	19.1	Long-Term Long-Term		
		31	2.025	2.500	19.1	Long-Term		

Table D.2 - Gravity Data for Laboratory Prepared Samples (Fall 1987)

	Oil/Water	Sample	Bulk	Rice	Voids	
Projec	t (%)	ID	Sp.Gr.	Sp.Gr.	. (%)	Notes
Warm	0.5/3.5	1G	2.190	2.487	11.9	Long-Term Modulus Sample
Spring		1H	2.222	2.487	10.7	Stability & Flow Sample
1 5		11	2.214	2.487	11.0	Modulus & Fatigue Sample
		2A	2.175	2.487	12.5	nouarus a racigae sampre
		2B	2.128	2.487	14.4	
		2C	2.168	2.487	12.8	Stability & Flow Sample
1		2D	2.248	2.487	9.6	Modulus & Fatigue Sample
		2E	2.207	2.487	11.3	nouning a radigad bampio
		2F	2.161	2.487	13.1	
		2G	2.259	2.487	9.2	
<i>.</i>		2H	2.266	2.487	8.9	
1		21	2.206	2.487	11.3	
		2J	2.256	2.487	9.3	
1		2K	2.203	2.487	11.4	Stability & Flow Sample
		ЗA	2.124	2.487	14.6	
1		3B	2.119	2.487	14.8	
t		3C	2.125	2.487	14.6	Long-Term Modulus Sample
		3D	2.147	2.487	13.7	Long-Term Modulus Sample
1		3E	2.109	2.487	15.2	
6		ЗF	2.165	2.487	12.9	
1.		3G	2.138	2.487	14.0	
		ЗH	2.164	2.487	13.0	
		ЗK	2.154	2.487	13.4	Modulus & Fatigue Sample
1						5
2	1.0/3.0	1E2	2.360	2.549	7.4	
		1F2	2.340	2.549	8.2	
1		1G2	2.312	2.549	9.3	Long-Term Modulus Sample
		1H2	2.386	2.549	6.4	Long-Term Modulus Sample
1		2A2	2.340	2.549	8.2	
		2B2	2.249	2.549	11.8	
		2C2	2.314	2.549	9.2	Modulus & Fatigue Sample
1		2D2	2.320	2.549	9.0	Stability & Flow Sample
		2E2	2.354	2.549	7.7	
2		2F2	2.345	2.549	8.0	
5		212	2.301	2.549	9.7	
		2J2	2.271	2.549	10.9	
1		3A2	2.267	2.549	11.1	Stability & Flow Sample
		3B2	2.232	2.549	12.4	Modulus & Fatigue Sample
1		3C2	2.224	2.549	12.8	
1		3D2	2.214	2.549	13.1	
-		3E2	2.201	2.549	13.7	Modulus & Fatigue Sample
1		3F2	2.251	2.549	11.7	Stability & Flow Sample
		3G2	2.211	2.549	13.3	
2.		3H2	2.220	2.549	12.9	
r i		312	2.222	2.549	12.8	Long-Term Modulus Sample

Table D	.2 (continu		avity Dat all 1987)		Laborato	ory Prepared Samples
Project	Oil/Water (%)	Sample ID	Bulk Sp.Gr.			Notes
Warm Springs	1.5/2.5	1F3 1G3 1H3 1J3 2A3 2B3 2C3 2D3 2E3	2.244 2.217 2.250 2.248 2.265 2.279 2.272 2.260 2.263 2.284	2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478	9.4 10.5 9.2 9.3 8.6 8.0 8.3 8.3 8.8 8.7 7.8	Long-Term Modulus Sample Long-Term Modulus Sample Stability & Flow Sample Stability & Flow Sample
		2F3 2H3 3A3 3C3 3D3 3G3 3H3 3I3 3J3 3J3 3K3	2.257 2.244 2.120 2.140 2.108 2.157 2.104 2.079 2.186 2.119 2.192	2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478 2.478	8.9 9.4 14.4 13.6 14.9 13.0 15.1 16.1 11.8 14.5 11.5	Long-Term Modulus Sample Stability & Flow Sample Modulus & Fatigue Sample Modulus & Fatigue Sample Modulus & Fatigue Sample

Table D.2	(continue		vity Da 11 1987		Laborat	ory Prepare	d Samples
Project	Oil/Water (%)	Sample ID	Bulk Sp.Gr.	Rice Sp.Gr.	Voids (%)	Notes	
Lake of	1.4/2.6	1A	2.139	2.500	14.4		
the Woods	•	1B	2.096	2.500			
		1C	2.172	2.500		-	Modulus Sample
		1D	2.155	2.500		Long-Term	Modulus Sample
h.		1H	1.996	2.500			
		11	1.989				& Flow Sample
J.		2A	2.028				& Flow Sample
		2B	2.001	2.500		Modulus &	Fatigue Sample
		2C	1.980				
1		2D	1.991	2.500	20.4		
		2G	1.966	2.500	21.4		
1		2H	2.107		15.7	4.3	
		21	2.048		18.1	Modulus &	Fatigue Sample
		3A	2.036	2.500	18.6		
1		3B	2.079		16.8		
		3C	2.033	2.500	18.7		
1		3D	2.030	2.500	18.8		
		3F	2.100	2.500	16.0		Modulus Sample
		3G 3H	2.003 2.071	2.500 2.500	19.9 17.2		& Flow Sample Fatigue Sample
r.	1.4/3.1	1	2.121	2.500	15.2		
	-	2	2.144	2.500	14.2		
)		3	2.084	2.500	16.6		
		4	2.092	2.500	16.3		
ł		5	2.046	2.500	18.2		
		6	2.130	2.500	14.8		
		7	2.085	2.500	16.6	Stability	& Flow Sample
I.		8	2.072	2.500	17.1		Fatigue Sample
		9	2.119	2.500	15.2		Fatigue Sample
A.		10	2.059	2.500	17.6		& Flow Sample
v		11	2.118	2.500	15.3	+	~
		12	2.073	2.500	17.1		
1		13	2.076	2.500	17.0	Modulus &	Fatigue Sample
		14	2.193	2.500	12.3		& Flow Sample
l.		15	2.053	2.500	17.9	-	-
		16	2.101	2.500	16.0		
		19	2.127	2.500	14.9		
r.		20	2.042	2.500	18.3		
		21	2.055	2.500	17.8	Long-Term	Modulus Sample
3.		22	2.071	2.500	17.2		Modulus Sample
		25	2.060	2.500	17.6		Modulus Sample

Project	Oil/Water (%)	Sample ID		Rice Sp.Gr.		Notes
ake of	1.9/2.6	1	2.105	2.500	15.8	
the Woods		2	2.112	2.500	15.5	
		3	2.074	2.500	17.0	
		4	2.107	2.500	15.7	
		7	2.092	2.500	16.3	
		8	2.101	2.500	16.0	
		9	2.100	2.500	16.0	
		10	2.106	2.500	15.8	
		13	2.049	2.500	18.0	
		14	2.112	2.500	15.5	
		15	2.082	2.500	16.7	
		16	2.089	2.500	16.4	
		17	2.074	2.500	17.0	Stability & Flow Sample
		18	2.081	2.500	16.8	Stability & Flow Sample
		19	2.077	2.500	16.9	Stability & Flow Sample
		20 21	2.082 2.063	2.500	16.7 17.5	Modulus & Fatigue Sample
		22	2.003	2.500 2.500	17.0	Modulus & Fatigue Sample Modulus & Fatigue Sample
	24	2.068	2.500	17.0	Long-Term Modulus Sample	
	24	2.008	2.500	16.3	Long-Term Modulus Sample	
		26	2.055	2.500	17.5	Long-Term Modulus Sample
	2.4/2.1	2	2.009	2.500	19.6	
		3	2.035	2.500	18.6	
		4	2.043	2.500	18.3	
		7	2.022	2.500	19.1	
		8	1.936	2.500	22.6	
		11	2.037	2.500	18.5	
		12	2.028	2.500	18.9	
		13	2.006	2.500	19.8	Modulus & Fatigue Sample
		14	1.992	2.500	20.3	Stability & Flow Sample
		15	2.084	2.500	16.6	
		16	2.058	2.500	17.7	
		17	2.020	2.500	19.2	Stability & Flow Sample
		18	2.083	2.500	16.7	Modulus & Fatigue Sample
		19 20	2.038	2.500	18.5	
		20	2.028	2.500	18.9	
		21	2.043	2.500	18.3	
		22	2.034	2.500	18.6	Wadulaa (Dations Course)
		23	2.046	2.500	18.2	Modulus & Fatigue Sample
		24	1.979	2.500	20.8	Stability & Flow Sample
		25	2.056	2.500	17.8	
		26 28	2.092	2.500	16.3	Long-Torm Modulus Comple
		28 30	2.061 2.058	2.500 2.500	17.6	Long-Term Modulus Sample
		31	2.058	2.500	17.7 17.8	Long-Term Modulus Sample Long-Term Modulus Sample

	Table D.3 - Resilient Modulus and Fatigue Test Results for Laboratory Prepared Samples (Fall 1986)				
Project	Emulsion/ Water (%)	Sample ID	Average Height (in.)	Resilient Modulus (ksi)	Fatigue Life (reps)
Warm Springs	0.5/3.5	1E 1F 1B	1.85 2.04 1.80	542 507 537	22891 15616 62165
	1.0/3.0	1I2 1J2 1D2	2.13 2.33 2.37	315 373 435	25958 11963 18097
	1.5/2.5	1C3 1D3 1B3	2.27 2.15 2.01	315 258 207	13228 29485 27872
Lake of the Woods	1.4/2.6	3I 1F 1G	2.20 2.58 2.32	452 291 406	56068 6987 43560
	1.4/3.1	18 17 *	2.10 2.41 2.19	508 442 448	63063 83622 127100
	1.9/2.6	30 11 12	2.31 2.25 2.16	347 535 488	47795 43136 27069
	2.4/2.1	10 27 1	2.38 2.28 2.19	395 562 266	153391 144491 54076

	Laboratory	Prepared	Samples (Fal	Ll 1987)	
Project	Emulsion/ Water (%)	Sample ID	Average Height (in.)	Resilient Modulus (ksi)	Fatigue Life (reps)
Warm Springs	0. 5/3.5	1I 2D 3K	1.88 2.15 2.40	387 342 228	31373 40942 26925
	1.0/3.0	2C2 3B2 3E2	2.19 2.33 2.25	457 313 267	34348 31943 29050
	1.5/2.5	3H3 3I3 3J3	2.50 2.10 2.30	260 348 290	33179 33775 23352
Lake of the Woods	1.4/2.6	2B 2I 3H	2.14 2.19 2.07	346 573 614	16113 18903 30858
	1.4/3.1	8 9 13	2.24 1.95 2.33	472 812 530	66353 86616 31042
	1.9/2.6	20 21 22	2.28 2.04 2.06	686 575 547	74282 29364 74162
	2.4/2.1	13 18 23	2.42 2.21 2.28	340 506 464	23765 72300 78409

Table D.4 - Resilient Modulus and Fatigue Test Results for

Table D.5 - Ma P:	arshall St repared Sa			for Laborat	ory
Project	Emulsion/ Water (%)	Sample ID	Average Height (in.)	Marshall Stability (lbs)	
Warm Springs	0.5/3.5	1H 2C 22	1.86 2.27 2.25	704.3 329.2 289.4	16.3 32.9 32.5
	1.0/3.0	3A2 2D2 3F2	2.08 2.00 2.11	719.6 777.4 586.1	29.2 19.6 23.5
	1.5/2.5	2B3 3G3 2A3	2.35 2.09 2.32	629.9 372.2 752.9	23.5 39.2 41.3
Lake of the Woods	1.4/2.6	15 2A 3G	2.06 2.20 2.22	477.6 443.5 610.7	20.2 24.3 31.7
	1.4/3.1	7 10 14	2.17 2.14 2.24	736.3 1101.6 1643.6	21.5 24.7 20.8
	1.9/2.6	17 18 19	2.31 2.35 2.35	864.8 841.5 875.6	31.3 32.9 32.9
	2.4/2.1	14 17 24	2.45 2.44 2.26	422.3 533.7 398.3	31.7 32.9 32.1

S	amples (Fa	ll 1986)	-	
Project	Emulsion/ Water (%)	Sample ID	Individual Modulus (ksi)	Average Modulus (ksi)
Warm Springs	0.5/3.5	1G 3C 3D	332 232 230	265
	1.0/3.0	1G2 1H2 3I2	344 476 289	370
	1.5/2.5	1I3 1J3 1H3	248 295 277	273
Lake of the Woods	1.4/2.6	1C 1D 3F	376 328 390	365
	1.4/3.1	21 22 25	380 447 334	387
	1.9/2.6	24 25 26	378 380 381	380
	2.4/2.1	28 30 31	404 393 361	386

Table D.6 - Resilient Modulus of the Long-Term Modulus Samples (Fall 1986)

Table D.7 - R S	esilient Mo amples (Fal	.l 1987)	the Long-Term	Modulus
Project	Emulsion/		Individual Modulus (ksi)	Average Modulus (ksi)
Warm Springs	0.5/3.5	1G 3C 3D	338 252 246	279
	1.0/3.0	1G2 1H2 3I2	430 527 366	441
	1.5/2.5	1I3 1J3 1H3	330 396 319	348
Lake of the Woods	1.4/2.6	1C 1D 3F	441 371 501	438
	1.4/3.1	21 22 25	475 516 453	481
	1.9/2.6	24 25 26	484 436 467	463
2	2.4/2.1	28 30 31	522 499 443	488

APPENDIX E

CONSTRUCTION PROCEDURE AND SPECIFICATIONS

SPECIAL PROVISIONS AND SUPPLEMENTAL STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

OREGON STATE HIGHWAY DIVISION SALEM, OREGON

KIND OF WORK.	(CIR) Cold Inplace Recycled Asphalt Concrete
SECTION	Various
HIGHWAY	Various
COUNTY	Various
PROPOSALS TO E	BE RECEIVED

SECTION 420 - COLD INPLACE RECYCLED (CIR) ASPHALT CONCRETE PAVEMENT

Description

<u>Subsection 420.01 Scope</u> - This work shall consist of constructing Cold Inplace Recycled (CIR) asphalt concrete pavement using Class I and Class II recycling treatments in accordance with these specifications, and in reasonably close conformity to the lines, grades, thicknesses and cross sections shown on the plans or established by the Engineer.

Definitions

<u>420.04</u> CIR Asphalt Concrete Pavement - CIR asphalt concrete pavement is a mixture of pulverized existing asphalt pavement (RAP), which has been removed and mixed with emulsified asphalt cement and water, then relayed and compacted in a continuous operation.

<u>420.05</u> Class I Recycling Treatment - Class I recycling treatment is performed on a uniform pavement, designed and built to specifications. The CIR mixture produced under Class I is based on a rational mix design method.

<u>420.06</u> Class II Recycling Treatment - Class II recycling treatment is performed on either a pavement with significant maintenance patches over a uniform pavement or a pavement with minimal design used in the original construction. The CIR mixture produced under Class II is less uniform than for Class I and is based on either a rational mix design method or mix design guidelines.

(Use following paragraph when single unit is allowed.)

<u>420.07</u> Option A or B - Under these specifications the Contractor shall perform CIR work using either a recycling train (Equipment Option A) or a single processing unit (Equipment Option B) as hereinafter specified.

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<u>420.08</u> Prepaying Conference - The Contractor and the Contractor's supervisory personnel plus any subcontractors and their supervisory personnel who are to be involved in the recycle and paving work shall meet with the Engineer's representatives for a prepaying conference at a time mutually agreed upon. At this conference, the Contractor shall present the methods of accomplishing all phases of the recycle and paving work. The plan of the work, order of work and other details of performance shall meet with the approval of the Engineer.

New supervisory personnel replacing anyone engaged in the recycle and paving work, after the first conference, shall be required to attend a new prepaving conference prior to performing their duties on this project.

<u>Materials</u>

<u>420.11</u> Asphalt - Emulsified asphalt shall be CMS-2S or HFE-150 as directed by the Engineer and shall meet the applicable requirements of Section 702.

<u>420.12 Water</u> - Water shall conform to the requirements of subsection 233.11.

(Use bracketed item when single unit option is allowed.)

<u>420.13</u> Recycled Asphalt Pavement (RAP) - Recycled material removed from the existing asphalt pavement (using Equipment Option A) shall have a maximum size of 1-1/2-inch prior to entering the mixer unless otherwise directed by the Engineer. Any recycled material larger than 1-1/2-inch shall be separated by screening or other means, broken down by mechanical means to pass a 1-1/2-inch sieve and uniformly reincorporated with the balance of the recycled material.

(Use following paragraph when single unit option is allowed.)

Recycled material removed from the existing asphalt pavement using Equipment Option B shall have a maximum size of two inches. Incidental oversize may be allowed by the Engineer if it is not detrimental to the mixture or wearing surface. If the gradation is determined to be detrimental, the Contractor shall take such action necessary to correct the oversize problem. These actions may include reducing the milling speed, crusher, changing screen

2/15

<u>420.08</u> Prepaying Conference - The Contractor and the Contractor's supervisory personnel plus any subcontractors and their supervisory personnel who are to be involved in the recycle and paving work shall meet with the Engineer's representatives for a prepaving conference at a time mutually agreed upon. At this conference, the Contractor shall present the methods of accomplishing all phases of the recycle and paving work. The plan of the work, order of work and other details of performance shall meet with the approval of the Engineer.

New supervisory personnel replacing anyone engaged in the recycle and paving work, after the first conference, shall be required to attend a new prepaving conference prior to performing their duties on this project.

Materials

<u>420.11</u> Asphalt - Emulsified asphalt shall be CMS-2S or HFE-150 as directed by the Engineer and shall meet the applicable requirements of Section 702.

<u>420.12</u> Water - Water shall conform to the requirements of subsection 233.11.

(Use bracketed item when single unit option is allowed.)

<u>420.13</u> Recycled Asphalt Pavement (RAP) - Recycled material removed from the existing asphalt pavement (using Equipment Option A) shall have a maximum size of 1-1/2-inch prior to entering the mixer unless otherwise directed by the Engineer. Any recycled material larger than 1-1/2-inch shall be separated by screening or other means, broken down by mechanical means to pass a 1-1/2-inch sieve and uniformly reincorporated with the balance of the recycled material.

(Use following paragraph when single unit option is allowed.)

Recycled material removed from the existing asphalt pavement using Equipment Option B shall have a maximum size of two inches. Incidental oversize may be allowed by the Engineer if it is not detrimental to the mixture or wearing surface. If the gradation is determined to be detrimental, the Contractor shall take such action necessary to correct the oversize problem. These actions may include reducing the milling speed, crusher, changing screen

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size (when screens are used) or other such measures as may be necessary. Failure of the Contractor to be able to provide an acceptable product will cause a rejection of the equipment or processing equipment.

(Use the following paragraph when the Contractor will produce choke aggregate.)

<u>420.14</u> Choke Aggregate - The material to be used as choke aggregate shall be either clean sand, crushed gravel or quarry rock free of clay, loam or other extraneous material and shall conform to the following:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8"	100
1/4"	95–100
40	20-40
100	0-5

(Use the following paragraph with State-furnished material.)

<u>420.14</u> Choke Aggregate - Choke aggregate will be furnished by the State. Material to be used on this project is stockpiled on State-controlled property located on Highway _____ at Milepost

<u>420.15</u> Job Mix Formula - The CIR asphalt concrete mixture shall consist of RAP from the existing pavement, emulsified asphalt cement and water combined in the proportions designated by the Engineer. Variability in the composition of the RAP material may require changes in the proportions of the constituents, as directed by the Project Manager. Normally, the emulsified asphalt content will be between 0.3 and 2.5 percent, by weight, and water between 1.5 and 4.0 percent by weight.

<u>420.16 Process Control Testing</u> - Process control sampling and testing will be performed by the Engineer.

<u>420.17</u> Acceptance of CIR Mixture - The CIR mixture will be accepted visually on the grade following initial compaction. Any mixture that ravels or does not provide any acceptable wearing surface shall be corrected. Any area showing an excess or deficiency of emulsified asphalt cement shall be reprocessed or replaced. Replacement shall be by a method approved by the Engineer. Removal and replacement under these provisions shall be at the expense of the Contractor unless the Engineer determines that the defects, excesses or deficiencies are not caused by or the fault of the Contractor's operations.

Construction

<u>420.31</u> Season and Weather Limitations - Inplace recycling of existing asphalt concrete pavement shall not begin until the pavement surface temperature is 70°F and rising. Pavement damaged by rain after placement shall be reprocessed, or other method approved by the Engineer, at the Contractor's expense. The construction of CIR asphalt concrete pavement will not be allowed before May 15 or after August 1, except the Engineer may approve a start-up before the pavement surface temperature is 70°F under the following conditions:

- (1) The Contractor requests such an early start in writing;
- (2) The Contractor assumes all financial responsibility for correction of raveling problems with the CIR mixture during the early start period. This includes, but is not limited to, the cost of complete recycling, additional choke, rollers, pilot cars and flaggers, etc. as determined by the Engineer.

If recycling and placement operations are not completed by August 1, the Contractor will not be allowed to resume operations until May 15 of the following year.

The Contractor shall stop milling work at the end of each day when the temperature of the mixture behind the paver drops below 90°F or three hours before sunset, whichever occurs first.

<u>420.32</u> Rate of Progress and Scheduling - The Contractor shall plan and schedule the recycle operation in such a manner that the materials are removed, mixed, replaced and the area open to traffic immediately after initial compaction is completed.

All recycled areas shall be competely backfilled with reprocessed and compacted asphalt concrete materials so the area is open to two-way traffic during all hours of darkness.

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replaced. Replacement shall be by a method approved by the Engineer. Removal and replacement under these provisions shall be at the expense of the Contractor unless the Engineer determines that the defects, excesses or deficiencies are not caused by or the fault of the Contractor's operations.

Construction

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- (1) The Contractor requests such an early start in writing;
- (2) The Contractor assumes all financial responsibility for correction of raveling problems with the CIR mixture during the early start period. This includes, but is not limited to, the cost of complete recycling, additional choke, rollers, pilot cars and flaggers, etc. as determined by the Engineer.

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The Contractor shall stop milling work at the end of each day when the temperature of the mixture behind the paver drops below 90°F or three hours before sunset, whichever occurs first.

<u>420.32</u> Rate of Progress and Scheduling - The Contractor shall plan and schedule the recycle operation in such a manner that the materials are removed, mixed, replaced and the area open to traffic immediately after initial compaction is completed.

All recycled areas shall be competely backfilled with reprocessed and compacted asphalt concrete materials so the area is open to two-way traffic during all hours of darkness.

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(Use bracketed item when single unit option is allowed.)

(Equipment Option A)

<u>420.34</u> Recycling Train - (Under this option the) existing pavement shall be recycled using a recycling train consisting of the following major components: (a) Planing machine or grinder, (b) crusher and (c) pugmill mixer.

(a) <u>Planning machine or grinder</u> - The existing pavement shall be removed by a self-propelled planing machine having a minimum 144-inch wide rotary cutter and be capable of removing the existing pavement to a depth of four inches in a single pass.

The unit, also, shall be capable of accurately establishing profile grades within a tolerance of 0.02-foot by reference from either the existing pavement or from independent grade control and shall have a positive means for controlling cross slope elevations. The equipment shall incorporate a totally enclosed cutting drum with replaceable cutting teeth and shall have an effective means for removing excess material from the surface and for preventing dust from escaping into the air. The use of a heating device to soften the pavement will not be permitted.

The unit shall be equipped to discharge not less than 70 gallons of water per minute into the cutting chamber, with fully variable control and meter capable of measuring the rate of feed within five gallons per minute.

(b) <u>Crusher</u> - The crusher shall be of the portable type capable of reducing the oversized RAP materials to the specified size.

(c) <u>Pug mill mixer</u> - The CIR asphalt concrete mixture shall be mixed in a pug mill type plant capable of providing a mix of RAP, emulsified asphalt and water at a minimum rate of 700 tons/hour to uniform proportions as designated by the Engineer.

Mixing plants shall be equipped with a positive control linking the RAP, emulsified asphalt and water feed in a manner that will maintain a constant ratio of each constituent. The plant shall be equipped with facilities so that the Contractor can verify and calibrate the RAP, asphalt and water quantities by a method acceptable to the Engineer.

The RAP shall be measured by weight and the emulsified asphalt and water may be proportioned by either weight or volume. The equipment shall be capable of feeding and maintaining a constant rate of RAP feed within a tolerance of plus or minus 5% (by weight) or the designated amount and a constant rate of emulsified asphalt and water feeds within plus or minus 0.2% (by weight) of the designated amounts.

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The mixing plant shall be equipped with positive displacement pumps and a computerized metering system which can accurately meter the amount of emulsified asphalt and water. The pumps shall be interlocked belt weighing system that measures the quantity of RAP material entering the mixing plant. The interlock shall be designed so that emulsified asphalt and water cannot be added until RAP material enters the mixer. Overrides of the interlock system shall be equipped with short duration timers to prevent their continuous use. Overrides shall be used only during start-up periods.

The belt weighing device and computerized-metering system shall have readouts that indicate the quantity in tons of RAP, water and emulsified asphalt being fed into the mixer at any given time. Totalizer readouts shall also be provided to allow determination of accumulative quantities of each constituent.

(Use following four paragraphs when single unit option is allowed.)

Eauipment Option B - Single Processing Unit:

Under this option the existing pavement shall be processed using a planing machine meeting all of the requirements of a planing machine under "Equipment Option A".

In addition, the planing machine shall be capable of adding emulsified asphalt and water to the RAP in amounts directed by the Engineer to produce a uniform mixture.

Positive displacement pumps which can accurately meter the planned amount of emulsified asphalt and water into the pulverized asphalt concrete shall be used. The pumps shall be interlocked to the movement of the machinery used to apply the emulsified asphalt and water to provide that no emulsified asphalt or water can be added when the machinery is not moving.

The emulsified asphalt and water feeds shall have positive readout capabilities so that the amount of emulsified asphalt and water in tons incorporated into at any given time can be read directly. Totalizer readouts shall also be provided to allow determination of accumulative quantities of water and emulsified asphalt used in the mixture.

(d) <u>Asphalt storage and heating tanks</u> - Storage tanks shall be equipped with accurate volume measuring devices or manufactures calibration charts for each storage tank and a thermometer for measuring the temperature of tank's contents.

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Between the storage tanks and the liquid asphalt mixing device or recycling equipment, a parallel piping filter system with at least one filter per line shall be used. Filters shall be capable of eliminating solid or semisolid particles from the emulsified asphalt liquid.

Each filtering line shall be equipped with on-off valves and changeable filter elements.

The emulsified asphalt cement shall be routed alternately through each filter line for a period of two to four hours, and alternate filters changed on the same frequency unless otherwise directed by the Engineer.

Loads of emulsified asphalt which break prematurely in the storage tanks or haul vehicles or which cause frequent plugging of the filters as determined by the Engineer will be rejected for use.

<u>420.35</u> Asphalt Concrete Pavers - Pavers shall be selfcontained, power-propelled units, provided with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing layers of recycled asphalt concrete material in widths applicable to the specified typical sections, and to required thicknesses, lines, grades and cross sections.

Extensions added to the paver when used on traffic lanes shall have the same augering and screeding equipment as the rest of the paver.

The paver shall be equipped with a receiving and distribution system of sufficient capacity for a uniform spreading operation and capable of placing the mixture uniformly in front of the screed without segregation of materials.

The paver shall be designed to compensate for minor irregularities of the base on which it is supported so that such will not be reflected immediately in the surface of the layer being placed. The weight of the paver shall be supported on tracks or wheels, none of which shall contact the mixture being laid. The contact area of the screed or strike-off assembly shall be uniform over the entire width of the strip of mixture being placed.

Pavers shall be equipped with a paver control system which shall automatically control the layer of the mixture to specified cross slope and grade. The control system shall be automatically actuated from independent line and grade control references through a system of mechanical sensors and sensor-directed devices which shall automatically maintain the paver screed in proper position to provide specified results. The screed of strike-off assembly shall produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

<u>420.36</u> <u>Compactors</u> - Rollers shall be steel wheel, pneumatic tire, vibratory or a combination of these types as specified. They shall be in good condition and capable of reversing without backlash.

(a) <u>Steel wheeled rollers</u> - Steel wheeled rollers shall have a minimum gross static weight of 10 tons and a minimum static weight on the drive wheel of 250 pounds per inch of width.

(b) <u>Vibratory rollers</u> - Vibratory rollers shall be a tandem steel wheeled type having a minimum gross static weight of 8 tons and shall be equipped with amplitude and frequency controls and shall be specifically designed for compaction of asphalt concrete mixtures. The rollers shall be capable of frequencies of not less than 2,000 vibrations per minute.

(c) <u>Pneumatic rollers</u> - The pneumatic-tired rollers shall have a minimum static weight of 20 tons and shall be selfpropelled, tandem or multiple axle, multiple wheel type with smooth-tread pneumatic tires of equal size staggered on the axles at such spacings and overlaps as will provide uniform capacting pressure for the full compacting width of the roller and shall be capable of exerting ground pressures of at least <u>80 pounds</u> per square inch of tire contact area.

<u>420.37</u> Preparation of Foundation - Just prior to windrowing the recycled pavement mixture, a tack coat conforming to Section 407 of these special provisions shall be applied to the entire profiled area including the vertical edges. Rates of application shall be as directed by the Engineer.

Care shall be taken to minimize the amount of fines on the milled surface that can be detrimental to a proper bond of the tack coat.

<u>420.40</u> Heating Emulsified Asphalt Cement - The temperature of the emulsified asphalt cement prior to entry into the mixture shall be not less than 125 F nor more than 185 F.

<u>420.41 Mixing</u> - All the various required components of the asphalt concrete mixer shall be utilized and operated in a manner to assure compliance with this section.

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<u>420.41</u> Mixing - All the various required components of the asphalt concrete mixer shall be utilized and operated in a manner to assure compliance with this section.

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The RAP, emulsified asphalt cement and water shall be measured and introduced into the mixer in the amounts specified in the "job mix formula" and as designated by the Engineer.

Mixing shall continue until the emulsified asphalt water have been distributed through the RAP to form a uniformly coated mixture.

<u>420.43 Control of Line and Grade</u> - The line and grade reference control shall be a floating beam device of adequate length and sensitivity to provide adequate control on either or both sides of the paver.

Manual control of line and grade for the paver will be permitted when approved by the Engineer.

<u>420.44 Spreading</u> - Except for unavoidable delay or breakdown, recycling and placing recycled pavement by the paving machine shall be at a rate sufficient to provide continuous operation of the paving machine. If paving operations result in excessive stopping of the paving machine, as determined by the Engineer, recycling and paving operations shall be suspended until the Contractor can synchronize the rate of recycle with the capacity of the paving machines.

(a) <u>General</u> - The mixture shall be laid on an approved surface, spread and struck off to established grade and elevation. Specified asphalt pavers shall be used to distribute the mixture.

The asphalt mixture shall be deposited in a windrow, then picked up and placed in the asphalt paver.

The loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine nor cause vibrations or other motions which could have a detrimental effect on the riding quality of the completed pavement. The loading equipment shall pick up substantially all of the material deposited on the roadbed and place it directly into the receiving hopper of the paving machine.

In areas where patching, irregularities or unavoidable obstacles make the use of specified equipment impracticable, the mixture may be spread with special hopper equipment with adjustable strike-off or by other equipment and means approved by the Engineer, provided the surface finish is within a tolerance of 0.01-foot of that hereinafter set forth.

(b) <u>Drop-offs</u> - Prior to any suspension of operations at the end of each shift, the full width of the area to be paved, including outside shoulders, shall be completed to the same elevation with no longitudinal drop-offs.

If unable to complete the pavement without longitudinal drop-offs as specified above, the Contractor shall, within the specified time constraints, construct and maintain a wedge of asphalt concrete at a slope of 10:1 or flatter along the exposed longitudinal joint located within the area to be paved. Longitudinal joints one inch or less will not require a wedge. The wedge shall be removed and disposed of prior to continuing paving operations. Construction, material, maintenance, removal and disposal of the temporary wedge shall be at the Contractor's expense.

Where allowable abrupt or sloped drop-offs occur within or at the edge of the paved surface the Contractor shall provide, at his expense, suitable warning signs as required under Section 111.

(c) <u>Finishing and details</u> - Special care shall be taken at longitudinal joints to provide positive bond and to provide density and finish to new mixture equal in all respects to the mixture against which it is placed.

<u>420.45</u> Choke Aggregate Placement - Immediately prior to the last roller coverage during initial compaction as hereinafter specified and before opening to traffic, the Contractor shall place choke aggregate at a rate of approximately 0.001 to 0.003 cubic yard per square yard. Choke aggregate shall be spread by a method that provides uniform coverage across the CIR mat. Any piles, ridges or uneven distribution of choke aggregate shall be eliminated by spreading and/or removing with hand tools or mechanical means as the Contractor elects prior to the final roll or coverage.

If raveling of the CIR mixture occurs following placement, the Contractor shall provide traffic control for these areas immediately or as directed by the Engineer. When the Engineer determines that additional rolling of the raveled areas is required, the additional rolling will be paid as Extra Work.

420.46 Compaction:

(a) <u>General</u> - Immediately after the CIR asphalt concrete mixture has been spread, struck off and surface irregularities and other defects remedied, it shall be thoroughly and uniformly rolled until the mixture is compacted as hereinafter set forth.

(a-1) <u>Surface repair</u> - Any displacement of the mat regardless of thickness occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected. <u>Steel roller wheels shall be</u> moistened with water or other approved material to the least extent necessary to prevent pickup of mixture. If unable to complete the pavement without longitudinal drop-offs as specified above, the Contractor shall, within the specified time constraints, construct and maintain a wedge of asphalt concrete at a slope of 10:1 or flatter along the exposed longitudinal joint located within the area to be paved. Longitudinal joints one inch or less will not require a wedge. The wedge shall be removed and disposed of prior to continuing paving operations. Construction, material, maintenance, removal and disposal of the temporary wedge shall be at the Contractor's expense.

Where allowable abrupt or sloped drop-offs occur within or at the edge of the paved surface the Contractor shall provide, at his expense, suitable warning signs as required under Section 111.

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to alleviate the problem.

(a-2) <u>Rolling</u> - The CIR asphalt concrete mixture shall be compacted with rollers conforming to the requirements hereinbefore set forth. The type, number and weight of rollers shall be sufficient to compact the mixture.

Rollers shall move at a slow but uniform speed recommended by the manufacturer with the drive rolls or wheels nearest the paver. Vibratory rollers, when used in the vibratory mode, shall be operated at frequencies of at least 2,000 vibrations per minute. The maximum operating speed of pneumatic rollers shall be 5 MPH.

Normal rolling shall begin at the sides and proceed longitudinally parallel to the road centerline, each trip overlapping one-half the roller width, gradually progressing to the center. On superelevated curves the rolling shall begin at the low side and progress to the high side, each trip overlapping one-half the roller width. When paving is in echelon or when abutting a previously placed lane, the longitudinal joint shall be rolled first followed by the regular rolling procedure. Rollers shall not make sharp turns on the course being compacted and they shall not be parked on the fresh CIR mixture. Alternate trips of a roller shall terminate in stops at least five feet distant longitudinally from adjacent preceding stops.

(b) <u>Initial compaction</u> - Compaction of the fresh CIR asphalt concrete mixture shall be performed with a minimum of two vibratory rollers meeting the requirements hereinbefore set forth. Rollers shall be operated in either vibratory or static mode as directed by the Engineer. The mixture shall be compacted with at least one coverage by each roller and such additional coverages as the Engineer may direct.

The overlapping of one-half of roller width on each trip by the rollers as required does not constitute two coverages on that particular area rolled.

(c) <u>Recompaction</u> - After initial compaction and prior to recompaction, the CIR asphalt concrete pavement shall be opened to public traffic and allowed to cure. Recompaction shall be performed between 3 and 15 days after laydown when directed by the Engineer. Rolling shall not be performed when the surface temperature is less than 90° F.

The entire recycled pavement area shall be recompacted with at least one steel wheeled roller and one pneumatic roller. Each roller shall make at least three coverages and such additional coverages as the Engineer may direct.

420.49 Pavement Smoothness:

(a) <u>General</u> - The top surface of CIR asphalt concrete pavement shall be tested with a 12-foot straightedge furnished and operated by the Contractor parallel to or perpendicular to the centerline, and shall not vary by more than 0.02-foot. The Engineer will observe this testing and may require additional testing.

When utility appurtenances such as manhole covers and valve boxes are located in the traveled way and they are not required to be adjusted or are required to be adjusted before paving, this tolerance will not apply.

(b) <u>Corrective action</u> - When tests show the pavement is not within the specified tolerance, the Contractor shall take immediate action to correct equipment or procedures in his paving operation to eliminate the unacceptable pavement roughness.

Any surface irregularities exceeding the specified tolerances shall be corrected by the Contractor within the period of 2 to 5 days following initial compaction using one of the following methods:

- (1) Remove, replace or reprocess the surface course.
- (2) Grind the pavement surface utilizing the planing machine or grinder as hereinbefore set forth to a maximum depth of 0.3-inch.

The cost of all corrective work, including traffic control and furnishing of materials, shall be performed at the Contractor's expense and no adjustment in contract time will be made for corrective work.

Measurement

<u>420.81</u> <u>Measurement - The number of square yards of recycled</u> emulsified asphalt mixture shall be based on the paved widths and milled depths shown on the plans and the horizontal measurement along the centerline of the actural length of the pavement recycled.

The entire recycled pavement area shall be recompacted with at least one steel wheeled roller and one pneumatic roller. Each roller shall make at least three coverages and such additional coverages as the Engineer may direct.

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When utility appurtenances such as manhole covers and valve boxes are located in the traveled way and they are not required to be adjusted or are required to be adjusted before paving, this tolerance will not apply.

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<u>420.81</u> <u>Measurement - The number of square yards of recycled</u> emulsified asphalt mixture shall be based on the paved widths and milled depths shown on the plans and the horizontal measurement along the centerline of the actural length of the pavement recycled.

No allowance will be made for pavement recycled in excess of the paved width and milled depth shown on the plans unless directed by the Engineer.

No change in unit price per square yard will be made for depths deviating from plan depths unless the milled depth is deviated by more than plus or minus one-half inch from the nominal thickness called for by the plans and directed by the Engineer. Where the Engineer directs construction of recycled emulsified asphalt concrete to a thickness other than plus or minus of one-half inch from the nominal thickness specified, these areas will be adjusted by converting in one-half-inch increments to the equivalent number of square yards of nominal thickness on a proportionate volume basis above or below the specified tolerance limits.

For example, if the plans require a nominal depth of 1-1/2-inch and the Engineer directs a milling depth of 2-1/2 inches, the adjustment will be based on an additional 1/2-inch depth. (2-1/2"-1-1/2"-1/2" (tolerance) = 1/2" adjustment)

The quantity of emulsified asphalt in the recycled asphalt concrete mixture to be paid for will be the number of tons used in the accepted mixture measured as set forth in subsection 109.01 of the Standard Specifications.

The quantity of water used in the mixture will be measured as set forth in Section 233.

The quantity of choke aggregate to be paid for will be the number of cubic yards actually spread on the inplace recycled emulsified asphalt mixture at the rate specified, measured as set forth in subsection 109.01 of the Standard Specifications.

Payment

<u>420.91</u> Payment - Payment when made at the contract unit price per square yard for the item "Recycled Emulsified Asphalt Pavement Mixture" will be full compensation for all equipment, labor and incidentals required to remove and pulverize the existing surfacing, and to mix the materials, place, compact and finish the work as specified.

Payment, when made at the contract unit price per ton for "Emulsified Asphalt in Recycled Mixture", will be full compensation for all costs of material, labor, tools and equipment necessary for the addition of the emulsion as specifed.

(Use word "furnish" when Contractor is to supply choke aggregate.)

Payment, when made at the contract unit price per cubic yard for "choke aggregate", will be full compensation for all costs to (furnish,) haul and place choke aggregate as specified.

Payment for water used in the CIR asphalt concrete mixture will be made as set forth in Section 233 and will comprise full compensation for the water used in connection with the recycle work.

<u>SECTION 407 - ASPHALT TACK COAT</u>

Delete Section 407 of the 1984 Standard Specifications and insert the following:

<u>Description</u>

<u>407.01</u> Scope - This work shall consist of the furnishing of asphalt and the application thereof to a prepared asphalt concrete surface to ensure thorough bond between profiled asphalt cement surface and recycled emulsified asphalt mixture. The tack coat shall be applied on the areas designated by the Engineer in accordance with these specifications.

Materials

<u>407.11</u> Asphalt - The asphalt to be used in the tack coat shall be CMS-2S and shall meet the applicable requirements of Section 702. The material may be conditionally accepted at the source or point of loading for transport to the project.

Emulsified asphalt in tack shall be diluted prior to application with 15-30 percent additional water conforming to the requirements of subsection 233.11, as determined by the Engineer.

Construction

<u>407.31</u> General - The tack coat shall be applied to the milled surface prior to placement of the recycled emulsified asphalt mixture is placed in a berm into the profiled area.

The tack coat shall be applied to the entire milled surface including the vertical edges.

(Use word "furnish" when Contractor is to supply choke aggregate.)

Payment, when made at the contract unit price per cubic yard for "choke aggregate", will be full compensation for all costs to (furnish,) haul and place choke aggregate as specified.

Payment for water used in the CIR asphalt concrete mixture will be made as set forth in Section 233 and will comprise full compensation for the water used in connection with the recycle work.

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<u>407.01</u> Scope - This work shall consist of the furnishing of asphalt and the application thereof to a prepared asphalt concrete surface to ensure thorough bond between profiled asphalt cement surface and recycled emulsified asphalt mixture. The tack coat shall be applied on the areas designated by the Engineer in accordance with these specifications.

<u>Materials</u>

<u>407.11</u> Asphalt - The asphalt to be used in the tack coat shall be CMS-2S and shall meet the applicable requirements of Section 702. The material may be conditionally accepted at the source or point of loading for transport to the project.

Emulsified asphalt in tack shall be diluted prior to application with 15-30 percent additional water conforming to the requirements of subsection 233.11, as determined by the Engineer.

Construction

<u>407.31</u> General - The tack coat shall be applied to the milled surface prior to placement of the recycled emulsified asphalt mixture is placed in a berm into the profiled area.

The tack coat shall be applied to the entire milled surface including the vertical edges.

<u>407.32</u> Distribution Equipment - The asphalt shall be spread by means of a pressure distribution system capable of applying the tack coat uniformly on surfaces having widths of up to 13 feet at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.05 gallon per square yard.

Distribution system equipment shall include pressure gauges, accurate volume measuring devices or a calibrated tank and a thermometer for running temperature of tank contents. The distribution system shall have a power unit for the pump and a full circulation system for the tank and spray bar.

The spray bar shall be capable of being easily adjustable laterally.

<u>407.33</u> Application Rate - Normally, the diluted emulsified asphalt shall be applied to the milled surface at a rate of 0.05-0.20 gallon/sq.yd. as directed by the Engineer.

Measurement

407.81 General - Asphalt used as directed in the asphalt tack coat will be measured by the ton as set forth in Section 109.

Payment

<u>407.91</u> General - The accepted quantity will be paid for at the contract price per ton for the item "Asphalt in Tack Coat". The water in the tack coat will be measured and paid for in accordance with subsections 233.81 and 233.91 of the Standard Specifications.

15/15

APPENDIX F

WARM SPRINGS PROJECT FIELD REPORT

FIELD REPORT PRELIMINARY PROJECT DATA

Unit "A"

120

GENERAL: Project Name: M.P. 79.2 - Wasco Co. Line M.P. 79.2 - M.P. 96.5 Warm Springs Highway Warm Springs Jct - Wasco Co. Line Actual Recycle Depth: 1 1/2" - 2" Plan Recycle Depth: 1 1/2" Date Completed: 8/14/86 Date Started: 8/5/86 Production Rate: 4.9 mi./day Ambient Temp.(daytime): Avg.: 82 deg. F.; High: 105 F.; Low: 70 F. Asphalt Supplier and Type: Chevron CMS-2S Emulsion.

PRELIMINARY INFORMATION FROM PAPER RESEARCH, CORES AND FIELD REVIEW:

The paper research produced / three prior projects. The first a 25 Yeorold AC -Class "B" Mix constructed in 1961 titled West unit Warm Springs Jct. -Bear Springs. This was a widening and paving project, but no Forold AC information could be found on the mix design or asphalt. The limits of this prior project were from mile point 62.1 to 96.5. The second prior project was a 1969 project titled Willow Creek - Simnasho Road. This was constructed with two lifts of Class "B" Mix using Union 85/100 asphalt. The existing lane width was 22 feet and was widened to 32 feet. The 10 feet of widening was the only area to get two lifts the remainder of the project received only one. The recycling will be encounter 2 feet of this widening in each lane. The job mix formula called for 7.3% asphalt to be used in the top lift. The limits of this prior project was from M.P. 78.9 - 84.9. The third prior project was Simnasho Road - Jefferson Co. Line. This prior project was constructed in May of 1971 using Douglas 60-70 in the top course and Shell/Douglas 85-100 in the base course. Again in this project the shoulder area received two lifts and the roadway only the wearing course. The job mix formula and the job averages for this project show 5.7% for the wearing surface. Under Extra Work Order, 3500 tons of Class "C" Mix were also placed under this contract, but the location was not recorded. During the field review the limits of the C mix were found from mile point 94.3 to 96.5.

) In the work thickness varying from 6 inches to 10 inches. The cores contributed to (?) In test section where we do and verified the information found during the field review. A'' we were to be uniformity of the

base rock

Due to the uniformity of the existing surface throughout this unit. 6 test sections were constructed where depth and emulsion content were varied. Deflections were taken every 50 feet within these test sections and Mays ride information was gathered throughout the entire unit. Figure 1 shows the limits of the test sections along with add emulsion/water contents and treatment depths. Additionally, millings samples from the recycle train were taken from within the test sections prior to the addition of emulsion. The millings will be used to form 75 <u>SP420</u> (5-14-87)

The mixing plant shall be equipped with positive displacement pumps and a computerized metering system which can accurately meter the amount of emulsified asphalt and water. The pumps shall be interlocked belt weighing system that measures the quantity of RAP material entering the mixing plant. The interlock shall be designed so that emulsified asphalt and water cannot be added until RAP material enters the mixer. Overrides of the interlock system shall be equipped with short duration timers to prevent their continuous use. Overrides shall be used only during start-up periods.

The belt weighing device and computerized-metering system shall have readouts that indicate the quantity in tons of RAP, water and emulsified asphalt being fed into the mixer at any given time. Totalizer readouts shall also be provided to allow determination of accumulative quantities of each constituent.

(Use following four paragraphs when single unit option is allowed.)

Equipment Option B - Single Processing Unit:

Under this option the existing pavement shall be processed using a planing machine meeting all of the requirements of a planing machine under "Equipment Option A".

In addition, the planing machine shall be capable of adding emulsified asphalt and water to the RAP in amounts directed by the Engineer to produce a uniform mixture.

Positive displacement pumps which can accurately meter the planned amount of emulsified asphalt and water into the pulverized asphalt concrete shall be used. The pumps shall be interlocked to the movement of the machinery used to apply the emulsified asphalt and water to provide that no emulsified asphalt or water can be added when the machinery is not moving.

The emulsified asphalt and water feeds shall have positive readout capabilities so that the amount of emulsified asphalt and water in tons incorporated into at any given time can be read directly. Totalizer readouts shall also be provided to allow determination of accumulative quantities of water and emulsified asphalt used in the mixture.

(d) <u>Asphalt storage and heating tanks</u> - Storage tanks shall be equipped with accurate volume measuring devices or manufactures calibration charts for each storage tank and a thermometer for measuring the temperature of tank's contents.

blow Marshall briquettes using the appropriate emulsion brand and content. Stability, Modulus, and Fatigue tests will be run on the briquettes at 3 mo., 6 mo., 12 mo. and 24 mo. intervals. These test results will be compared to results of the same tests performed on 4" dia. pavement cores from the test sections taken at the same time intervals.

There were four mix design areas designated for this unit. Figure 3 contains their descriptions by mile point, mix design sample locations, original asphalt data and a description of the pavement condition prior to recycle.

BINDER CONTENT:

Note:

I agree

Recommended add emulsion contents were determined using revised mix design criteria developed 7-29-86. In addition, a minimum of 1% add emulsion was specified to provide the necessary softening and coating for the millings. Figure 2 illustrates percents used, original mix design, and revised mix design contents. Note that the actual percents used were based on meter readings only and not extractions. Beginning with this report extraction test results will no longer be reported. They were erratic and misleading since it was uncertain whether all of the emulsifiers and solvents were being evaporated prior to extraction of the residual asphalt.

INITIAL COMPACTION:

The initial compaction was accomplished with an Ingersoll Rand model DA-5D double drum vibratory roller using one pass vibratory and one pass static then a Hyster model C340B tandem steel roller using two passes.

As can be seen in figure 4 the initial compaction was generally in the high 70s to low 80s throughout the entire unit. This is slightly below the average compaction seen on most of the recycle projects this year. M.P. 81.8-84.9 Rt. was analyzed separately in Fig. 4 because this area experienced severe ravelling to the point that it had to be re-recycled. Note that initial compaction in this area was the lowest recorded. Although no well defined pattern in compaction developed which could be correlated to treatment depth or emulsion content, it does appear that a minimum initial compaction of 75% is required to prevent ravel.

SECOND COMPACTION:

Second compaction was accomplished with three passes each using a Raygo model C2A double drum vibratory in static mode and a Brothers model 1919 pneumatic roller. Figure 5 lists the construction variations that could have affected compaction along with the corresponding compaction achieved and the increase in density over first compaction. Note that for most of the second compaction a Rice Density of 150.9 lbs/ft³ was used which was different than the Rice used on initial compaction.

FIELD OBSERVATIONS OF RECYCLED MIX AND LAYDOWN:

For the most part the recycle of this unit went well. This was the first unit recycled this Summer where the revised mix design criteria were used in their respective mix design areas with good success. This is encouraging because it shows we are learning how to make successful laboratory designs for cold in-place recycle pavements.

OBSERVATIONS OR SPECIAL PROBLEMS ON THIS UNIT:

From MP 79.2 to MP 84.85 Rt. there was intermittent ravelling 200 to 300 feet long. To correct this, add emulsion was increased from 1.1% to 1.3% and additional rolling was provided. This area is heavily forested and large areas are shaded part of the day. Additionaly, the ambient temperature when this section was recycled was approx. 15 degrees F. cooler than the ambient temperature during the previous week's work (low 80's vs. mid to high 90's) where 1% add emulsion was performing satisfactorily without ravelling. The cool temperatures created by the shade and weather reduced softening and cure of the recycle mat prior to placing high volume traffic onto the new pavement. From MP 83.8 to MP 84.85 Rt. ravelling was so severe that the pavement had to be re-recycled with 0.5% more emulsion added for a total add emulsion of 1.7%. Note that in this area loaded log truck traffic was pulling onto the recycle pavement from a side road and accelerating uphill. Another area that required re-recycling was from MP 88.3 to 88.75. The emulsion shipment used in this area contained 1% more naptha and emulsifiers than previous shipments. This may have caused the ravelling according to the project manager. An additional 0.3% to 0.5% emulsion was added in this section during re-recycling bringing the total add emulsion to 1.3% to 1.5%.

GENERAL COMMENTS:

The temperature sensitivity of recycle mixtures during initial cure was reemphasized during construction of this unit. Keep in mind that approximately 50% of this unit was recycled using only 1.0%-1.2% add emulsion which is an addition of only 0.7%-0.8% residual asphalt. While the daytime ambient temperatures were in the 90 degree F.--100 degree F. range there were no ravelling problems. As soon as the recycle train encountered areas of prolonged shade and/or reduced ambient temperatures ravelling was experienced. Of course an inspector's first reaction to this problem is to add more emulsion. This should be avoided, but if necessary should be kept to 0.1% to 0.2% adjustments and should never go above that emulsion content determined by mix design which would reduce stability after second compaction to a value less than 10. The addition of too much emulsion during cool temperatures will result in flushing and/or instabilities as soon as hot temperatures return. We have seen on previous recycles this Summer that cooler temperatures often lead to ravelling problems since softening of the existing asphalt and cure of the recycled pavement is retarded. But we know that softening and cure will progress though at a slower rate, and that if through careful piloting of traffic and additional rolling we can control the ravel the recycled pavement will eventually set up.

이야지 비행의 가지 그 비사님의 것 같아요.

The test sections which were to be constructed on this unit to determine the effects of different recycle depths and different emulsion contents have been completed. Following is a description of their limits and how they were constructed: 4/20

TEST SECTIONS: WARM SPRINGS JCT. -- WASCO CO. LN.

M.P. 88.0-88.09 (500')	Rt. & Lt. Lanes	Recycle Depth=2" Emul.%=1.0% H ₂ 0%=2.4%
M.P. 88.09-88.17 (400')	Rt. & Lt. Lanes	Recycle Depth=2" Emul.%=1.9% H ₂ 0%=2.4%
M.P. 88.17-88.26 (500')	Ri. & Li. Lanes	Recycle Depth=2" Emul.%=1.6% H ₂ 0%=2.4%
M.P. 88.28-88.47 (1000')	Rt. & Lt. Lanes	Recycle Depth=3" Emul.%=1.0% H ₂ 0%=2.4%
M.P. 88.47-88.54 (400')	LI. Lane Only	Recycle Depth=3" Emul.%=1.3% H ₂ 0%=2.4%
M.P. 88.56-88.75 (1000')	Li. Lane Only	Recycle Depth=4" Emul.%=1.0% H ₂ 0%=2.4%

construction of the second second

CRITICAL DESIGN PROPERTIES AT REVISED RECOMMENDATION:

MIX DES. Area	A. N	used" » Mater/Emul	% EMUL. MIX DES. REC. Origisal Revised	L. . REC. Revised	COATING	HVEEN STAB. (after 2nd compac.)	VOIDS Biter 2nd comp.	VOIDS Biter 2md comp. miter 3rd comp.	PEN ADJ.	REMARKS
	1 79.2-84.9 2.4%/1.2%	2.4%/1.2%		1.5% 1.0%	Dry-Saff.	33	X 55 - 5	4.2%	\$0	33 9.5% 4.2% 0% Pen of original asphalt =14 (Data Sht. A34401) >10 & <20 No pen adi. reg'é.
2	81.9-94.3	2.4%/1.3% (test secs.) (not incl.)	1°.5%	1.0%	Dry-Suff.	2	5.2%	4.9%	% 0	Pes of original asphalt =25 (Data Sht A34402) Mia. 1% add emul.
	88.56-88.75 2.3%/1.0% (test sec.) (4* T.D. Lt.	2.3%/1.0% (1est sec.) (4* T.D. Lt.)	2.0%	1.0%	Dry-Suff.	-	8.1% 5	4.45	% 0	Pea of original asphalt =26 (Deta Sht A34403) Mia. 1% add emet.
	94.3-96.5	2.3%/1.6% Rt. 3.0%/1.9% Lt.	2.5%	1.5%	Dry-Suff.	Ξ	11.5%	5.7%	N O	Per of original asphalt =7 (Data Shi A34844) This doesa't seem to fit with the stab. aos Normally w/ iow nea aos., stab aos are high
		-	-							

"Water/Envision contest based on meter readings.

FIGURE 3

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NIX DES	. W.P.	SAMPLE LOCATIONS	% Asph.	SPH. PROPER Pen. (cm./109) (Visc.	ORIGINAL SURFACE CONDITION
1	79.2-84.9	W.P. 83.4, 5.5'Lt. M.P. 83.2, 6' Rt. M.P. 83.6, 8' Lt.	5.5%	14	907	Thermal cracks spaced 15°-20' apart. Altigator cracking is wheel tracks. One sample taken from a patched area. 3 samples combined for mix design.
2	84.9-94.3	M.P. 88.1, 7' Rt. M.P. 89.2, 9.5' Lt.	5.8%	25	736	Thermal cracks spaced approx, 30' apart. 2 samples combined for mix design.
3	88.56-88.75	W.P. 88.7, 3' Rt.	6.3%	26	681	Test Sec. 4" treatment depth. Longitudinal and thermai cracks spaced 30'-50' avart.
}	94.3-96.5	M.P. 95.2, 9.5' Lt. M.P. 96.1, 2.5' Rt.	5.3%	1	1600	Alligatored and deformed in wheel tracks. Discontinuous thermal cracks 5'-10' long. 2 samples combined for mix design.

				F1745 4		24	14	
			Mean	INITIAL CON	COMPACTION]]]	
	Σ	۰. ۵	Bulk Density (In Lbs.)	Rice Density (In Lbs.)	Mean % Compaction		Remarks	
M.P. M.P. M.Y.	======================================	======================================	======================================	154.0		======================================	=====================================	
M.P. Area Mix D	81.8-84.9 Rt Re-recycled Jesign Area #	Rt. ed a#1	103.8 (4 tests)	144.5	71.8	28.2	1.7% Emul 2.4 Water 1.5" Avo. Treatment Dep	Depth
M.P. Mix D	84.9-94.3 esign Are	Lt. & Rt. a #2	122.8 (16 tests)	154.3	79.6	20.4	1,3% Еми! 2,4 Water 1.6" Аvg. Treatment Dep	e p t h
M.P. Mix D	94.3-96.5 esign Are	Rt. 8 #4	128.2 (3 tests)	150.9	85.0	15.0	1.6% Emul 2.3% Water 1.5" Avo. Treatment Dep	Depth
M.P. Mix D	94.3-96.5 esign Are	요 나 나 . # 4 4 .	134.8 (2 tests)	156.9	85.9	14.1	1,9% Emul 3,0% Water 1,5" Avo. Treatment Den	Depth D
M.P. Test	88.0-88.0 Section	9 Rt. & Lt.	(No tests)				1=0% Emul 2=4 Water 2" Treatment Depth	
M.P. Test	88.09-88. Section	.17 Rt. & Lt.	125.5 (1 test)	158.3	79.3	20.7	1.9% Emul 2.4 Water 2" Treatment Depth	
M.P. Test	88 . 17 - 88 . Section	26 Rt. & Lt.	128.5 (1 test)	158.3	81.2	18.8	1.6% Emul 2.4 Water 2" Treatment Depth	
M.P. Test	88.28~88. Section	47 Rt. & Lt.	121.5 (1 test)	158.3	76.8	23.2	1.0% Emul 2.4 Water 3" Treatment Depth	
M.P. Test	88.47-88. Section	54 Lt.	121.5 (1 test)	158.3	76.8	23.2	1.3% Emul 2.4 Water 3" Treatment Depth	
M.P. Test	88.56-88. Section	.75 Lt.	125.0 (1 test)	158.3	0.67	21.0	1.0% Emul 2.4 Water 4" Treatment Depth	

	1	t Depth	t Depth	Depth	: Depth	: Depth						
	Remarks	:=====================================	1.7% Emul 2.4 Water 1.5" Ava. Treatment	1.3% Emui 2 ₅ 4 Water 1.6" Avg. Treatment	1.6% Emul 2.3% Water 1.5" Avg. Treatment	1.9% Emul 3.0% Water 1.5" Avg. Treatment	1.0% Emul 2.4 water 2" Treatment Depth	1.9% Emul 2.4 Water 2" Treatment Depth	1.6% Emul 2.4 Water 2" Treatment Depth	1.0% Emul 2.4 Water 3 ¹¹ Treatment Depth	1,3% Emul 2,4 Water 3** Treatment Depth	1.0% Emul 2.4 Water 4" Treatment Depth
	Mean Density Change (in Lbs.)	5 0 5	20.5	11.7	6.7	-5.6		19.0	10.5	22.0	13.0	11.5
	PACTION Mean Voids	======================================	17.6	12.0	8 . 6	16.1	10.2	4.2	7.9	4.9	10.9	9.5
Figure 5	SECOND Mear % Compact		82.4	88.0	91.4	83.9	8 . 68	95.8	92.1	95.1	1 68	90.5
	Mean Rice Density (In Lbs)		150.9	152.8	150.9	154.0	150.9	150.9	150.9	150.9	150.9	150.9
	Mean Bulk Density Cin Lbs)		124.3 (18 tests)	134.5 (63 tests)	137.9 (15 tests)	129.2 (16 tests)	135.5 (2 tests)	144.5 (2 tests)	139.0 (2 tests)	143.5 (1 test)	134.5 (2 tests)	136.5 (2 tests)
	α. Σ	2-81.8 Rt. & 2-84.9 Lt. 20 Area #1	8–84.9 Rt. recycled gn Area #1	9–94.3 Lt. & Rt. gn Area #2	3-96.5 Rt. gn Area #4	3-96.5 Lt. gn Area #4	0-88.09 Rt. & Lt. tion	09-88.17 Rt. & Lt. tion	17-88.26 Rt. & Lt. tion	28-88.47 Rt. & Lt. tion	47-88.54 Lt tion	56-88.75 Lt. tion
		M. P. 79. M. N. 200	M.P. 81. Area Re- Mix Desi	M.P. 84.9 M.X.Desi	M.P. 094.	M.P. MIX Des	M.P. 88. Test Sec	M.P. 88.0 Test Sec.	M.P. 88. Test Sec	M.P. 88. Test Sec	M.P. 88. Test Sec	M.P. 88. Test Sec

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		E. A		
PRELIMINARY COLD RECYCLE MIX DES: Project Region 4 Recycle-MP79.2-While	ion line			,00
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Contractor _ J. C. Compton				
Submitted by Dan Olson University	1 Code / _ <u>8U</u> <u></u>	Date reported	4/a/a/	
Source of Material MP 83, 2 MP 83, 4 MP 83, 6	7	- Place C		le All
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Sampled or inspected by <u>RFR Team</u>	Quantity repre			
<u>* Test Gradation: of Pavement grindings</u> <u>- P. 1" - 100 P. 38 - 74</u> P. 34"- 96 P. 4 - 53	P. #40 - P. #200-	1.6	<u>°/s Passii</u>	<u>ze / </u>
P. E- 85 P. #10-20		report 86.		
	<u>SHTO - T-246</u>		- 5.5 Pe	p-14)
% Water / % Emulsion <u>CMS-25</u> @ 67% Kesidne	4.0 1.0	4.0 2.0	4.0 3.0	4.0
1st Compaction @ 140°F (After 15-24 hrs. Cure in Bread Pan @ 140°F	1			
Hyeem stability 6 77°F (Cured @ 140°F 15-24 hrs.)	62	62	56	49
Hyeem stability @ 140°F	23	18	12	<u> 7</u>
Hveem stability @ 140°F after 2pd Comp. (Compacted after 3-4 hrs. @ 240°F)	33	4		
Bulk Specific Gravity - 1st Comp.	2.18	2,22	2.24	2,26
Bulk Specific Gravity - 2nd Comp.	2.19	2.24	2.25	2,28
Bulk Specific Gravity - 3rd Comp.	2.33	2.35	2.37	2.35
Percent Voids @ 3rd Comp.	4.2	2.4	1.0	11-
Rice Method Real Gravity	2.431	2.407	2.394	2.376
Asphalt Film Thickness	Dry-Suff.	Suff	Suff	Thick
Unconditioned Resilient Modulus (x 10 ³) -	536.6	573.3	589.5	585.2
Vac. Sat. Resilient Modulus (x 10 ³) -	312.9	380.3	384.1	479.0
Freeze-Thaw Resilient Modulus (x 10 ³) -	107.7	186.8	275,5	311.9
M _R Ratio 1 (Vac. Sat./Uncond.) -	58%	66%	65%	82%
MR Ratio 2 (Freeze-Thaw/Uncond.) -	20 %	33%	47%	53%
		Ilina dry	weight]	- 4.0 %
<u>Inverter and the second secon</u>	<u> </u>	······································	<i>,</i> , ,	-1.5%
E Mulsigh coricai	ECOMMENDATIO	N·		
 F.H.W.A. Construction Engineer Maintenance Engineer Bridge Engineer Region Engineer Project Manager Dist. Maintenance Supervisor 	Material as repres	ented by this sam		
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LABORATORY RECORD		Laborator	y No	•
HIGHWAY DIVISION — MATERIALS SECT	NOR		1 No. <u>A344</u>	402-
PRELIMINARY COLD RECYCLE MIX DE	STGN		10218	
- Region 4 Becycle - MP 79.2 - Was				000
hver Warm Sorings Unit A F	Desich #2-		Charge	· · · · · · · · · · · · · · · · · · ·
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	ASHTO - T-240	1		25)
Water / % Emulsion CMS-25 @67% Residuo	40	4.0 2.0	4.0 3.0	4.0 4.0
st Compaction @ 140°F After 15-24 brs, Cure in Bread Pan @ 140°F				
eem stability @ 77°F	60	36	21	16
ceem stability @ 140°F	15	4	1	1
veem stability @ 140°F after 2nd Comp. ompacted after 3-4 hrs. @ 240°F)	2.	1	0.7	0.5
lk Specific Gravity - 1st Comp.	2.41	2.45	2.47	2.49
lk Specific Gravity - 2nd Comp.	2.43	2.46	2.48	2.49
1k Specific Gravity - 3rd Comp.	2.45	2.47	2.49	2.51
ercent Voids @ 3rd Comp.	6.0	3.7	2.3	0.3
ce Method Real Gravity	2.606	2.565	2,548	2.518
sphalt Film Thickness	Dry	Suff	Suff	Suff-That
conditioned Resilient Modulus (x 103) -	527.7	480.6	391.9	321.8
.c. Sat. Resilient Modulus (x 10 ³) -	497.0	464.5	389.7	308.4
peze-Thaw Resilient Modulus (x 10 ³) -	195.5	244.7	261,2	201.1
Ratio 1 (Vac. Sat./Uncond.) -	94%	97%	99%	96%
Ratio 2 (Freeze-Thaw/Uncond.) -	37%	51%	67%	62%
commended water addition (Ba	sed on n	illing de	y weight) - 4.0%
Emploion content	11 11	<i>,,</i> 0 ,;	<i>,, v</i>	-1.5%
	ECOMMENDATIO		. , .	المترجم المحمد المحمد الم
H.W.A. Construction Engineer Maintenance Engineer ridge Engineer eroon Engineer	Material as represe ecifications. Vised Dessig			
roject Manager Dist. Maintenance Supervisor Materials, Portland faterials, Eugene iles			ă.	5.°

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HIGHWAY DIVISION MATERIALS SECT	ION		No. A3440	3
PRELIMINARY COLD RECYCLE MIX DE		E. A	10218	
Project Region 4 Recycle - MP 79,2 - Warco	Co. Line	Laboratory	charge \$ 510	<u> </u>
Highway Marm Springs Unit A Design	#3			
Contractor J.C. Compton		Date receiv	ed 4/10/86	,
Submitted by Dan Olson Ur			1/ Arran 6	
Source of Material MP 88.1, MP 89.2		Date samp	ed 4/8/86	
Sampled or inspected at Roadway			-	
Sampled or inspected by <u>R & R Team</u>	Quantity re	presented	,	
* Test Gradation: of Pavement grindings	calculated	1 to 100	% Passing	1"
P.1"- P.3"-		,# <i>40</i>	J	
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P.Ź"- P.#10-	* M;	lling report #	F86 - 4648	
Resistance to Deformation and Cohesion: AA	SHTO - T-24		17 - 17 - 17 - 17 - 17 - 17 - 17 - 17 -	
% Water 1 % Emulsion CMS-25 @67% Residu	4.0 1.0	4.0 2.0	4.0 3.0	4.0 4.0
lst Compaction @ 140°F (After 15-24 hrs. Cure in Bread Pan @ 140°F				
Hyeem stability @ 77°F (Cured @ 140°F 15-24 hrs.)	53	52	26	17
Hyeem stability $\begin{bmatrix} 140^{\circ}F\\ 140^{\circ}F \end{bmatrix}$	18	13	6	2
Hveem stability @ 140°F after 2nd Comp. (Compacted after 3-4 hrs. @ 240°F)	4	1	0.5	0,5
Bulk Specific Gravity - 1st Comp.	2.18	2.25	2,27	2.29
Bulk Specific Gravity - 2nd Comp.	2.22	2,28	2.30	2.32
Bulk Specific Gravity - 3rd Comp.	2.32	2,34	2.36	2.38
Percent Voids @ 3rd Comp.	6.1	4.4	2.4	1.1
Rice Method Real Gravity	2,471	2.447	2.417	2,407
Asphalt Film Thickness	Dry	Dry Suff	Dry-Suff	Dry-Saff
Unconditioned Resilient Modulus (x 103) -	427.5	468.9	457.7	440.8
Vac. Sat. Resilient Modulus (x 10 ³) -	220,5	354.8	378.8	371.8
Freeze-Thaw Resilient Modulus (x 10 ³) -	42.8	77.6	108.9	111.2
MR Ratio 1 (Vac. Sat./Uncond.) -	52%	76%	83%	84%
MR Ratio 2 (Freeze-Thaw/Uncond.) -	10.10	17%	24%	25%
Recommended water addition (Base	d on mill.	ing dry n	leight) -	4.0%
11 Employ content "	11 11	V	·/ <u>-</u>	2.0°/0
REPORT TO: RI	ECOMMENDATIO			
F.H.W.A. Construction Engineer	ecifications	sented by this sam		
Maintenance Engineer Based on 7-29-86 Re Bridge Engineer	vised Desi	gn Criteria	- 1.5%	=MS-25
Region Engineer Project Manager				
Dist. Maintenance Supervisor Materials, Portland				
Materials, Eugene				

de transmissione a series a s				
LABORATORY RECORD		Leboratory	No	
HIGHWAY DIVISION — MATERIALS SECT	ION		No. A-3440	
PRELIMINARY COLD RECYCLE MIX DE	SIGN		10218	
Project Region & Recycle - MP79. 2-Wasco				1000
Highway Werm Springs Unit A Desi				
T i i i	0	Date receiv	4/10/8	6
Submitted by Dan Olson Un			/ /	<u> </u>
Source of Material MP 95.2, MP 96.1				, , ,
Sampled or inspected at ROadway				
Sampled or inspected by <u>RER TEAM</u>				
* Test Gradation: of Pavement grindings	colculate	1 to 10001	Passing	1
	P. #40 - 6			
P.34"- 96 P.4"-58	P.#200-2			
P. 1/2"- B3 P. #10-24		report BE	6-4649	<u> </u>
		6 & 247 (A/		e_{n-7}
% Water / % Emulsion (MS-25 @67% Residual	4.0 10	4.0 2.0	4.0 3.0	4.0 4.0
1st Compaction @ 140°F (After 15-24 hrs. Cure in Bread Pan @ 140°F	1			
Hyeem stability 677°F (Cured (140°F 15-24 hrs.)	50	43	32	14
Hyeem stability (140°F Hyeem stability (5-24° brs.)	20	19	13	5
Hveem stability @ 140°F after 2pd Comp. (Compacted after 3-4 hrs, @ 240°F)	16	7	1	0.5
_Bulk Specific Gravity - 1st Comp.	2,19	2.25	2.27	2.31
Bulk Specific Gravity - 2nd Comp.	2.22	2.28	2.30	2.34
_Bulk Specific Gravity - 3rd Comp.	2.36	2.38	2,40	2.42
Percent Voids @ 3rd Comp.	6,6	4.7	3.0	1.1
Rice Method Real Gravity	2.526	2.496	2.473	2.447
Asphalt Film Thickness	Pry	Dry Suff	Suff	Suff
Unconditioned Resilient Modulus (x 103) -	362.0	433.4	544.8	423,4
Vac. Sat. Resilient Modulus (x 10 ³) -	177.0	352.4	465.5	362.7
Freeze-Thaw Resilient Modulus (x 10 ³) -	58.6	145.9	264,8	209.6
MR Ratio 1 (Vac. Sat./Uncond.) -	49%	81%	85%	86%
MR Ratio 2 (Freeze-Thaw/Uncond.) -	16 %	34%	49%	49%
Recommended water addition (Ba	sed on t	nilling d.	ry weigh	+) - 4.0%
Emulsion content	11 15	,, ` ,	í T,	-2.5%
REPORT TO: RE	COMMENDATIC			
Construction Engineer 50	Material as repres	ented by this sam	ple does, does not	t comply with
□ Maintenance Engineer Based on 7-29-86 Re. □ Bridge Engineer	vised Crite	ria - 2.0	% CMS-2	ک۔
Region Engineer Project Manager				
Dist. Maintenance Supervisor Materials, Portland				
Materials, Eugene Files				

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	13/2
ST OF AL	Zogz
ASFHALT LABORATORY RE	
MANNAY DEPARTMENT for Pavement Grindings for (ASPHULT BRUND and TYPE)	r Recycle (Millings) LABORATORY NO. 86 4646
PROJECT	DATA SHEET NO.
Region 4 Recycle Projects (Unit A)	A 34401
Various (Warm Springs)	Wasco C10218
J.C. Compton	FA PROJECT NO.
Dan Olsen	UNIT CODE NO.
SUBMITTED BY	8027 UNIT CODE NO. DATE RECEIVED DATE REPORTED
SOURCE OF MATERIAL	UKIT CODE NO. DATE RECEIVED DATE REPORTED
	LABORATORY CHURGES
SAMPLED OR INSPECTED AT Mix Design Area #1	TO BE USED SEE Page. One
SAMPLED OR INSPECTED BY DATE SAMPLED	Recycled Pavement
Randy Davis, D. Foster 4-8-86	
SAMPLE NO. TEST	RESULTS
PAVING ASPHALT	Liquid Asphalt
T 73 Flash point, closed cup *F	T 48 Flash point, open cup
T 44 Solubility in CHCL: CCL2 %	T201 Viscosity, Kinematic at 140 F C.S.
T 49 Penetration at 77F/39.2 cm/100 Penetration ratio 39.2/77 F	78 Distillation (% of total distillate to 680 F)
T201 Viscosity, Kinematic 275 F C.S.	To 374 F %
T202 Viscosity, Absolute 140 F	To 437 F%
T240 Paving Asphalt RTF (c) Residue	To 500 F %
47 Loss on heating %	To 600 F %
 1201 Viscosity, Kinematic 275 F C.S. 	Residue from distillation to 680 F Volume by difference
T202 Viscosity, Absolute 140 F, 30cm Hg., Vac.	Water %
T 49 Penetration at 77 5	
% of orig. penetration %	Liquid Asphelt Residue
T 51 Ductility at 77 F cm.	T 49 Penetration at 77 F cm/100
cm.	T 44 Solubility in CHCL:CCL2%
Emulaified Asphalt	T 51 Ductility at 77 F cm.
T 59 Viscosity, S.F. at F soc.	1202 Viscosity ABS. at 140 F P.
T 59 Slove test %	M180 Pipe Coating (Bituminous)
T 59 Residue by distillation to 500 F%	T 44 Solubility in CHCL:CCL2 %
T 59 Oil distillate in%	T 49 Penetration at 77 F cm/100
T 49 Penetration of Res. at 77 F cm/100 T 44 Solubility in CHCL:CCL2 %	T 47 Loss on heating at 325 F%
T E4 Durallia as THE	T 49 Penetration of Res. at 77 F % of orig.
cm.	
T170 Modified Abson Recovery of Asphalt	
T201 Viscosity, Kinematic 275 F GO7 C.S.	
T202 Viscosity, Absolute 140 F, 30 cm <u>25, 828</u> P. Hg. Vac.	
T 49 Penetration of Res. at 77 F 1 4 cm/100 "C" value	i Andre Frederick
FE-ORT TO:	informational only
	COMMENDATION: terial as represented by this sample does, does not comply with specifications.
MAINTENANCE ENGINEER DISTRICT SUPERVISOR PAVING QUALITY COORDINATOR FILE	

2						ŀ	4/20
SAN	IPLE DATA and L		TODY T			1 0	32
	AGGREGATE				DATA SHEET NO.	86 40	546
PROJECT: Parton / D.					A 34401		
PROJECT: Region 4 Re	cycle Projects (Unit	A)		EXP. ACCT/S48 30		
HIGHWAY: Various (War	m Springs)	C	COUNTY:Va	rious(Was	sco) C10218	4-10	2-86
CONTRACTOR: J.C. COM					F.A. PROJECT NO.	DATE REI	
PROJECT MANAGER: Dan O		4	GY-ORG, U	NIT 8027		5-16	
SUBMITTED ay: Dan Ols	en	A	GY. ORG.U		BID ITEM NO.	LABCHA	RGES
SAMPLE NO. NO. OF BOXES	QUANTITY REPRE	OFLITER I		0001	12 FIELD CONTROL	# 31	200
1 1	(YARDS, TONS, ET	.C.)		IGN 🔲 RECO		SIEVE	PERCEN
NO. OF BAGS	6	11			(TM 204 TM 2	SIZE	PASSING
AGGREGATE SIZE:	BRAND & GRADE ASPHALT:	TYPE MIX:		SIGN NO.	10/14 9		
Pavement Grinding		Recycl	.e		40/10 %		
	SOURCE NO.			OUARRY	200/10 *		
Recycle Pavement SOURCE NAME OR LOCATION:				GRAVEL	FRACTURE *		
COURCE NAME OF EDUCATION:		SAMPLED	AT:		PI		
		DATE SAN	APLED.	Area #1			
REMARKS, INSTRUCTIONS:		1	4-8-	-86	S.E.		
					MOISTURE *		
					RETENTION *		
					EXTRACTED A/C %		
CHECK "BOY" FOR TECT DE					TOTAL A/C %		
CHECK "BOX" FOR TEST RE		DATA SHEE	TFOREAC	H SAMPLE. LI	IST ADDITIONAL PROJEC	S SEPARATE	ELY.
K TM 204 DRY SIEV		S.E.			TM 209 A	PHALT STR	PRINC
TM 205 WET SIEV						1	r r insa
3 1 TM 309 8 EXTRAC	C TM 103	P.1.			BRAND&		
SIEVE PERCENT PERCEN	TT TM 201	UNIT WI	EIGHT		COATED		%
SIZE PASSING PASSIN	G LOOSE		1		L TM 211 A	RASION	
ALRIL AVC.		THIS LAB N		%	GRADING	WEAR	%
Z 100 °F	OF LAB NO.		MBINED		TM 212 ORGA	NC PLATE NO.	
11/2 95 3 ext.	TM 202				TM 213 FF	ACTURE	<u>%</u>
1 89	L IM 202	FINE BU	LK GRAVIT	Y	TM 221 FF	ABLE PARTI	CLES
3/4 85 100	BULK		SSD		WEIGHTED	AVG	%
YU 76 94	APP.	L	ABS.		11/2-34	% 44-46	%
3/8 66 85	TM 203	COARSE	BULKGR		+6-4	% 4-16	%
14 47 70	BULK	(90)	sso		TM 222 LK	HTWEIGHT	
4 37 60	APP.		ABS.				
10 18 37	TM 206		SULFATEI		C.A. L	🏂 F.A.	<u>*</u>
40 5 20		line)	1	LUSS	TM 225 WOOI		<u> </u>
200 14 8.1	25/217		112-14	%	TM 227 CLEA		
	4	PAVERAG		%	TM 228 DMSC		
TM 205 P200	C.A. 11/2-14		¥-16	%	11/2-34	× +++	%
0/14 % 200/10 %	36.4		i i	C.A		26 1	~~~
0/10 %	F.A. 4-8		8-16	% F.A	4-8	2 4-16	<u>%</u>
NENESS FACTOR	16-30	<u> </u>	30-50	%	16-30 L	26 30-50	<u>%</u>
14. 4. 4. 8. 16. 30. 50. 100	TM 208A	COARSE	DEGRADE		TM 229 ELONGA	TED PIECES	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
OISTURE 1.29 %	ANOF HT.	IN F	20		14 A		<u>dine</u>
TRACTEDA/C 5.5%	BEFHT	IN F	20	10	BITA 314B		
TENTION 😽	TM 208B	FINE DEG	PADE				
TAL ASPHALT %	нт.						
ES	nı. <u> </u>	<u>IN</u> F	-20 [_%		HANTHAR	'а _{'Н}
₩A	MATERIAL RE	PRESENTE	DBYTHISS		S. DOES NOT COMPLY WIT	(12)01	
	LAB COMM	ENTS In	forma	tichal	Only		
STRUCTION ENG.		_			/		
DJECT MANAGER Dan 01s	on			Construction of the			
TRICT ENG.	011				1 . 0 .		
GION GEOLOGIST RJ Van				ζ	tack L. Ol.	van	
VTRACTOR JC Compton				-1	ENGINEER OF MATERIALS		
INSTRUCTION: FORW.	ARD WHITE ORIGINAL TO MATERIAL	S LABORATO	RY SALEM, CA	NARY TO PROJEC	T MANAGER, ORIGINATOR RETA		

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Distance Distance Distance PROJECT. Region 4 Recycle Projects (Unit A) R** accr254 37 av Autoca Country Construction J.C. Comption Contractor Country Various (Various (Various (Various Various (Various Various (Various Various (Various Various (Various Various Various (Various Various Various (Various Various Various (Various Various		SAMPLE DA	TA and LA	BORAT	ORY TE	ST REPO	DRT LABORATORY REPORT NO.	86 46	<u>47</u>
Processon COUNTY Various (Warschool Free Decision Contractor) COUNTY Various (Warschool Contractor) COUNTY Various (Warschool Contractor) PROJECT MUNADER: Dan Olson Acroac warr 8027 BOITEM NO. Scalada SUMUTTED \$r: Dan Olson Acroac warr 8027 BOITEM NO. Scalada SUMUTTED \$r: Dan Olson Acroac warr 8027 12 372.2 SUMUTTED \$r: Dan Olson Contractor) BoitEM NO. Scalada Moore Buds Boitem NO. Boitem NO. Scalada Moore Buds Boitem NO. Boitem NO. Scalada Acconce ware Solada Boitem NO. Boitem NO. Scalada Acconce ware solada Boitem NO. Boitem NO. Scalada Acconce ware solada Boitem NO. Boitem NO. Boitem NO. Acconce ware solada Boitem NO. Boitem NO. Boitem NO. Acconce ware solada Boitem NO. Boitem NO. Boitem NO. Acconce ware solada Boitem NO. Boitem NO. Boitem NO. Boitem NO. Boitem NO. Boitem NO. Boitem NO. Boitem NO. <td>HOMMAY DAVISON</td> <td></td> <td>GGREGATE</td> <td>🗌 вітимі</td> <td>NOUS MIXT</td> <td>URE</td> <td>a construction of the party in a construct</td> <td></td> <td></td>	HOMMAY DAVISON		GGREGATE	🗌 вітимі	NOUS MIXT	URE	a construction of the party in a construct		
INCLEMENT, Various (Vasco) COURTE Various (Vasco) COURS (Courter Courts of the courts	PROJECT: Region	4 Recycle P	rojects (Unit	A)			DATE REC	ENED
CONTRACTOR: J.C. Compton Contractor F.A. PROJECTION. Difference PROJECT MUNICER, Dan Oleen ACP.ORG.MART 8027 BUTTEND, LA GUANADE SUBMITED, Dan Oleen ACP.ORG.MART 8027 12 372.9 Magreen Stratting Data Stratting Stratten Stratting Stratten Stratting Stratten Stratten Stratting Stratten Stratten Stratting Stratten S						OUR (WAR	-01		
PROJECT MUNAGER Dan Olson JChrore Jum 8027 BIDITEM NO. JC21_AG SUBJITED \$Y: Dan Olson JCP. OR. LAWER 8027 12 372_2 SUBJITED \$Y: Dan Olson JCP. OR. LAWER 8027 12 372_2 SUBJITED \$Y: Dan Olson JCP. OR. LAWER 8027 12 372_2 SUBJITED \$Y: Dan Olson JCP. OR. LAWER 8027 12 372_2 SUBJITED \$Y: Dan Deson JCP. OR. LAWER 8027 12 372_2 SUBJITED \$Y: Dan Deson JCP. OR. LAWER 8027 12 372_2 Addread State Dan Deson JCP. OR. LAWER 8027 10 10 10 Addread State Dan Deson TM 204 TM 204 TM 204 TM 204 TM 204 17 Sounce MARE ON LOCATION: SAMPLED AI: PI ILL ILL ILL ICP. CARL 10 No. Sounce MARE ON LOCATION: SAMPLED AI: PI ILL ICP. CARL 10 No. ICP. CARL 10 No. ICP. CARL 10 ICP. CARL 10 ICP. CARL 10 ICP. CARL 10							F.A. PROJECT NO.	DATE REP	ORTED
SUBMITTED ÅY: Den Oleen Acr. GR4.Lawr BOZT 12 37.2	and the second se			40	Y-OKE WAR	r 8027	-		
SAMPLE NO. NO. OF BOXES OWANTITY REPRESENTED AUGULARYING RECORD FIELD CONTROL SIEVE PP AGGREARTESTE BANADA GRADE ASPHALT: TYPE WARK MUDDESIGN NO. TM 204 TM 205 SIEVE PP AGGREARTESTE BRANDA GRADE ASPHALT: TYPE WARK MUDDESIGN NO. TM 204 TM 205 SIEVE PP Parvement Grindings SOURCE NO. OULARYING CHARCK MUDDESIGN NO. TM 201 TM 205 SIEVE PP SOURCE NO. GRAVEL PP GRAVEL FRACTURE % PP SOURCE NO. GRAVEL CALL PP PP PP PP SOURCE NO. GRAVEL FRACTURE SOURCE NO. GRAVEL PP PP SOURCE NO. GRAVEL SAMPLED AT: FREMANS, NOT NO. FRACTURE % PP PP SOURCE NAME GRUEAR TO REST RECOURDED: TM 101 S.E. DATE SAMPLED AT: TM 201 MONT NEIGHT FRACTURE % PA SUEVE PRECENT PERCENT TM 101 S.E. TM 201 MONT NEIGHT GRADING GRADING WARATERINEND GRA									
Image: Construction of the constrele of the construction of the construction of the								312	·
ADDREATE SIZE DRAND & GRADE ASPIALT: TYPE MIX: Recycle MIX DESKIN NO. 40/10 D/A Pavement Grindings SOURCE NO. Recycle OUARRY [] GUARAY [] GUARAY [] GUARAY [] MIX DESKIN NO. GRAVEL FRACTURE % IIII NETROPCOUSE SAMPLED AT: DATE SAMPLED AT: IDATE SAMPLED AT:	NO.C				MIX DESIGI		TEST NO.		PERCE
Parement Grindings Bounce No. Guanny [] 200/10 % MITENDEUUSE. BOUNCE NO. GUANNY [] 200/10 % SOURCE NAME ON LOCATON: SAMPLED AT: PI			ADE ASPHALT:					2.14	
INTERVEDUSE SOURCE NO. OURAIN GRAVEL 200/10 % Recycle Pavebent OURAIN GRAVEL 200/10 % FRACTURE % SOURCE NAME ON LOCATION: PI PI PI It is Design Area #2 DATE SAMPLED, It is Design Area #2 PI PI It is Design Area #2 DATE SAMPLED, It is Design Area #2 MOISTURE % PI It is Design Area #2 DATE SAMPLED, It is Design Area #2 MOISTURE % PI It is Design Area #2 DATE SAMPLED, It is Design Area #2 MOISTURE % PI It is Design Area #2 DATE SAMPLED, It is Design Area #2 MOISTURE % PI It is Design Area #2 DATE SAMPLED, It is Design Area #2 MOISTURE % PI It is Design Area #2 It is Design Area #2 MOISTURE % PI It is Design Area #2 It is Design Area #2 MOISTURE % PI It is Design Area #2 It is Design Area #2 It is Design Area #2 PI It is Design Area #2 It is Design Area #2 It is Design Area #2 PI It is Desis MAREAR PASSING PASSING <t< td=""><td>(</td><td></td><td></td><td></td><td>[14] 2010/08/08/26/2018</td><td></td><td>the same water and the same state of the same st</td><td></td><td>1</td></t<>	([14] 2010/08/08/26/2018		the same water and the same state of the same st		1
Recycle Parement GRAVEL FRACTURE * SOURCE NAME OR LOCATION: SAMPLED AT: PI PI Mix Design Area #2 DATE SAMPLED AT: PI PI Mix Design Area #2 DATE SAMPLED AT: PI PI Mix Design Area #2 DATE SAMPLED AT: PI PI Mix Design Area #2 DATE SAMPLED AT: PI PI Mix Design Area #2 DATE SAMPLED AT: PI PI CHECK "BOK" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE, LIST ADOTIONAL PROJECTS SEPARATELY TOTAL A/C % CHECK "BOK" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE, LIST ADOTIONAL PROJECTS SEPARATELY BRANDA GRADE COATED SIEVE PASING PASSING		<u>q</u>	SOURCE NO.			WARRY D			
Source Name on Location: Sample Dat: PI Mix Design Area #2 Date SampleDation: LL Mix Design Area #2 Moisture % REMARKS. INSTRUCTIONS: Retention % Retention % Extracted Area CHECK "BOX" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE. UST ADDITIONAL PROJECTS SEPARATELY CHECK "BOX" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE. UST ADDITIONAL PROJECTS SEPARATELY CHECK "BOX" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE. UST ADDITIONAL PROJECTS SEPARATELY CHECK "BOX" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE. UST ADDITIONAL PROJECTS SEPARATELY CHECK "BOX" FOR TEST REQUIRED: USE SEPARATE DATA SHEET FOR EACH SAMPLE. UST ADDITIONAL PROJECTS SEPARATELY Steve Prescher Prescent TM 101 S.E. Steve PARCENT PRECENT COMBINE COMPACT Steve PARCENT PRECENT COMENT Steve PARCENT PRECENT VI 0.0 OF LAB NO. COMBINED TM 212 ORGANCE PATENCI VI 0.5 9.7 APP. ABS. VI 0.5 9.7 APP. ABS. VI 0.5 9.7 APP. ABS. VI 0.5 9.7	Recycle Pav	ement			0	BRAVEL			
REWARKS, INSTRUCTION RS: MOISTURE MOIST				SAMPLED	λT:		PI		
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REWARKS, INSTRUCTION RS: MOISTURE MOIST	Mix Design	Area #2		DATESAN	4-9-8	6	S.E.		
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SIZE PASSING LOOSE COMPACT GRADING WEAR 7 100 OF STHIS LAB NO. WITH TM 212 ORGANIC PLATE NO. 14 90 OF LAB NO. COMBINE TM 202 FINE BULK GRAVITY TM 221 ORGANIC PLATE NO. 14 96 100 TM 202 FINE BULK GRAVITY TM 221 FRIABLE PARTICLI 14 96 7.7 97 APP. ABS. 114-34 54-16 14 92 TM 203 COARSE BULK GRAVITY WEIGHTED ANG. 114-34 54-16 14 53 81 TM 203 COARSE BULK GRAVITY 14-4 54-16 14 53 820 TM 203 COARSE BULK GRAVITY 14-4 54-16 14 53 820 TM 203 COARSE BULK GRAVITY 14-4 54-16 10/4 53 820 TM 203 COARSE BULK GRAVITY 14-4 54-16 10/4 53 24 TM 206 SOONUM SULFATE LOSS TM 227 CLEANNESC V TM 227 CLEANNESC V 10/4 54 50 TM 228 SOONOWASTE	SIEVE PERCENT	PERCENT	TM 201	UNIT W	EIGHT		TM 211 AB	RASION	
7 700 COMBINE St THIS LAB NO. WITH ITM 212 ORGANIC PLATE NO. 11 90 OF LAB NO. COMBINED ITM 212 ORGANIC PLATE NO. 14 96 700 ITM 202 FINE BULK GRAVITY ITM 221 FRIABLE PARTICLI 14 96 77 97 ABS. Itm 203 COARSE BULK GRAVITY Itm 221 FRIABLE PARTICLI 14 97 97 APP. ABS. Itm 203 COARSE BULK GRAVITY 4 42 72 BULK SSO Itm 203 COARSE BULK GRAVITY 4 42 72 BULK SSO Itm 203 COARSE BULK GRAVITY 4 42 72 BULK SSO Itm 203 COARSE BULK GRAVITY 4 42 72 BULK SSO Itm 202 Itm 203 CA St 4-16 40 5 24 Itm 206 SOOHUM SULFATE LOSS Itm 227 Itm 228 WOODWASTE 201 13.3 GA St 4-16 St 4-16 St 4-16 0110 S GA St 4-16 St 4-16 St 4-16 St 4	SIZE PASSING	B + B B + + + + B	E	_ COMPA	CT L		GRADING	WFA	RI :
I I Image: Comparison of LAB NO. COMBINED Image: Thm 213 FRACTURE Image: Comparison of LAB NO.		COME	BINE 4	THIS LAB N	0. WITH	<u>%</u>			
1/2 1		OF LA	.B NO.	co	MBINED L				
74 76 7000 74 720 7000 74 720 7200 74 720 7200 74 720 7200 74 720 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 74 7200 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 7240 7200 75 72			TM 202	FINE BL	LX GRAVIT		Contraction in the second s		ICLES
10 43.5 97 10			BULK		550	1-		AVG	
1/4 5.3 9/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.3 8/ 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.5 1.5 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4 1/4 5.4 5.4					1		· · · · · · · · · · · · · · · · · · ·		
17 3.3 2/ Im 203 COARSE BORNOM SUBJECT IN THE SAMPLE Im 222 LIGHTWERGHT PIEL 10 18 76 78 74 72 Im 203 COARSE BORNOM SUBJECT IN THE SAMPLE Im 222 LIGHTWERGHT PIEL 10 18 76 13.3 Im 205 SOOLUM SUBJECT IN SUBJECT IN 222 LIGHTWERGHT PIEL 10/4 13.3 Im 205 200 Im 205 CA 36 FA 10/4 3.3 Im 205 P200 Im 205 Im 205 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td>1477</td> <td></td> <td></td> <td></td>						1477			
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40 5 24 700 13.3 Im 206 SOONUM SULFATE LOSS 214-114 5 114-34 5 214-114 5 114-34 5 1074 5 200/10 5 114-34 5 1074 5 200/10 5 114-34 5 114-34 5 1074 5 200/10 5 114-34 5 114-34 5 114-34 5 1074 5 200/10 5 14-4 5 114-34 5 </td <td>the second s</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td> TM 222 LIG</td> <td>1</td> <td>PIECES</td>	the second s						TM 222 LIG	1	PIECES
200 1.6 13.3		the second s	APP.	L	ABS. [C.A. L	<u>%</u> F.A.	
214-114 114-34	the second se		TM 206	SODIUN	I SULFATE L	.oss			
TM 205 P200 CA. 11/2-14 5 14/2-14 5 10/14 5 200/10 5 11/2-14 5 14/2-14 5 10/14 5 200/10 5 14/2-14 5 14/2-14 5 10/14 5 200/10 5 14/2-14 5 14/2-14 5 10/14 5 200/10 5 14/2-14 5 14/2-14 5 10/14 5 200/10 5 16-30 5 2 16-30 5 3 16-30 5 3 16-30 5 30-50 5 16-30 5 30-50 5 16-30 5 30-50 5 16-30 5 30-50 5 16-30 5 30-50 5 16-30 5 30-50 5 17 17 229 10-14 17 17 229 10-14 16-30 5 16-30 5 16-30 5 16-30 5 16-30 5 16-30 5 16-30 5 16-30 5 <	600 1.6	13.3	24-14	s <u>%</u>	9434	×	TM 227 CLEA	NNESS CV I	
TM 205 P200 C.A. H44 H						×	TH 228 DMSC	· .	r
10/4 x 200/10 x 4.4 x 8-16 x 4.8 x 4.16 40/10 x 16-30 x 30-50 x 16-30 x 30-50 TINENESS FACTOR			112-26	*	24-76	*	11/2-14	% 44-16	
40/10 % F.A. 16-30 % 30-50 % FINENESS FACTOR	TM 205 P200	C.A. L		×.		C.	A 34_4	* .	
Internation	10/14 200/	10 3	4-8	×	8-16	- 1/2 -	4-8	% 4-16	
11/4, 4, 4, 8, 16, 30, 50, 100 MOISTURE 0. 64 % EXTRACTED A/C 5. 0 % REF HT. IN P20 MOISTURE 0. 64 % EXTRACTED A/C 5. 0 % REF HT. IN P20 MOISTURE % ITM 208B FINE DEGRADE ITM 208B FINE DEGRADE ITM 208B FINE DEGRADE IN P20 % NOTED NOTED NOTED NOTED IN P20 % NOTED %	40/10 %	F.A. L	16-30	- *	30-50	% F./	16-30 L		
114, 4, 4, 8, 16, 30, 50, 100 HT. IN P20 MOISTURE 0.64 % EXTRACTED A/C 5.8 % REF HT. IN P20 % RETENTION % ITM 2088 FINE DEGRADE MOTED IN P20 % NOTED NOTED IN A SPHALT 5.8 % MATERIAL REPRESENTED BY THIS SAMPLE DOES NOT COMPLETINGATIONAL ABCOMMENTS SL ONSTRUCTION ENG. MATERIAL REPRESENTED BY THIS SAMPLE DOES NOT COMPLETINGATIONAL ABCOMMENTS MOJECT MANAGER Dan 01 son A A				COARSE				TED PIECES	
REF HT. IN P20 5.0 × REF HT. IN P20 5.0 × REF HT. IN P20 5 HT. IN P20 5 NOTED NOT			1		1	-	THI SPEAK		
Internation * Image: Second	Y		~				TEST THE AR		
INDEES HT. IN P20 MOTED HWA MATERIAL REPRESENTED BY THIS SAMPLE DOGES. DOGES NOT COMPLETIMENTICATION NOTED SL ONSTRUCTION ENG. LAB COMMENTS LAB COMMENTS EGIONIENCE 4 RAS ROJECT MANAGER Dan 01 son									
ILES NOTED HWA MATERIAL REPRESENTED BY THIS SAMPLE DOES, DOES NOT COMPLEMENTATION SL LAB COMMENTS ONSTRUCTION ENG. EGIONIZINGE 4 RAS ROJECT MANAGER Dan 01 son	services of the service of the services		TM 208B						
HWA SL CONSTRUCTION ENG. EGIONIZENCE 4 RAS ROJECT MANAGER Dan 01 son		-8*	нт. Ц	IN	P20	- 26		~~	
SL DAB COMMENTS		L	1				NOT	ADISCON	ATKONS
EGIONENGE 4 RAS ROJECT MANAGER Dan Olson					ED BY THIS S		ES, LIDUES NUT COMPLETING	IT PERMIT	
EGIONENCE 4 RAS ROJECT MANAGER Dan Olson			LAD COMM						
HISTRICT ENG.		Dan Olson				-1-	1 1 00		
		D-L 110-01				Jac	to Siellevan		
EGION GEOLOGIST RI-VanCleave						1-	ENGINEER OF MATERIALS		
WILSON, G. BOYLE, G. HICKS			ks		mevelinin		ICOT MANAGER ORIGINATOR OF		

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ASPHALT LABO	RATORY REC	ORD		U	
HOHWAY DEPARTMENT for Pavement G	LABORATORY NO. 86 4647				
PROJECT Region 4 Recycle Projects (Uni		• 1	олта бнеет но. А 34402		
Warious (Warm Springs)		COUNTY	EA NO.		
CONTRACTOR		Wasco	C10218	<u>*1</u>	
J.C. Compton					
REDUCT MANAGER		UNIT CODE NO.	1	17. 19 M W	
Dan Olsen SUBMITTED BY		8027 UNIT CODE NO.	DATE RECEIVED	DATE REPORTED	
5 TT TT		tt	4-10-86		
BOURCE OF MATERIAL	•		LABORATORY CHARGES		
BAMPLED OR INSPECTED AT		TO BE USED	see page /	4 (4) b	
Mix Design Area #2		Recycled P	avement	1993 - S	
Randy Davis, D. Foster	te sampled 4-8-86		QUANTITY REPRESENTED	9 X - 7	
SAMPLE NO.	TEST RI	RSULTS			
PAVING ASPHALT	12		Liquid Asphelt		
T 73 Flash point, closed cup	•F	Y 48 Flash point, op	en cup	•F	
T 44 Solubility in CHCL: CCL2	%	T201 Viscosity, Kine	matic at 140 F	C.S.	
T 49 Penetration at 77F/39.2 Fenetration ratio 39.2/77 F	cm/100	7 73 Distillation (% o	of total distillate to 680 F)		
	C.S.	To 374 F		%	
T202 Viscosity, Absolute 140 F		To 437 F		%	
	P.	To 500 F		%	
renng repharter (c) ricerdop		To 600 F		%	
T 47 Loss on heating	%	Residue from d	listillation to		
	C.S.	680 F Volum	e by difference	%	
F202 Viscosity, Absolute 140 F, 30cm Hg., Vac.	P.	Water	<u></u>	%	
49 Penetration at 77 F % of orig. penetration	cm/100		Liquid Asphalt Residue		
51 Ductility at 77 F	~~ ~ ~ /	T 49 Penetration at 7	7F	cm/10	
Ductility at 45 F	cm.	T 44 Solubility in CH	CL:CCL2	%	
		T 51 Ductility at 77 F	1	cm.	
Emulsified Aspheit		1202 Viscosity ABS.		P.	
59 Viscosity, S.F. at F	\$ 0 C.				
59 Sieve test	*	M190	Pipe Coating (Bituminous	4	
59 Residue by distillation to 500 F	*	T 44 Solubility In CH		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
59 Oli distillate in	*	T 49 Penetration at 7		cm/10	
49 Penetration of Res. at 77 F	cm/100	T 47 Loss on heating		%	
44 Solubility in CHCL:CCL2	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		les. at 77 F		
51 Ductility at 77 F	cm.		103. dl // t	×0.0	
170 Modified Abson Recovery of Asphalt	t			•	
201 Viscosity, Kinematic 275 F736	C.S.				
202 Viscosity, Absolute 140 F, 30 cm 11, 419 Hg. Vac.	P.				
49 Penetration of Res. at 77 F 2.5	cm/100				
PORT TO:	Ag	COMMENDATION:			
F.H.W.A. C REGION ENGINEER	Ma	nerial as represented by this sar	nple does, does not comply with sp	ecifications.	

						٦	7/20
					3 8 .	1 0	75 Z
SAM	PLE DATA and L	ABORATOR	Y TEST R	REPOR	T LABORATORY REPORT NO.	86 46	48
26	AGGREGATE		SMIXTURE		DATA SHEET NO.		
PROJECT: Region 4 Res	cvole Projecte	(11:41)			A34403 EXP. ACCT/SHB :	DATE RE	CEN/ED
HIGHWAY: Various (War	Springe)	(Unit A)	Y:Various(C10218		0-86
CONTRACTOR: J.C. Com	ton Contractor	00000	agi.iong(asco	F.A. PROJECT NO.	DATERE	
PROJECT MANAGER: Dan O	lsen	AGY-0	RE. WAIT 80	27		5-21	-86
SUBMITTED AY: Dan Olse	n	ACY-0	REMAIT 80		BID ITEM NO.	LAB CHAL	AGES
SAMPLE NO. NO. OF BOXES	OUANTITY REPRE			_			2-
NO. OF BAGS	(YARDS, TONS, ET			HECK		SIEVE	PERCE
AGGREGATE SIZE:	BRAND & GRADE ASPHALT:		IX DESIGN NO.	AICON	10/%	*	
Pavement Grindings		Recycle			40/10	*	1
Recycle Pavement	SOURCE NO.		QUARRY		200/10	*	
SOURCE NAME OR LOCATION:		SAMPLED AT:	GRAVEL		FRACTURE	*	
					<u>P1</u> LL · · · ·		
Mix Design Area #	3	DATE SAMPLED	+-8-86	-	S.E.		
REMARKS, INSTRUCTIONS:				-	MOISTURE	%	
		40-		NOTE	RETENTION	*	
		A. D. SHAR			TOTAL A/C	*	
CHECK "BOX" FOR TEST RE	OUIRED: USE SEPARATE	DATA SHEET FOR	REACH SAMP	LE. LIST	ADDITIONAL PROJE	CTS SEPARAT	ELY.
3.2 TM 3095 EXTRAC SIEVE PERCENT PERCENT PASSING PASSING AJ Arc. Arc.q.J 11/2 100 contraction 1 9.8 4 3/4 9.6 100 Y2 8.9 9.6 3/4 9.6 2.00 10 3.4 4.6 4 6.2 7.0 10 3.4 4.6 40 8 2.4 200 0.3 10.4 TM 205 P200	T TM 201 LOOSE COMBINE OF LAB NO TM 202 BULK APP. TM 203 BULK APP. TM 206 2½-11 RIP R 4-8 16-30 TM 208A HT TM 208A	COARSE BUL COARSE BUL SSD ABS BOOIUM SUL AP AVERAGE		 C.A. [F.A. [COAT TM 211 GRADINO TM 212 ORO TM 212 ORO TM 213 TM 221 ; WEIGHT 1½-34 1½-34 TM 222 C.A TM 225 WO	ABRASION GLWEAF GANIC PLATE NO. FRACTURE FRIABLE PART ED AVG 	icles
ETENTION - % DTALASPHALT 6,3 %	Тм 2088 нт	FINE DEGRAD	E%				
ES WA	MATERIAL R LAB COMM	EPRESENTED BY	THIS SAMPLE C] DOES, [DOES NOT COMPLY	WITH SPECIFICA	TIONS.
L NSTRUCTION FUG	1						
L NSTRUCTION ENG. GION RENCK 4 RAS							
NSTRUCTION ENG. GION RNOX 4 RAS DJECT MANAGER Dan 01sc	on		0	00	0 111		
NSTRUCTION ENG. GION RENCK 4 RAS	leave		A	ach	Sellur	21	

18/20 Zog Z

Emulsified Asphalt 7 59 Viscosity, S.F. at F		T 51 Ductility at 77 T202 Viscosity ABS							
T 51 Ductility at 77 F Ductility at 45 F	cm.	T 44 Solublility in C	HCL:CCL2	%					
% of orig. penetration	cm/100	T 49 Penetration a	Liquid Asphalt Res	idue cm/	/100				
T202 Viscosity, Absolute 140 F, 30cm Hg., Vac.	P.	Water	-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
-	C.S.	Residue from 680 F Volu	distillation to me by difference	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
	%	To 600 F	/	%					
T202 Viscosity, Absolute 140 F T240 Paving Asphalt RTF (c) Resi	P.	To 500 F	7. 3	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
·	C.S.	To 437 F		%					
Penetration ratio 39.2/77 F		To 374 F		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
	~~ cm/100		of total distillate to 680	C.S	j.				
	•F	T 48 Flash point, o	60.625 (10000)	•F					
PAVING ASPHALT	el.		Liquid Asphat						
SAMPLE NO.	TEST RE	ESULTS							
SAMPLED OR INSPECTED BY Randy Davis, D. Foster	DATE SAMPLED 4-8-86	Recycieu	Recycled Pavement						
SAMPLED OR INSPECTED AT Mix Design Area #3		TO BE USED							
BOURCE OF MATERIAL			LABORATORY CHARGES	nhp					
SUGMITTED BY		UNIT CODE NO.	DATE RECEIVED	DATE REPORTED					
Dan Olsen		UNIT CODE NO. 8027		÷ 1					
J.C. Compton		i.	Wasco C10218 F.A. PROJECT NO.						
Various (Warm Springs)		Wasco							
Region 4 Recycle Projects (1	COUNTY	EA NO.							
PROJECT	олта внеет но. А 34403								
HOHWAY DEPARTMENT FOR DEPARTMENT FOR	LABORATORY NO. 86 4648								

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ENGINEER OF MATERIALS

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	r								1	ofZ	~
SAN SAN	PLE DATA	and L	ABORA	TORY	TEST	REPO	RT LABO	RATORY		0	
HOUMAN DANSION	AGGR						REPC	SHEET N	.(<u>86 46</u>	49
·		EGATE		JMINOUS	MIXTURE			A 3440			
PROJECT: Region 4 Re	cycle Proj	ects	(Uni	+ A)		EXP. ACC	T/540	Jed	DATEREC	ENED
HIGHWAY: Various (War	m Springs)				Variou	(Wasc	J C102	218		4-10	500 A A A A A A A A A A A A A A A A A A
CONTRACTOR: J.C. COM	pton Contra	actor					FA PROJE	CT NO.		DATEREP	ORTED
PROJECT MANAGER: Dan C				AGY-ORG	.UMT (3027	BIDITEMN			5-21-8	
SUBMITTED SY: Dan Ols	en			ACY-ORE	MANIT &	3027	And a second second	12		4 37.	200
NO. OF BOXES		TITY REPRE			eskan [RECORD	and a second second				
NO. OF BAGS	5						TH 20	н Пт	M 205	SIEVE	PERCEN
AGGREGATE SIZE: Pavement Grinding	BRAND & GRADE A	SPHALT:	TO'PE MD		DESKIN NO	D .	10/14		*		
WTENDED USE:		0000500	Recyc	le			40/10		%		
Recycle Pavement	5	OURCE NO.			GRAVE		200/10		%		
SOURCE NAME OR LOCATION:			SAMPLI	ED AT:	GRAVI		FRACTUR	E	*		
Min Dad A //	ı.		DATES								
Mix Design Area #	+		DATES	MPLED:	8-86		S.E.				
							MOISTUR	E	%		
	a and a second secon						RETENTIC		%		
						}	EXTRACT		*		
CHECK "BOX" FOR TEST RE	OURED: USE SI	EPARATEC	ATA SHE	ETFORE	ACH SAM	PLE LIST	TOTAL A/C	AL PROI	%	EPADATE	
TH 204 DRY SIEV	1] TM 101	1			1					
TH 205 WET SIEV		TM 102	S.E.					4 209		ALT STRIP	PING
TH SOS EXTRAC		TM 103	P.L					BRAND			
SIEVE PERCENT PERCEN	īī [TM 201	UNE	¥EIGHT			<u> </u>	COA		L	<u>%</u>
SIZE PASSING PASSIN	LOOSE		_ COMP				() TK		ABRA		ll com
21/2 100 minuti	_ COMBINEL		'HIS LAB	NO. WITH	~			GRADIN		WEAR	<u>%</u>
2 97 J			C	OMBINED	[1212 08	FRAC	PLATE NO.	*
11/2 96	┥□	TM 202	FINEB	ULK GRA	/ITY					LEPARTK	
195]	BULK					:	WEIGHT			%
] _	APP.	L	_ ABS. L				15-14	*	34-36 L	%
11 79 98 3/8 69 90		TM 203	COARS	SE BULK (TIVAR			36-4 L	*	4-16	*
318 69 90 14 55 77	-	BULK		_ssd _	·		ТМ	222	LIGHT	WEIGHT PI	ECES
4 46 67	1 _	APP.	L	ABS. L				CAL	~	FA	*
10 23 43	╡────□	TM 206	SOCHU	W SULFAT	ë loss		Тм	225 W	000w	ASTE	~
40 6 20]	212-112		113-34	%			227 CL		ESS CV]
200 1.9 10.1	4 .		PAVERA	Г	X			228 DA	ASO		
TM 205 P200		112-34		1 34-36 L	%	CAL	•	113-14	%	**	
0/14 200/10 %	FA	4-8		8-16 L	*	1		4-8	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	4-16	~
NENESS FACTOR		16-30		30-50 L	%	F.A. L	*	16-30	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	30-50	<u>%</u>
5. 4. 4. 8, 16, 30, 50, 100	D·	TH 208A		EDEGRA	E			229 ELO	HGATED	Card and a start of the start o	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
OISTURE 0.64 %		HT.		P20	*		TM.	3141	4'		<u></u>
TRACTED A/C 53 % A	10.953 R	EF HT.		P20	~		3 74	3141	3 1		
ETENTION - %		TM 2088	FINE DE	GRADE			- -				
TALASPHALT 5, 3 %		HT.		P20	%		NOT	ED			
ES	1	ATCO					R. D. SHA	RTNER			
		ATERIAL RE	PRESENT	ED BY THIS	SAMPLE		DOESNOT	COMPLY	WITH S	PECIFICATK	ONS.
STRUCTION ENG.											
GION ENGEX 4 RAS	son [1					
TRICT ENG.						La.	R. O	nn			
HTRACTOR JC CONDU	Leave				6	1 cc	بنائره	ellu	ion		
Wilson G. Boyle,	G. Hicks				v	EM	GINEER OF M	TERIALS			
	NO WHILE ORIGINAL	IUMATERIAL	S. ABORAT	ORY SALEM.	CANARY TO	PROJECTA	ANAGER OR				1

		* 50		20/20
				Zgz
ASPHALT LABORA	LABORATORY NO. 86 L	1649		
PROJECT (ASPHALT BRAND and T	DATA SHEET NO.	1043		
Region 4 Recycle Projects (Unit	A)		A 34404	
. Various (Warm Springs)		COUNTY Wasco	C10218	
J.C. Compton			F.A. PROJECT NO.	
BROJECT MANAGER		UNIT CODE NO.		
Dan Olsen SUBMITTED BY	- 16 /	8027		
		UNIT CODE NO.	DATE RECEIVED	DATE REPORTED
SOURCE OF MATERIAL			LABORATORY CHARGES	
BAMPLED OR INSPECTED AT		TO BE USED	see page o	ine
Mix Design Area #4 SAMPLED OR INSPECTED BY		Recycled		a
	1-8-86		QUANTITY REPRESENTED	
SAMPLE NO.	TEST	IESULTS	8	
PAVING ASPHALT	14		Liquid Asphalt	
T 73 Flash point, closed cup	*F	T 48 Flash point,	open cup	*F
T 44 Solubility in CHCL: CCL2	and the second sec	T201 Viscosity, Kir	nematic at 140 F	C.S.
T 49 Penetration at 77F/39.2 Penetration ratio 39.2/77 F	cm/100	T 78 Distillation (9	of total distillate to 680 F)	
T201 Viscosity, Kinematic 275 F	C.S.	To 374 F		%
T202 Viscosity, Absolute 140 F	P.	To 437 F	· · · · · · · · · · · · · · · · · · ·	%
T240 Paving Asphalt RTF (c) Residue		To 500 F	····	%
T 47 Loss on heating	%	To 600 F ,		%
. T201 Viscosity, Kinematic 275 F	C.S.		distillation to me by difference	•
T202 Viscosity, Absolute 140 F, 30cm		Water		%
Hg., Vac	P. cm/100		1	
% of orig. penetration		T 49 Penetration at	Liquid Asphalt Residue	
Ductility at 45 F	cm.	T 44 Solubility in C		cm/100
		T 51 Ductility at 77		
Emulsified Asphalt		T202 Viscosity ABS		cm.
T 59 Viscosity, S.F. at F T 59 Sieve test	\$0C.	,		
The second se		¥1190	Pipe Costing (Bituminous	1)
T 59 Residue by distillation to 500 F T 59 Oli distillate in		T 44 Solubility in Cl	+CL-CCL2	%
	_ *	T 49 Penetration at	77 F	cm/100
T M Salatila Culor core		T 47 Loss on heatin	ig at 325 F	%
T E1 Descritter of TT F		T 49 Penetration of	Res. at 77 F	% of orig.
	cm.			Net 19
T170 Modified Abson Recovery of Asphalt				
T201 Viscosity, Kinematic 275 F	C.S.			
T202 Viscosity, Absolute 140 F, 30 cm 83, 437 Hg. Vac.	P.			
"C" value	cm/100			
PORT TO:	RE	COMMENDATION:		
			imple does, does not comply with sp	ecifications.
CONSTRUCTION ENGINEER PROJECT MANAGER MAINTENANCE ENGINEER DISTRICT SUPERVISOR				
PAVING QUALITY COORDINATOR DIFLE				

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