Report No. CDH-SMB-12-83-8

1982 COLORADO TRAFFIC PAINT TEST STRIPES

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Final Report
May, 1983

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
CDOH-SMB-R-83-8		

4. Title and Subtitle	5. Report Date
1982 Colorado Traffic Paint Test Stripes	May, 1983
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Kenneth P. Morrison	CDOH-SMB-12-83-8
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Colorado Department of Highways 4201 East Arkansas Avenue Denver, Colorado 80222	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Final
Colorado Department of Highways 4201 East Arkansas Avenue Denver, Colorado 80222	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report documents the performance of 15 different traffic paints including formulations from nine different states and also four experimental formulations. The testing was performed according to ASTM D 713-69 Standard Test Method for conducting Road Service Tests on Traffic Paints by the Colorado Department of Highways and Hercules Inc. Paints tested included Alkyd Resin, Chlorinated Rubber, and Fast Drying Alkyd Resin based paints. From the findings of this study alkyd resin based paints were specified for the 1983 bids for Colorado's standard traffic paint and should result in more economical, longer lasting pavement markings.

17. Key Words	18. Distribution Statement
Pavement Marking Material, Paint Alkyd Resin, Chlorinated Rubber	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
		45	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

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MISCELLANEOUS DATA FROM HERCULES, INC.

LOCATION, APPLICATION AND GENERAL COMMENTS

In conjunction with Hercules, Inc., the Chemical Unit of the Staff Materials Branch applied 15 different traffic paint formulations to a test section located on Interstate 70. The test section is located on the Eastbound lane of I70 at milepost 288+. The traffic count over this section of I70 is approximately 10,600 vehicles per day. Approximately 20 to 40 percent of these vehicles are trucks.

The test stripes were applied by Hercules, Inc. with the cooperation and aid of Maintenance personnel from District I. The Chemical Unit of the Staff Materials Branch ran chemical and physical tests on the paints applied to the test section. Personnel from Staff Traffic, Staff Materials, District VI Traffic and District I Traffic were used to rate the stripes. The layout of the test section is shown in Figure Number 1.

The paints applied to the test section include traffic paint formulations from nine (9) different states. Four experimental paints formulated by Hercules, Inc. were also applied for evaluation. Both white and yellow paints of all the different formulations were tested. The traffic paints tested include alkyd resin, chlorinate rubber and fast dry alkyd resin traffic paints. The complete list of paints applied is given in Table Number 1.

The application and evaluation of the paint stripes was done according to ASTM Designation D713-69 Standard Test Method for "Conducting Road Service Tests on Traffic Paints." Two stripes of each color and formulation of paint were applied to both portland cement concrete pavement and asphalt cement pavement. Reflective glass beads were applied to all the test stripes. The stripes were perpendicular to the shoulder line and extended to the center line of the Eastbound lane. The stripes were applied on June 16, 17 and 21 of 1982. See Table Number 2 for data concerning the application of these stripes.

On June 21 while the test section was being completed an examination of the paint stripes previously applied revealed that some of the stripes were beginning to wear. The paints that were showing signs of chipping are as follows:

White Paints on Asphalt	Yellow Paints on Asphalt
New Mexico's Chlorinated Rubber	New Mexico's Chlorinated Rubber
Arizona's Chlorinated Rubber	Oregon's Chlorinated Rubber
Oregon's Chlorinated Rubber	

White Paints on P.C.C.P.	Yellow Paints on P.C.C.P.
Arizona's Chlorinated Rubber	New Mexico's Chlorinated Rubber Oregon's Chlorinated Rubber

ASTM D713 requires that the stripes be rated immediately after application, then 24 hours after application and then every 30 days after application until the stripes fail. Due to the accelerated wear (chipping), it was decided to hold the first rating 10 days after application or June 25. The next rating was then scheduled for July 9. From that date on, the normal spacing at 30 days between ratings was followed. Table Number 3 contains the scheduled rating dates. The paint stripes were photographed using color slide film at each rating to provide a pictorial history of each paint's performance.

The paints from Colorado, New Mexico, Oregon and Wyoming included in the test section were produced for the 1981 or 1982 traffic paint bids. The CDOH paints used for the test sections were produced to meet the 1982 Maintenance paint bid. The chlorinated rubber paints are lot numbers 1BW2 (white) and 3BY2 (yellow). These paints were tested and approved for use in February of 1982. This paint was made by Traffic Paint Mfg., Inc. a division of Jourgensen Paint Company in Saverton, Missouri. The white and yellow alkyd resin based paints were lot numbers T-0632 and T-0472 tested and approved March 9 and February 25. The paint was produced for Baltimore Paint Company by Sherwin-Williams, Inc. in Garland, Texas. Table Number 4 includes the results obtained from the Colorado paints when originally tested and from the samples obtained when the paints were applied to the test section. Table Number 5 includes the test results obtained from the testing of all the paint samples.

RETROREFLECTIVITY

A reflectometer developed by the Michigan Department of Transportation was used to measure the reflectivity of the paint stripes included in this traffic paint test section. This device was built and operated by Hercules, Inc. The reflectivity was measured on three occasions; 1) when the stripes were completed; 2) when they were 105 days old, and 3) when they were 6 months old. These results are summarized in Table Number 6.

The following comments are applicable to this reflectometer:

1. This meter is very sensitive to the presence of reflective glass beads.

2. This meter shows a large difference in reflectivity readings on yellow paints. The best reflectivity occurs when some of the medium chrome yellow pigment in these paints is replaced by a white pigment, namely titanium dioxide.
3. When reading the yellow paints at 105 days, the meter showed little difference with the 5 day readings. Paints numbered 4 and 6 were in fact quite close to failure.

RESULTS AND CONCLUSIONS

The testing done on the paints supplied to the CDOH reveals that the paint sampled by the supplier and tested for CDOH approval is representative of the paint shipped under each batch number. The physical properties of the paint remained fairly constant even though the paints were stored outside for three or four months. The drying times increased somewhat, but this is due to normal reactions between the driers and pigments used to produce the paints.

Those paints that failed first were chlorinated rubber based traffic paints. These paints were from Oregon, Arizona and New Mexico. Appendix A gives the days to failure of all the paints. The early failure of these three paints is traceable to their low non-volatile vehicle content. The non-volatile vehicle contents of these paints are as follows:

PAINT	COLOR	NON-VOLATILE VEHICLE (%)
Oregon Chlorinated Rubber	White	25.26
	Yellow	28.52
New Mexico Chlorinated Rubber	White	24.15
	Yellow	38.66
Arizona Chlorinated Rubber	White	30.79
	Yellow	39.16

The yellow paints from these three states performed better than the white paints due to increased non-volatile vehicle contents. The best durabilities are achieved when non-volatile vehicle contents are over 40 percent.

The next paints to fail were the 50 second (dry time) alkyds from Indiana and Nebraska. This is not unexpected as most fast dry, hot applied alkyd paints have high pigment contents with correspondingly lower non-volatile vehicle contents. It should also be noted that the Indiana-Nebraska 50 second alkyd paints performance specifications are similar to the Urban Fast Dry Traffic Paint used by the CDOH.

Yellow traffic paints that replace some of the yellow pigments with a white pigment are more reflective than the 1982 CDOH yellow paint. Durability does not suffer because of this change. The 1983 traffic paint specifications were changed to reflect this finding. The CDOH Maintenance paint should appear brighter and less orange.

Traffic paints are more durable on bituminous pavements than on concrete pavements. This is probably due to the rigidity of concrete pavement with a corresponding accelerated loss of paint film due to chipping.

The results of the CDOH paints tested reveal that our alkyd resin based paint out performed most of the other paints included. Appendix A gives the length of useful life of all the paints tested. This paint did show less durability on the concrete pavement, but its life should be more than adequate when used for lane lines and the dashed center line. At the February rating, the CDOH alkyd resin based white paint was rated as the second best paint on bituminous pavement and the yellow was ranked number three. On concrete pavements, this paint was ranked number tenth for the white and ninth for the yellow. Appendix B lists the Colorado ratings and ranking for the paints tested. From the results of this test section, and because the chlorinated rubber based CDOH paint costs approximately 42% more than our alkyd resin based paints, it was our recommendation that we use only the alkyd resin based paint for our 1983 paint bid.

One factor overlooked when this recommendation was made is the drying time differential between chlorinated rubber and alkyd resin based traffic paints. The chlorinated rubber paints will dry in three to five minutes at $77^{o}F$ while the alkyd resin paint will require from 20 to 30 minutes to dry. The decreased dry time of the chlorinated rubber paint negates the need for coning or other forms of protecting the freshly applied paint stripes. This should result in considerable cost savings due to decreased paint crew size and equipment savings. Some method needs to be developed to determine if this savings would offset the initial cost differential between chlorinated rubber and alkyd resin traffic paints.

The premature failure of the paints from Oregon, New Mexico and Arizona points out the need to continue our current thorough testing of traffic paints. Road service tests of traffic paint are a valuable tool that can be used to determine the durability of paints currently used by our Department. Changes in specifications can then be made to improve the paints if our testing program determines that durability or reflectivity has dropped.

MISCELLANEOUS DATA

Data from Hercules, Inc. that includes reflectivity readings, paint formulations and application data is included after Appendix B in this report. Some of this data is not typed or is a repeat of information from our report.

Complete ratings reports and physical test results are on file in the Chemical Unit of the Staff Materials Branch.

FIGURES AND TABLES

Figure Number 1

Test Section Layout

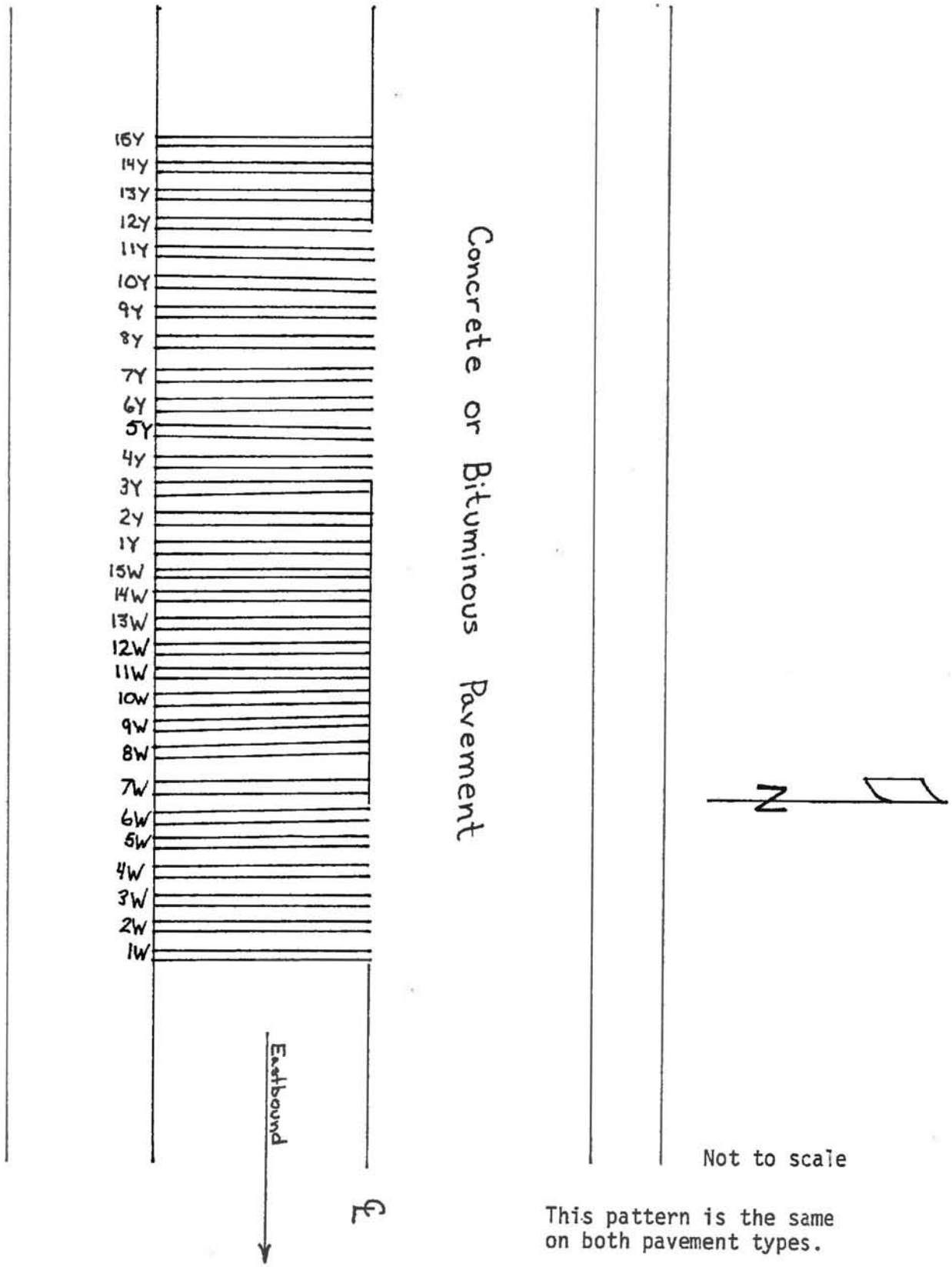


TABLE NUMBER 1

Traffic Paints Tested on I 70 in 1982

Paint Number	Color	Type of Paint	Remarks
1	White Yellow	Chlorinated Rubber	Colorado 1982 Paint Bid
2	White Yellow	Chlorinated Rubber	New Jersey Type IV
3	White Yellow	Chlorinated Rubber	New Mexico
4	White Yellow	Chlorinated Rubber	Arizona
5	White Yellow	Chlorinated Rubber	Illinois
6	White Yellow	Chlorinated Rubber	Oregon
7	White Yellow	Chlorinated Rubber	Pennsylvania
8	White Yellow	Chlorinated Rubber	Wyoming 1981 Paint Bid
9	White Yellow	Alkyd Resin	Wyoming 1981 Paint Bid
10	White Yellow	50 Second Alkyd 50 Second Alkyd	Indiana 1982 Paint Bid Nebraska 1982 Paint Bid
11	White Yellow	Alkyd Resin	Colorado 1982 Paint Bid
12	White	Chlorinated Rubber	Experimental: New Jersey IV with Pulpex (Polypropylene fibers)
13	White Yellow	Chlorinated Rubber	Experimental: High Solids using S 20 chlorinated rubber
14	White Yellow	Chlorinated Rubber	Experimental: New Jersey IV using Cel 604 resin
15	White Yellow	Chlorinated Rubber	Experimental: New Jersey IV with reduced Primary Pigments. (Florida formulation)

TABLE NUMBER 2

Paint Test Stripe Application Data

Date	Time	Paint Number	Color	Paint Temperature Heat Exchanger	Paint Temperature Nozzle	Pavement Temperature PCCP	Pavement Temperature BCP	Air Temperature	Relative Humidity	D711 Dry Time
6-16-82	9:50 AM	1	White	70°F	70°F	79°F	87°F	63°F	65	--
6-16-82	10:28 AM	2	White	110	105	82	90	67	63	
6-16-82	10:55 AM	3	White	95	90	85	97	68	54	
6-16-82	11:10 AM	4	White	90	85	87	98	70	50	2 min.
6-16-82	11:30 AM	5	White	90	85	91	101	72	45	
6-16-82	11:52 AM	6	White	90	85	93	104	72	42	1.5-2 min.
6-16-82	1:15 PM	7	White	138	135	96	108	73	42	
6-16-82	1:33 PM	8	White	135	135	97	109	74	42	
6-16-82	1:55 PM	9	White	135	130	97	107	74	44	
6-16-82	2:20 PM	10	White	150	150	98	109	76	44	
6-16-82	2:35 PM	11	White	105	105	98	107	75	40	
6-16-82	2:53 PM	12	White	140	140	99	109	76	42	
6-17-82	9:18 AM	13	White	135	130	76	77	67	63	
6-17-82	9:55 AM	14	White	140	135	77	83	66	62	
6-17-82	10:09 AM	15	White	100	100	82	87	65	62	
6-17-82	10:42 AM	1	Yellow	85	85	77	81	64	59	
6-17-82	10:58 AM	2	Yellow	80	80	82	86	67	58	
6-17-82	11:15 AM	3	Yellow	80	80	83	92	68	58	
6-17-82	11:50 AM	4	Yellow	80	80	83	93	67	58	
6-17-82	12:16 PM	5	Yellow	80	80	80	85	66	60	
6-17-82	1:26 PM	6	Yellow	135	135	73	80	66	65	
6-17-82	1:42 PM	7	Yellow	150	145	85	95	69	64	
6-17-82	2:05 PM	8	Yellow	130	130	87	96	71	53	
6-17-81	2:41 PM	9	Yellow	95	95	80	80	68	59	
6-21-82	9:11 AM	9	Yellow	76	76	78	83	69	52	
6-21-82	9:50 AM	10	Yellow	155	150	82	91	69	59	
6-21-82	10:04 AM	11	Yellow	105	105	83	90	73	54	
6-21-82	10:26 AM	12	Yellow	125	120	89	93	73	57	
6-21-82	10:52 AM	13	Yellow	135	130	89	100	74	54	
6-21-82	11:16 AM	14	Yellow	135	130	91	101	74	54	
6-21-82	11:26 AM	15	Yellow	115	110	95	100	74	49	

Paint Number 9 Yellow was reapplied due to a heavy rain on the fresh paint, lack of thickness on one stripe and lack of beads on all stripes.

TABLE NUMBER 3

Scheduled Rating Dates

Rating Number	Date	Remarks
1	June 16, 17 & 21, 1982	Date of Application
2	June 17, 18 & 22, 1982	24 Hours After Application
3	June 28, 1982	10 Days After Application
4	July 9, 1982	23 Days After Application
5	August 9, 1982	54 Days After Application
6	September 8, 1982	84 Days After Application
7	October 8, 1982	114 Days After Application
8	November 8, 1982	145 Days After Application
9	December 8, 1982	175 Days After Application
10	January 7, 1983	205 Days After Application
11	February 7, 1983	236 Days After Application
12	March 9, 1983	266 Days After Application
13	April 8, 1983	296 Days After Application
14	May 9, 1983	327 Days After Application
15	June 8, 1983	357 Days After Application

TABLE NUMBER 4
PHYSICAL TEST DATA ON COLORADO HIGHWAY DEPARTMENT'S PAINTS

Date Tested	Lot Number	Paint Type	Wt/gal lb.	% Solids	Grind	Consistency K. U.	Drying Time ASTM D711	Pigment %	Non-Volatile Vehicle %
Feb. 25, 1982	T-0472	Yellow Alkyd	11.22	74.72	2+	80	30 minutes	48.70	50.72
Jun. 23, 1982	T-0472	Yellow Alkyd	11.29	75.25	3+	80	41 minutes	49.64	50.85
Mar. 9, 1982	T-0632	White Alkyd	11.22	74.16	3	80	28 minutes	-	-
Jun. 18, 1982	T-0632	White Alkyd	11.30	74.15	3+	84	30 minutes	52.96	47.17
Feb. 11, 1982	1BW2	Wh. Chl. Rub.	12.06	70.83	3	70	4 minutes	-	-
Jun. 22, 1982	1BW2	White C. R.	12.10	71.11	3	71	8 minutes	49.21	43.12
Feb. 19, 1982	3BY2	Yellow C. R.	12.56	72.35	3+	71	2.5 minutes	-	-
Jun. 22, 1982	3BY2	Yel. Chl. Rub.	12.46	72.30	3+	71	10 minutes	51.16	43.28

TABLE NUMBER 5
PHYSICAL PROPERTIES OF THE PAINTS INCLUDED IN 1982 TEST SECTION

Paint Number	Color	Paint Source & Type	Laboratory Number	Wt/gal (lbs.)	% Solids	Grind	Consistency (K.U.)	Drying Time ASTM D711	% Pigment	% Non-Volatile Vehicle
1	White	CO Chl. Rubber	C558-92	12.10	71.11	3	71	8 minutes	49.21	43.12
2	White	NJ IV C.R.	C559-82	12.73	72.85	5	75	8 minutes	53.34	41.81
3	White	NM C. R.	C560-82	12.14	68.37	6	75	4 minutes	58.30	24.15
4	White	AZ C. R.	C561-82	12.03	69.93	6	71	4 minutes	56.56	30.79
5	White	IL C. R.	C562-82	12.05	71.57	5+	70	3 minutes	54.79	37.12
6	White	OR C. R.	C563-82	11.24	65.89	4	78	6 minutes	54.36	25.26
7	White	PA C. R.	C564-82	13.23	78.32	5	89	15 minutes	52.70	54.28
8	White	WY C. R.	C565-82	12.11	72.81	5	82	4 minutes	47.51	48.20
9	White	WY Alkyd	C566-82	11.22	70.80	5	76	35 minutes	51.58	39.69
10	White	IN 50" Alkyd	C567-82	12.07	73.05	5	102	3 minutes	55.36	39.63
11	White	CO Alkyd	C568-82	11.30	74.15	3+	84	30 minutes	52.96	47.17
12	White	NJ IV w/Pulpex	C569-82	12.54	74.72	1	94	11 minutes	52.09	47.23
13	White	Hi-Solids S-20	C570-82	13.44	76.06	4+	88	6 minutes	58.50	42.31
14	White	NJ IV w/Cel604	C571-82	12.39	71.41	5	93	6 minutes	54.15	37.64
15	White	Lo-Prime C. R.	C572-82	11.53	66.94	4	63	11 minutes	45.58	39.25
1	Yellow	CO C. R.	C573-82	12.46	72.30	3+	71	10 minutes	51.16	43.28
2	Yellow	NJ IV C. R.	C574-82	13.02	74.25	5	72	11 minutes	53.99	44.04
3	Yellow	NM C. R.	C575-82	12.33	70.70	6+	75	6 minutes	52.23	38.66
4	Yellow	AZ C. R.	C576-82	12.49	72.94	6	72	3 minutes	55.52	39.16
5	Yellow	IL C. R.	C577-82	12.25	73.60	5	69	4 minutes	54.81	41.58
6	Yellow	OR C. R.	C578-82	13.17	75.29	5+	63	9 minutes	65.43	28.52
7	Yellow	PA C. R.	C597-82	12.19	70.25	5	61	10 minutes	52.83	36.93
8	Yellow	WY C. R.	C598-82	12.40	72.66	5	76	8 minutes	49.30	46.07
9	Yellow	WY Alkyd	C599-82	11.34	71.22	6	79	12 minutes	52.50	39.41
10	Yellow	NE 50" Alkyd	C600-82	12.07	71.92	5	108	1.5 minutes	54.88	37.76
11	Yellow	CO Alkyd	C601-82	11.29	75.25	3+	80	41 minutes	49.64	50.85
12	Yellow	NJ IV w/Pulpex	C602-82	13.20	75.33	1-	98	11 minutes	57.41	42.08
13	Yellow	Hi-Solids S-20	C603-82	13.63	78.81	4	100	6 minutes	59.00	48.32
14	Yellow	NJ IV w/Cel 604	C604-82	12.63	71.77	6	82	8 minutes	55.07	37.17
15	Yellow	Lo-Prime C. R.	C605-82	11.08	66.88	4	63	12 minutes	41.18	43.69

TABLE NUMBER 6

SUMMARY OF RETROREFLECTIVITY
DENVER EXPOSURE I70 - ASPHALT

	WHITE			YELLOW		
PAINT	INITIAL	3+ MONTHS	6- MONTHS	INITIAL	3+ MONTHS	6- MONTH
NJ	82	40	33	43	26	30
PA	73	38	30	48	32	27
WY-PR	58	34	26	47	29	29
IL	51	29	16*	32	23	16*
AZ	50	24	10*	40	28	12*
NM	58	30	13*	34	21	11*
OR	61	16*	10*	46	27	14*
IN	65	24	14*			
NB					19	10*
CO-CR	70	36	26	38	28	25
CO-AK	54	34	30		27	25
WY-AK	55	36	31		28	17*
NJ	82	40	33	43	26	30
HS	77	39	30	N/A	24	24
PULPEX	56	37	30	N/A	27	25
604	74	39	29	N/A	29	27
LO PRIME	53	34	31	N/A	21	22

ROAD SURFACE 10

* FAILURE

TABLE NUMBER 6

SUMMARY OF RETROREFLECTIVITY
DENVER EXPOSURE I70 - CONCRETE

	WHITE			YELLOW		
PAINT	INITIAL	3+ MONTHS	6- MONTHS	INITIAL	3+ MONTHS	6- MONTHS
NJ	75	40	30	33	24	27
PA	79	39	28	55	35	30
WY-CR	64	33	24	31	26	25
IL	55	29	14*	28	25	19*
AZ	59	20	12*	26	27	14*
NM	58	22	13*	34	19	13*
OR	65	18*	12*	32	31	14*
IN	63	25	12*			
NB				54	21	13*
CO-CR	63	40	27	32	28	26
CO-ALK	60	38	24	42	30	21
WY-ALK	51	41	21	49	26	15*
NJ	75	40	30	33	24	27
HS	70	41	29	63	28	24
PULPEX	62	37	30	65	30	25
604	61	39	30	52	27	24
LO PRIME	46	35	31	31	21	22

ROAD SURFACE 11

* FAILURE

APPENDIX A

LENGTH OF USEFUL LIFE

PAINT NUMBER	SOURCE	COLOR	DAYS TO FAILURE* ASPHALT	CONCRETE
1	Colorado C.R.	W	205	205
		Y	205	205
2	New Jersey IV	W	267	236
		Y	267	267
3	New Mexico C.R.	W	145	84
		Y	145	84
4	Arizona	W	84	84
		Y	84	145
5	Illinois	W	180	118
		Y	180	180
6	Oregon	W	54	54
		Y	180	145
7	Pennsylvania	W	267	205
		Y	267	205
8	Wyoming C.R.	W	205	205
		Y	267	205
9	Wyoming Alkyd	W	205	180
		Y	180	180
10	Indiana Alkyd Nebraska	W	180	118
		Y	118	180
11	Colorado Alkyd	W	267	180
		Y	267	205
12	Experimental	W	267	267
		Y	296	296
13	Experimental	W	267	236
		Y	267	236
14	Experimental	W	267	236
		Y	267	267
15	Experimental	W	267	267
		Y	205	267

*A paint is considered failed when the average rating is 3.0 or less on a scale of 10.

APPENDIX B

PAINT	COLOR	PAVEMENT TYPE	APPEARANCE	DURABILITY	WEIGHTED RATING	PAINT RANK
Arizona	White	Asphalt	0.17	0.00	0.085	14
			0.17	0.00	0.085	14
		Concrete	0.17	0.17	0.17	12-14
			0.17	0.17	0.17	12-14
Illinois	White	Asphalt	0.33	0.33	0.33	12
			0.33	0.33	0.33	12
		Concrete	0.33	0.17	0.20	11
			0.33	0.17	0.20	11
Oregon	White	Asphalt	0.00	0.00	0.00	15
			0.00	0.00	0.00	15
		Concrete	0.00	0.00	0.00	15
			0.00	0.00	0.00	15
Penn.	White	Asphalt	3.83	3.83	3.83	4
			3.83	3.83	3.83	4
		Concrete	1.33	1.50	1.415	8
			1.33	1.33	1.33	8
Wyo. C.R.	White	Asphalt	3.00	3.00	3.00	9
			3.00	3.00	3.00	9
		Concrete	1.33	1.33	1.33	7
			1.67	1.67	1.67	7
Wyo. Alkyd	White	Asphalt	3.00	2.83	2.92	8
			3.67	2.83	3.25	8
		Concrete	1.00	0.83	0.915	9
			1.00	0.83	0.915	9
Ind.	White	Asphalt	0.05	0.17	0.11	13
			0.05	0.17	0.11	13
		Concrete	0.17	0.17	0.17	11-14
			0.17	0.17	0.17	11-14
Colo Alkyd	White	Asphalt	4.33	4.50	4.42	2
			4.33	4.50	4.42	2
		Concrete	0.33	0.33	0.33	10
			0.33	0.33	0.33	10
Pulpex	White	Asphalt	4.17	4.17	4.17	3
			4.17	4.17	4.17	3
		Concrete	3.00	3.33	3.165	2
			3.00	3.33	3.165	2
High-Solids	White	Asphalt	3.00	3.33	3.165	7
			3.17	3.50	3.34	7
		Concrete	2.33	2.83	2.58	5
			2.33	3.00	2.665	5
604	White	Asphalt	3.33	3.67	3.50	6
			3.33	3.67	3.50	6
		Concrete	2.33	2.83	2.58	4
			2.50	2.67	2.585	4
LoPrime	White	Asphalt	4.67	4.83	4.75	1
			4.67	4.83	4.75	1
		Concrete	3.67	4.50	4.085	1
			3.67	4.50	4.085	1

PAINT	COLOR	PAVEMENT TYPE	APPEARANCE	DURABILITY	WEIGHTED RATING	PAINT RANK
Colo. C.R.	Yellow	Asphalt	1.83	2.33	2.08	9
			1.83	2.33	2.08	9
		Concrete	2.33	2.50	2.415	7
			2.33	2.50	2.415	7
N.J. IV	Yellow	Asphalt	3.17	3.83	3.50	5
			3.50	3.83	3.665	
		Concrete	3.67	4.17	3.92	4
			3.67	4.17	3.92	
New Mex	Yellow	Asphalt	0.17	0.17	0.17	12-15
			0.17	0.17	0.17	
		Concrete	0.33	0.17	0.20	14-15
			0.33	0.17	0.20	
Arizona	Yellow	Asphalt	0.17	0.17	0.17	12-15
			0.17	0.17	0.17	
		Concrete	0.33	0.17	0.20	14-15
			0.33	0.17	0.20	
Illinois	Yellow	Asphalt	0.33	0.50	0.415	11
			0.33	0.50	0.415	
		Concrete	0.67	0.50	0.585	11
			0.67	0.50	0.585	
Oregon	Yellow	Asphalt	0.17	0.17	0.17	12-15
			0.17	0.17	0.17	
		Concrete	0.50	0.50	0.50	12-13
			0.50	0.50	0.50	
Penn.	Yellow	Asphalt	2.67	3.00	2.835	7
			3.33	3.83	3.58	
		Concrete	2.00	2.17	2.085	8
			2.00	2.33	2.165	
Wyo. C.R.	Yellow	Asphalt	3.33	4.00	3.665	6
			3.00	3.67	3.335	
		Concrete	2.50	2.83	2.665	6
			2.33	2.83	2.58	
Wyo. Alkyd	Yellow	Asphalt	1.00	1.00	1.00	10
			1.00	1.00	1.00	
		Concrete	1.00	0.67	0.835	10
			1.00	0.67	0.835	
Nebraska	Yellow	Asphalt	0.17	0.17	0.17	12-15
			0.17	0.17	0.17	
		Concrete	0.67	0.33	0.50	12-13
			0.67	0.33	0.50	
Colo. Alkyd	Yellow	Asphalt	4.50	5.00	4.75	3
			4.50	4.83	4.665	
		Concrete	1.50	1.00	1.25	9
			1.33	0.83	1.08	
Pulpex	Yellow	Asphalt	5.00	5.33	5.165	1
			5.00	5.33	5.165	
		Concrete	4.67	5.00	4.835	1
			4.67	5.00	4.835	

PAINT	COLOR	PAVEMENT TYPE	APPEARANCE	DURABILITY	WEIGHTED RATING	PAINT RANK
High-Solids	Yellow	Asphalt	4.50	4.67	4.585	4
			4.50	4.83	4.665	
		Concrete	4.17	4.17	4.17	2
			4.33	4.33	4.33	
604	Yellow	Asphalt	4.83	4.83	4.83	2
			4.83	4.83	4.83	
		Concrete	4.00	4.00	4.00	3
			4.00	4.00	4.00	
LoPrime	Yellow	Asphalt	3.00	3.00	3.00	8
			3.00	3.00	3.00	
		Concrete	3.17	3.83	3.50	5
			3.17	3.83	3.50	

MISCELLANEOUS DATA FROM HERCULES, INC.

TABLE 1

1982 COLORADO ROAD TEST TRAFFIC PAINT

STATE PAINTS

1.	Colorado CR	- Commercial Production
2.	New Jersey Type IV	- Hercules Production
3.	New Mexico	- Commercial Production
4.	Arizona	- Commercial Production
5.	Illinois M123-81	- Commercial Production
6.	Pennsylvania (1981 spec.)	- Commercial Production
7.	Wyoming CR	- Commercial Production
8.	Wyoming Alkyd	- Commercial Production
9.	Indiana/Nebraska "50 sec alkyd"	- Commercial Production
10.	Colorado Alkyd	- Commercial Production
11.	Oregon	- Commercial Production

EXPERIMENTAL PAINTS

1.	New Jersey IV + Pulpex P, AD-HR	- Hercules Production
2.	New Jersey IV/Cellolyn 604 alkyd	- Hercules Production
3.	New Jersey IV High Solids S-20	- Hercules Production
4.	New Jersey IV/Florida Pigment (Low Prime)	- Hercules Production

TABLE 2
1982 COLORADO ROAD TEST
TRAFFIC PAINT APPLICATION DATA

PAINT	DATE	TIME	PRESSURES (PSIG)			TEMPERATURES (°F)					RH
			PAINT	ATOMIZATION	BEADS	HEAT EXCHGR.	GUN	AIR	SUBSTRATE PCC	SUBSTRATE BCC	%
Colorado CR (W)	6/16	9:50	34	45	28	Ambient	Ambient	63	79	87	65
New Jersey IV (W)	6/16	10:28	44	50	28	110	110	67	82	90	63
New Mexico (W)	6/16	10:55	26	50	28	95	95	68	85	97	54
Arizona (W)	6/16	11:10	34	40	28	90	90	70	87	98	50
Illinois (W)	6/16	11:30	34	45	28	90	90	72	91	101	45
Oregon (W)	6/16	11:52	30	45	28	90	90	72	93	104	42
Pennsylvania (W)	6/16	1:15	42	45	28	138	135	73	96	108	42
Wyoming CR (W)	6/16	1:33	42	45	28	135	135	74	97	109	42
Wyoming Alkyd (W)	6/16	1:55	34	45	28	135	130	74	97	107	46
Indiana (W)	6/16	2:20	34	34	28	150	150	76	98	107	46
Colorado Alkyd (W)	6/16	2:35	40	45	28	105	105	75	98	107	40
NJ IV-Pulpex (W)	6/16	2:53	42	50	28	140	140	76	99	109	42
NJ IV High Solids S-20 (W)	6/17	9:17	36	45	28	135	130	66	76	77	63
NJ IV-Cellolyn 604 (W)	6/17	9:55	46	50	28	140	135	66	77	83	62
NJ IV-Florida Pigment (W)	6/17	10:09	36	50	28	100	100	65	82	87	62
Colorado CR (Y)	6/17	10:42	24	50	28	85	85	64	77	81	59
New Jersey IV (Y)	6/17	10:58	34	50	28	80	80	67	82	86	58
New Mexico (Y)	6/17	11:15	34	50	28	80	80	68	83	92	58
Arizona (Y)	6/17	11:50	30	50	28	80	80	67	83	93	59
Illinois (Y)	6/17	12:16	30	50	28	80	80	66	80	85	60
Oregon (Y)	6/17	1:26	36	50	28	135	135	66	73	80	65
Pennsylvania (Y)	6/17	1:42	40	50	28	150	145	69	85	94	64
Wyoming CR (Y)	6/17	2:05	38	50	28	130	130	71	87	96	53
Wyoming Alkyd (Y)	6/17	2:41	36	50	28	95	95	68	80	80	59

TABLE 2
1982 COLORADO ROAD TEST
TRAFFIC PAINT APPLICATION DATA

PAINT	DATE	TIME	PRESSURES (PSIG)			TEMPERATURES (°F)					RH
						HEAT			SUBSTRATE		
			PAINT	ATOMIZATION	BEADS	EXCHGR.	GUN	AIR	PCC	BCC	%
Wyoming Alkyd (Y)	6/21	9:11	34	50	28	76	76	67	78	83	52
Nebraska (Y)	6/21	9:50	34	50	28	155	150	70	82	91	59
Colorado Alkyd (Y)	6/21	10:04	34	50	28	105	105	70	83	90	59
NJ IV-Pulpex (Y)	6/21	10:26	52	50	28	125	120	73	89	94	57
NJ IV High Solids S-20 (Y)	6/21	10:48	48	50	28	135	130	73	89	100	57
NJ IV-Cellolyn 604 (Y)	6/21	11:14	46	50	28	135	130	74	91	101	54
NJ IV-Florida Pigment (Y)	6/21	11:40	24	50	28	115	110	74	95	100	49

1982 COLORADO TEST SITE

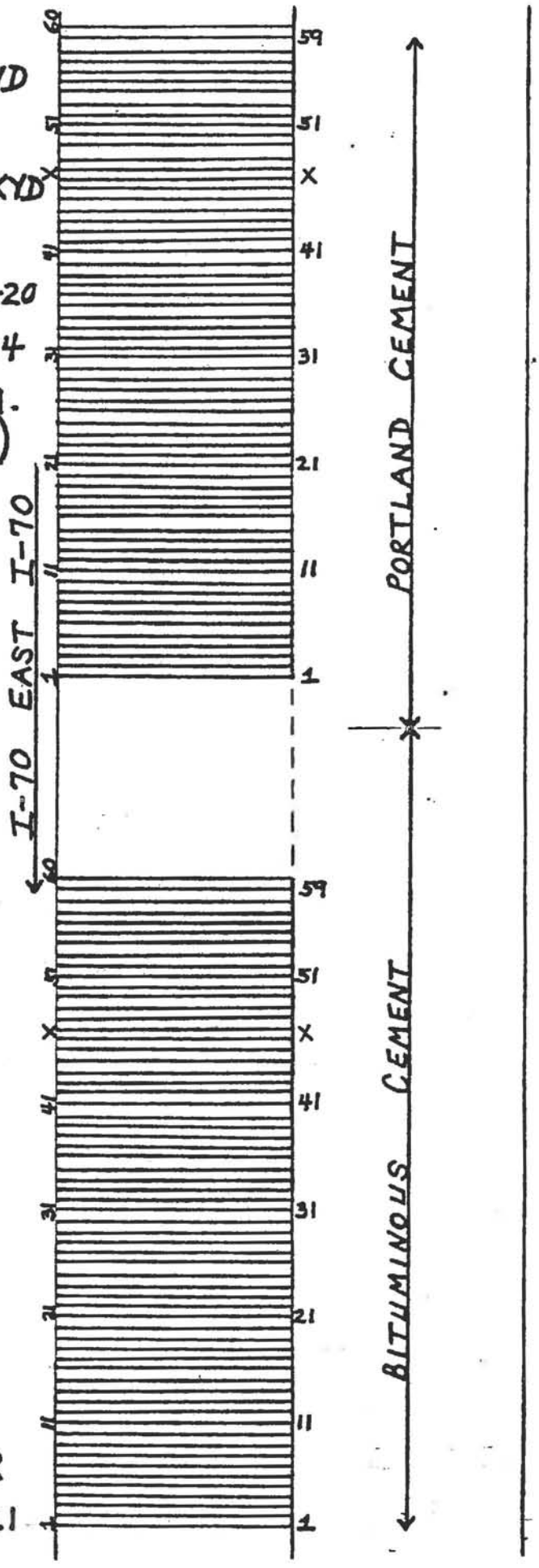
WHITE

1 COLORADO CR
3 NJ IV
5 NEW MEXICO
7 ARIZONA
9 ILLINOIS
11 OREGON
13 PA. 1981 (M)
15 WYOMING CR
17 WYOMING ALKYD
19 INDIANA
21 COLORADO ALKYD
23 PULPEX
25 HIGH SOLIDS S-20
27 CELLOLYN 604
29 FLORIDA PIGM. (LOW PRIME)

YELLOW

31 COLORADO CR
33 NJ IV
35 NEW MEXICO
37 ARIZONA
39 ILLINOIS
41 OREGON
43 PA. 1981 (M)
45 WYOMING CR
47 WYOMING ALKYD
49 NEBRASKA
51 COLORADO ALKYD
53 PULPEX
55 HIGH SOLIDS S-20
57 CELLOLYN 604
59 FLORIDA PIGM. (LOW PRIME)

X - RAINED IMMEDIATELY AFTER APPLICATION, REAPPLIED 6/21



SUMMARY OF RETROREFLECTIVITY
DENVER EXPOSURE I70 - ASPHALT

	WHITE			YELLOW		
PAINT	INITIAL	3+ MONTHS	6- MONTHS	INITIAL	3+ MONTHS	6- MONTHS
NJ	82	40	33	43	26	30
PA	73	38	30	48	32	27
WY-PR	58	34	26	47	29	29
IL	51	29	16*	32	23	16*
AZ	50	24	10*	40	28	12*
NM	58	30	13*	34	21	11*
OR	61	16*	10*	46	27	14*
IN	65	24	14*			
NB				N/A	19	10*
CO-CR	70	36	26	38	28	25
CO-AK	54	34	30	N/A	27	25
WY-AK	55	36	31	N/A	28	17*
NJ	82	40	33	43	26	30
HS	77	39	30	N/A	24	24
PULPEX	56	37	30	N/A	27	25
604	74	39	29	N/A	29	27
LO PRIME	53	34	31	N/A	21	22

ROAD SURFACE 10

* FAILURE

SUMMARY OF RETROREFLECTIVITY
DENVER EXPOSURE I70 - CONCRETE

	WHITE			YELLOW		
PAINT	INITIAL	3+ MONTHS	6- MONTHS	INITIAL	3+ MONTHS	6- MONTHS
NJ	75	40	30	33	24	27
PA	79	39	28	55	35	30
WY-CR	64	33	24	31	26	25
IL	55	29	14*	28	25	19*
AZ	59	20	12*	26	27	14*
NM	53	22	13*	34	19	13*
OR	65	18*	12*	32	31	14*
IN	63	25	12*			
NB				54	21	13*
CO-CR	63	40	27	32	28	26
CO-ALK	60	38	24	42	30	21
WY-ALK	51	41	21	49	26	15*
NJ	75	40	30	33	24	27
HS	70	41	29	63	28	24
PULPEX	62	37	30	65	30	25
604	61	39	30	52	27	24
LO PRIME	46	35	31	31	21	22

ROAD SURFACE 11

* FAILURE

CONCRETE WHITE

RETRO-REFLECTANCE

LINE No.	PAINT	STD. PANEL	RWT			CWT			AVE.	%
1	CO-CR	297	68	68	69	81	75	78	73.2	26.4
2			70	66	80	85	77	82	76.7	27.7
3	NJ	277	79	74	93	92	87	89	85.7	30.9
4			71	74	87	83	80	86	80.2	29.1
5	NM	272	35	80	31	39	37	39	35.2	13
6										
7	AZ	267	32	28	31	34	36	36	32.8	12
8										
9	IL	266	35	32	33	39	41	45	37.5	14.1
10			38	32	35	41	42	45	38.8	14.6
11	OR	266	31	27	31	32	33	34	31.3	12
12										
13	PA	266	72	69	72	78	69	78	73.0	27.4
14			72	65	81	80	71	85	75.7	28.4
15	WY-CR	265	59	53	62	68	64	70	62.7	23.6
16			60	57	64	70	62	66	63.1	23.8
17	WY-AK	264	43	42	49	62	57	65	52.5	19.9
18			51	47	62	66	55	66	57.8	21.9
19	IN	263	31	29	35	32	34	35	32.6	12
20										
21	CO-AK	262	55	45	65	80	57	61	60.5	23.1
22			59	55	66	75	69	78	67.0	25.6
23	Pulpex	262	70	72	86	90	78	84	80.0	30.5
24			72	72	86	85	78	85	79.7	30.4
25	HS	260	64	63	74	78	69	79	71.2	27.4
26			74	70	90	88	83	86	81.8	31.5
27	604	259	66	65	82	70	75	85	73.8	28.5
28			75	74	80	87	84	85	80.8	31.2
29	Lo Prime	260	73	72	81	85	86	83	80.0	30.8
30			75	70	74	87	82	87	79.2	30.4
	Road		33	29	32	33	32	24	31	11

CONCRETE YELLOW

RETRO-REFLECTANCE

LINE NO.	STD. PAINT	PANEL	RWT			CWT			AVE.	%
31	CO-CR	256	62	57	58	73	62	73	64.2	25.1
32			61	58	58	73	72	77	68.2	26.6
33	NJ	255	61	63	66	77	66	72	67.5	26.5
34			65	65	70	82	71	77	71.7	28.1
35	NM	260	31	25	34	36	35	35	32.7	13
36										
37	AZ	261	28	28	39	35	34	39	33.8	13.0
38			31	29	32	45	42	43	37.0	14.2
39	IL	260	46	47	60	52	48	54	51.2	19.7
40			48	43	52	59	52	46	50.0	19.2
41	OR	260	41	30	34	36	35	36	35.3	14
42										
43	PA	257	63	65	79	80	72	79	73.0	28.4
44			67	79	93	78	73	85	79.2	30.8
45	WY-CR	258	58	59	64	70	64	66	63.2	24.5
46			57	60	69	71	67	70	65.7	25.5
47	WY-AK	256	40	39	42	42	37	35	39.2	15.3
48			42	37	37	39	40	42	39.5	15.4
49	NB	254	43	31	30	33	30	35	33.7	13.3
50			36	28	36	33	31	32	32.7	12.9
51	CO-AK	254	50	48	61	58	51	57	54.2	21.3
52			52	50	59	52	41	57	51.8	20.4
53	Pulpex	253	61	56	60	73	66	68	64.0	25.3
54			56	59	74	66	64	69	64.7	25.6
55	HS	252	51	54	67	66	63	66	61.2	24.3
56			55	54	64	63	62	65	60.5	24.0
57	604	250	58	52	58	68	63	63	60.3	24.1
58			55	54	60	64	68	62	60.5	24.2
59	Lo Prime	251	48	51	58	61	58	62	56.3	22.4
60			51	49	58	58	56	63	55.8	22.2

ASPHALT WHITE

RETRO-REFLECTANCE

LINE NO.	PAINT	Std. PANEL	RWT			CWT				%
1	CO-CR	261	62	49	62	65	64	75	62.8	24.1
2			61	79	80	66	76	89	75.1	28.8
3	NJ	250	80	79	88	87	79	81	82.3	32.9
4			80	69	85	80	81	88	80.5	32.2
5	NM	249	35	29	35	29	30	38	32.7	13.1
6			35	30	38	33	30	39	34.2	13.7
7	AZ	247	25	22	27	27	26	28	25.8	10
8										
9	IL	249	44	35	48	44	38	42	41.8	16.8
10			32	27	37	38	38	46	36.3	14.6
11	OR	247	22	21	25	24	26	26	24.0	10
12										
13	PA	245	75	69	72	83	71	71	73.5	30.0
14			71	69	84	70	74	86	75.7	30.9
15	WY-CR	244	61	58	70	62	61	70	63.7	26.1
16			57	55	76	57	59	64	61.3	25.1
17	WY-AK	244	68	60	78	74	64	79	70.5	28.9
18			74	74	91	79	75	94	81.2	33.3
19	IN	244	35	27	38	30	29	46	34.2	14.0
20			30	25	35	30	30	51	33.5	13.7
21	CO-AK	244	64	73	86	75	69	83	75.0	30.7
22			63	64	88	63	63	73	69.0	28.3
23	Pulpex	243	66	66	86	71	70	80	73.2	30.1
24			69	66	79	80	68	71	72.1	29.7
25	HS	242	64	64	81	64	63	90	71.0	29.3
26			72	66	89	73	66	65	71.8	29.7
27	604	243	73	67	84	86	71	70	75.2	30.9
28			75	66	52	75	63	73	67.3	27.7
29	LO Prime	242	66	68	89	78	72	79	75.3	31.1
30			66	64	77	83	73	76	73.2	30.2
	Road		24	20	23	25	25	26	24	10

ASPHALT YELLOW

RETRO-REFLECTANCE

LINE NO.	PAINT	STD. PANEL	RWT			CWT			AVE.	%
31	CO-CR	238	59	53	66	75	56	57	61.0	25
32			48	59	67	64	58	62	59.7	25.1
33	NJ	236	61	67	82	70	68	76	90.7	29.9
34			60	64	83	71	70	77	70.8	30.0
35	NM	238	27	21	28	25	23	28	25.3	11
36										
37	AZ	238	28	21	27	31	29	38	29.0	12.2
38			28	27	29	28	25	34	28.5	12.0
39	IL	239	44	32	49	45	31	26	37.8	15.8
40			51	41	49	30	28	34	38.8	16.2
41	OR	237	38	29	41	34	27	41	35.0	14.8
42			28	24	35	29	28	32	29.3	12.4
43	PA	238	56	56	76	67	66	70	65.2	27.4
44			50	49	59	52	48	52	51.7	21.7 *
45	WY-CR	236	55	66	81	72	61	69	67.3	28.5
46			57	71	79	71	67	71	69.3	29.4
47	WY-AK	238	52	39	37	43	35	40	41.0	17.2
48			40	32	41	36	38	48	39.2	16.5
49	NB	235	22	19	27	25	25	29	24.5	
50										
51	CO-AK	235	50	68	75	60	56	61	61.7	26.2
52			53	50	61	60	53	59	56.0	23.8
53	Purplex	234	52	51	61	58	56	61	56.5	24.1
54			56	53	63	61	58	68	59.8	25.6
55	HS	234	51	48	52	65	55	54	54.2	23.1
56			52	48	67	58	53	57	55.8	23.9
57	604	236	58	52	63	69	61	58	60.2	25.5
58			63	62	77	73	66	69	68.3	29.0
59	Lo Prime	233	45	46	58	59	54	56	53.0	22.7
60			52	54	52	46	50	50	50.7	21.7

* No beads

HERCULES INCORPORATED

DATE 11/82 NO.

AUTHOR

NJ IV - WHITE

DENSITY		LBS.	LBS./GAL.		GAL.	TNV
.805	- MEK* 101.59 -	~~119.5~~	6.72		~~17.783~~ 15.117	
1.029	- Alkyd -	41.6	8.59	(75%)	4.843 (3.632)	31.20
1.16	- Clorafin 40 -	30.0	9.68		3.099	30.00
1.63	- Parlon S-20 -	40.0	13.60	(93%)	2.941 (2.735)	37.20
1.80	- Bentone 38 -	0.8	15.02		0.053	0.80
5.60	- AZO-33 -	20.0	46.73		0.428	20.00
2.85	- Nytal 300 -	70.0	23.78		2.944	70.00
2.71	- Snowflake -	60.0	22.61		2.654	60.00
4.12	- TiO_2 -	80.0	34.38		2.327	80.00
1.12	- 24% Lead -	0.8	9.35	(64%)	0.086	0.512
0.93	- 6% Cobalt -	0.4	7.76	(71%)	0.052	0.284
0.8729	- Solvesso 100 -	2.0	7.28		0.275	329.996
0.906	- Exkin #1 -	1.2	7.56		0.159	
1.0469	- Styrene Oxide -	1.2	8.74		0.137	
		~~467.5~~			~~37.781~~	
		449.58			35.115	

12.373 WT./GAL. - CALCULATED
12.670 " - MEASURED
12.80 " - ADJUSTED

70.59% SOLIDS - CALCULATED
73.40% " - MEASURED
73.40% " - ADJUSTED

Volume Solids - 50.895%
PVC - 46.738%

% VOL. SOLIDS

Alkyd - 3.632
C-40 - 3.099
S-20 - 2.735
Bentone - 0.053
AZO-33 - 0.428
Nytal - 2.944
Snow - 2.654
TiO_2 - 2.327

17.872 ÷ 35.115
50.895%

* 17.91 LBS. MEK LOST.

PVC

AZO-33 - 0.428
Nytal - 2.944
Snow - 2.654
TiO_2 - 2.327

8.353 ÷ 17.872
46.738%

HERCULES INCORPORATED
DATE 11/82 NO.
AUTHOR

III IV - YELLOW

DENSITY		LBS.	LBS./GAL.	GAL.	TAV
0.805	- MEK *	116.4 ~~127.1~~	6.72	SOLIDS ~~14.76~~ 17.32	
1.029	- ALKYD	46.1	8.59	(75%) 5.37 (4.0275)	34.575
1.16	- Cloisite 40	33.3	9.68	3.44	33.300
1.63	- Perlite S-20	44.3	13.60	(93%) 3.26 (3.0318)	44.199
1.80	- Bentone 38	0.89	15.02	0.06	0.890
2.85	- Nytal 300	33.3	23.78	1.40	33.300
2.71	- Snowflake	155.1	22.61	6.86	155.100
5.629	- Med. Chrome	99.7	46.97	2.12	99.700
1.12	- 24% Lead	0.89	9.35	(64%) 0.95	0.570
0.93	- 6% Cobalt	0.44	7.76	(71%) 0.57	0.312
0.8729	- Solvesso 100	2.22	7.28	0.30	398.946
0.906	- Exkin #1	1.33	7.56	0.18	
1.0469	- Styrene Oxide	1.33	8.74	0.15	
		~~546.30~~		~~43.62~~	
		535.30		41.98	

12.52 LBS./GAL - CALCULATED
12.96 " - MEASURED
12.75 " - ADJUSTED

73.03% SOLIDS - CALCULATED
74.50% " - MEASURED
74.52% " - ADJUSTED

VOLUME SOLIDS - 49.88

PVC - 49.57

% VOL. SOLIDS
alkyd - 4.0275 GAL.
C-40 - 3.44
S-20 - 3.0318
BENTONE - 0.06
NYTAL - 1.40
SNOW - 6.86
CHROME - 2.12
20.9393 ÷ 41.9
49.88

PVC %
Nytal - 1.40 GAL.
Snow - 6.86
Chrome - 2.12
10.38 ÷ 20.9393 = 49.57

* Assumed 11 LBS. OF MEK was Lost.

HERCULES INCORPORATED

DATE ____ NO. ____

AUTHOR ____

ILLINOIS M123-81 (WHITE)

	LBS.	LBS./GAL.	GAL.	TNV (LBS.)
MEK * 51.38	~~56.0~~	6.72	~~8.333~~ 7.65	
Alkyd	43.2	8.59	5.029 (3.771)	32.40
Cloralin 40	22.0	9.68	2.272	22.00
Parlon S-20	32.0	13.60	2.352 (2.188)	29.76
Soya Lecithin	1.6	8.345	0.191	1.60
Bentone 38	1.6	15.02	0.106	1.60
Nytal 300	110.0	23.78	4.625	110.00
Snowflake	100.0	22.61	4.422	100.00
TiO_2	40.0	34.38	1.163	40.00
Toluesol 25	45.2	6.16	7.337	
VM+P Naptha	21.6	6.34	3.406	
24% Lead	0.6	9.35	0.064	0.390
6% Cobalt	0.24	7.76	0.030	0.156
Exkin #1	0.4	7.56	0.052	[redacted]
Styrene Oxide	0.8	8.74	0.091	337.906
	~~475.24~~		~~39.473~~	
	470.62		38.79	

12.039 WT./GAL. – CALCULATED

12.080 " – MEASURED

12.13 " – ADJUSTED

71.102 [redacted] % SOLIDS – CALCULATED

71.800 " – MEASURED

71.80 " – ADJUSTED

VOLUME SOLIDS – ~~47.47%~~ 48.31

PVC – 54.48%

% VOL. SOLIDS

3.771
2.272
2.188
0.191
0.106
4.625
4.422
1.163
18.738

38.79 ÷ ~~39.473~~ = ~~47.47%~~ 48.31

PVC

4.625
4.422
1.163
10.210 ÷ 18.738 = 54.48%

*4.62 LBS. MEK LOST

HERCULES INCORPORATED

DATE ____ NO ____

AUTHOR ____

ILLINOIS [illegible]-81 (YELLOW)

DENSITY		LBS.	LBS./GAL.	GAL.	T.V.
0.805	- MEK	53.93 ~~57.5~~	6.72	~~6.99~~ 8.03	
1.029	- Alkyd	~~43.2~~	8.59 (75%)	5.03 (3.772)	32.4
1.16	- Cloisonite 40	22.0	9.68	2.27	22.0
1.63	- Perlon S-20	32.0	13.60 (93%)	2.35 (2.188)	29.76
1.00	- Soya Lecithin	1.6	8.345	0.19	1.6
1.80	- Bentone 38	1.6	15.02	0.11	1.6
2.85	- Nytal 300	112.0	23.78	4.71	112.0
2.71	- Snowflake	104.0	22.61	4.60	104.0
5.629	- Med. Chrome	42.0	46.97	0.89	42.0
0.738	- Toluol 25	45.2	6.16	7.34	
0.76	- VM&P Naptha	21.6	6.34	3.41	
1.12	- 24% Lead	0.6	9.35 (65%)	0.64	0.39
0.93	- 6% Cobalt	0.24	7.76 (65%)	0.03	0.16
0.906	- Exkin #1	0.4	7.56	0.05	345.91
1.0469	- Styrene Oxide	0.8	8.74	0.09	
		~~183.24~~		~~46.04~~	
		481.17		39.74	

12.07 LBS./GAL. - CALCULATED
12.16 " - MEASURED
12.11 " - ADJUSTED

71.58 % SOLIDS - CALCULATED
71.80 % " - MEASURED
71,80 % " - ADJUSTED
% Volume Solids - ~~46.78~~ 47.13
PVC - 54.46

% VOL. SOLIDS
3.772
2.27
2.188
0.19
0.11
4.71
4.60
0.89
18.73 ÷ ~~46.04~~ 39.74
~~46.78~~
47.13

PVC
4.71
4.60
0.89
10.20 ÷ 18.73
54.46

HERCULES INCORPORATED

DATE NO.

AUTHOR

WYOMING FAST DRY (WHITE)

	LBS.	LBS./GAL.		GAL.		TNV (LBS.)
Toluene	26.8	7.25		3.696		
Alkyd	20.8	8.59	(75%)	2.421	(1.816)	15.60
Clorbin 40	15.0	9.68		1.549		15.00
Parlon S-20	20.0	13.60	(93%)	1.470	(1.367)	18.60
Bentone 38	0.8	15.02		0.053		0.80
AZO-33	10.0	46.73		0.213		10.00
Nytal 300	45.0	23.78		1.892		45.00
Snowflake	35.0	22.61		1.547		35.00
TiO_2	30.0	34.38		0.872		30.00
24% Lead	0.4	9.35	(65%)	0.042		0.26
6% Cobalt	0.2	7.76	(65%)	0.025		0.13
Exkin #1	0.6	7.56		0.079		170.39
MEK	18.0	6.72		2.678		
Heptane	9.0	6.07		1.482		
VM+P Napthe	10.4	6.34		1.640		
Styrene Oxide	0.6	8.74		0.068		
	242.6			19.727		

12.297 LBS./GAL. – CALCULATED
12.240 " – MEASURED

70.234 % SOLIDS – CALCULATED
70.200 " – MEASURED

VOLUME SOLIDS – 47.2%
PVC – 48.6%

% VOL. SOLIDS

1.816
1.549
1.367
0.053
0.213
1.892
1.547
0.872
9.309 ÷ 19.727 = 47.189

PVC

0.213
1.892
1.547
0.872
4.524 ÷ 9.309 = 48.60

HERCULES INCORPORATED

DATE ____ NO ____

AUTHOR ____

WYOKOTE FAST DRY - YELLOW

DENSITY		LBS.	LBS./GAL.	GAL.	TNV
*0.866	- TOLUENE 32.8	~~24.6~~	7.25	~~3.40~~ 4.52	
1.029	- ALKYD	20.8	8.59	2.42 (1.82)	15.6
1.16	- CLORAFIN 40	15.0	9.68	1.55	15.0
1.63	- PARLON S-20	20.0	13.60	1.47 (1.37)	18.6
1.80	- BENTONE 38	0.8	15.02	0.05	0.8
5.60	- AZO-33	10.0	46.73	0.21	10.0
2.85	- NYTAL 300	45.0	23.78	1.89	45.0
2.71	- SNOWFLAKE	40.0	22.61	1.77	40.0
4.12	- TiO_2	10.0	34.38	0.29	10.0
5.629	- MED. CHROME	20.0	46.97	0.43	20.0
1.12	- 24% LEAD	0.4	9.35	0.04	0.26
0.93	- 6% COBALT	0.2	7.76	0.03	0.13
0.906	- EXKIN # 1	0.6	7.56	0.08	175.39
0.805	- MEK	18.0	6.72	2.68	
0.727	- HEPTANE	9.0	6.07	1.48	
0.76	- VM&P NAPTHA	10.4	6.34	1.64	
1.0469	- STYRENE OXIDE	0.6	8.74	0.07	
		~~247.6~~		~~19.86~~	
		253.6		20.62	

12.51 LBS./GAL. - CALCULATED
12.27 " - MEASURED
12.30 " - ADJUSTED

70.84% SOLIDS - CALCULATED
69.20 " - MEASURED
69.16 " - ADJUSTED

VOL. SOLIDS - 45.49%
PVC - 48.93%

VOL. SOLIDS

[redacted]
1.82
1.55
1.37
0.05
0.21
1.89
1.77
0.29
0.43
9.38 ÷ 20.62
45.49

* ADD 6 LBS. TOLUENE

PVC
0.21
1.89
1.77
0.29
0.43
4.59 ÷ 9.38 = 48.93

HERCULES INCORPORATED
DATE 11/82 NO. ___
AUTHOR ___

NJ IV HIGH SOLIDS S-20 (WHITE)

Density		LBS.	LBS./GAL.		GAL.	TNV(LE
.8050	- MEK *	123.82 ~~138.00~~	6.72		~~20.536~~ 18.4256	
1.029	- Alkyd	50.00	8.59	(75%)	5.821 (4.366)	37.500
1.16	- Clorafin 40	33.60	9.68		3.471	33.600
1.15	- Epi-Rez 510	2.40	9.60		0.250	2.400
1.63	- Parlon S-20	48.00	13.60	(93%)	3.529 (3.282)	44.640
1.80	- Bentone 38	0.96	15.02		0.064	0.960
5.60	- AZO-33	24.00	46.73		0.525	24.000
2.85	- Nytal 300	36.00	23.78		1.514	36.000
2.71	- Snowflake	153.60	22.61		6.793	153.600
2.82	- Mica 325	36.00	23.53		1.530	36.000
4.12	- TiO_2	96.00	34.38		2.792	96.000
0.93	- 6% Cobalt	0.48	7.76	(71%)	0.062	0.341
1.12	- 24% Lead	0.96	9.35	(64%)	0.103	0.614
0.8729	- Solvesso 100	2.40	7.28	[redacted]	0.330	465.655
0.906	- Exkin #1	1.44	7.56		0.190	
1.0469	- Styrene Oxide	1.44	8.74		0.165	
		~~625.28~~			~~47.675~~	
		611.10			45.565	

13.115 LBS./GAL. - CALCULATED
13.350 " - MEASURED
13.410 " - ADJUSTED

74.47% SOLIDS - CALCULATED
76.20% " - MEASURED
76.20% " - ADJUSTED

VOLUME SOLIDS - 53.96%
PVC - 51.36%

% VOL. SOLIDS

Alkyd - 4.366
C-40 - 3.471
EPI-REZ - 0.250
S-20 - 3.282
Bentone - 0.064
AZO-33 - 0.525
Nytal - 1.514
Snow - 6.793
MICA - 1.530
TiO_2 - 2.792
24.587 ÷ 45.565
53.96%

PVC

NYTAL - 1.514
SNOW - 6.793
MICA - 1.530
TiO_2 - 2.792
12.629 ÷ 24.587
51.36%

* ASSUMED 14.18 LBS. MEK LOST.

HERCULES INCORPORATED
DATE 11/82 NO
AUTHOR

NJ IV - PULPEX (WHITE)

DENSITY		LBS.	LBS./GAL.	GAL.	TNV (LBS
0.805	- MEK * 108.06 ~~120.0~~		6.72	~~17.857~~ 16.08	
1.029	- Alkyd	41.6	8.59	4.842 (3.632)	31.2
1.16	- Clorafin 40	30.0	9.68	3.099	30.0
1.63	- Parlon S-20	40.0	13.60	2.941 (2.735)	37.2
1.80	- Bentone 38	0.8	15.02	0.053	0.8
5.60	- AZO-33	20.0	46.73	0.427	20.0
2.85	- Nytal 300	70.0	23.78	2.943	70.0
2.71	- Snowflake	60.0	22.61	2.653	60.0
4.12	- TiO_2	80.0	34.38	2.326	80.0
0.2025	- Pulpex P-ADHR	2.4	1.69	1.420	2.4
1.12	- 24% Lead	0.8	9.35	0.085	0.52
0.93	- 6% Cobalt	0.4	7.76	0.051	0.26
0.8729	- Solvesso 100	2.0	7.28	0.274	332.38
0.906	- Exkin #1	1.2	7.56	0.158	
1.0469	- Styrene Oxide	1.2	8.74	0.137	
		~~470.4~~		~~39.266~~	
		458.46		37.489	

11.98 LBS./GAL. - CALCULATED
12.49 " - MEASURED
12.23 " - ADJUSTED

70.66 % SOLIDS - CALCULATED
72.50 % " - MEASURED
72.50 % " - ADJUSTED

51.45 % - VOLUME SOLIDS
43.29 % - PVC

* ASSUME 11.94 LBS. MEK LOST.

% VOL. SOLIDS
3.632
3.099
2.735
0.053
0.427
2.653
2.943
2.326
1.420
19.288 ÷ 37.489
51.45 %

PVC
0.427
2.943
2.653
2.326
8.349 ÷ 19.288 = 43.29

HERCULES INCORPORATED
DATE 11/82 NO.
AUTHOR

NJ IV - CELLOLYN 604 (White)

DENSITY		LBS.	LBS./GAL.		GAL.	TNV(LBS
.805	- MEK* 123.49 ~~138.0~~		6.72		~~20.535~~ 18.376	
1.003	- Cellolyn 604	59.8	8.37	(60.5%)	7.144 (4.322)	36.179
1.16	- Cloraflin 40	34.5	9.68		3.564	34.500
1.63	- Parlon S-20	46.0	13.60	(93%)	3.382 (3.145)	42.780
1.80	- Bentone 38	0.92	15.02		0.061	0.920
5.60	- AZO-33	23.0	46.73		0.492	23.00
2.85	- Nytal 300	80.5	23.78		3.385	80.50
2.71	- Snowflake	69.0	22.61		3.051	69.00
4.12	- TiO_2	92.0	34.38		2.675	92.00
0.93	- 6% Cobalt	0.46	7.76		0.059	0.29
1.12	- 24% Lead	0.92	9.35		0.098	0.59
0.8729	- Solvesso 100	2.3	7.28		0.315	379.77
0.906	- Exkin #1	1.38	7.56		0.182	
1.0469	- Styrene Oxide	1.38	8.74		0.157	
		~~550.16~~			~~45.100~~	
		535.65			42.941	

12.198 LBS./GAL. - CALCULATED
12.410 " - MEASURED
12.47 " - ADJUSTED

69.03 % SOLIDS - CALCULATED
70.90 % " - MEASURED
70.90 % " - ADJUSTED

Volume Solids - 48.19 %
PVC - 46.40 %

% Vol. Solids
4.322
3.564
3.145
0.061
0.492
3.385
3.051
2.675
20.695 ÷ 42.941
48.19 %

PVC
0.492
3.385
3.051
2.675
9.603 ÷ 20.695 = 46.40 %

* ASSUMED 14.51 LBS. MEK LOST

HERCULES INCORPORATED

DATE ____ NO. ____

AUTHOR ____

NJ IV - FLA. PIGM. (WHITE) (LOW PRIME)

	LBS.	LBS./GAL.	GAL.	TNV (LBS.)
MEK	120.0	6.72	17.857	
Alkyd	41.6	8.59	4.842 (3.632)	31.2
Clordin 40	30.0	9.68	3.095	30.0
Parlon S-20	40.0	13.60	2.941 (2.735)	37.2
Bentone 38	0.8	15.02	0.053	0.8
Azo-33	20.0	46.73	0.021	20.0
Nytal 300	40.0	23.78	1.682	40.0
Snowflake	87.0	22.61	3.847	87.0
Mica 325	20.0	23.53	0.849	20.0
TiO_2	40.0	34.38	1.163	40.0
24% Lead	0.8	9.35	0.085	0.52
6% Cobalt	0.4	7.76	0.051	0.26
Aromatic 100	2.0	7.28	0.274	306.98
Exkin #1	1.2	7.56	0.158	
Styrene Oxide	1.2	8.74	0.137	
	445.0		37.055	

12.009 LBS./GAL. - CALCULATED
11.930 - MEASURED

68.98% SOLIDS - CALCULATED
69.00% " - MEASURED

VOLUME SOLIDS - 46.31%
PVC - 44.06%

% VOL. SOLIDS

3.632
3.095
2.735
0.053
0.021
1.682
3.847
0.849
1.163
0.085
17.162 ÷ 37.055
46.31%

PVC

0.021
1.682
3.847
0.849
1.163
7.562 ÷ 17.162 = 44.06

HERCULES INCORPORATED
DATE 11/82 NO. —
AUTHOR —

NJ IV HIGH SOLIDS S-20 - YELLOW

DENSITY		LBS.	LBS./GAL.	GAL.	TNV
.805	- MEK *	102.88 ~~100.00~~	6.72	~~14.911~~ 15.31	
1.029	- ALKYD	50.00	8.59	(75%) 5.820 (4.365)	37.495
1.16	- Cloroflin 40	33.60	9.68	3.471	33.599
1.15	- Epi-Rez 510	2.40	9.60	0.250	2.400
1.63	- Parlon S-20	48.00	13.60	(93%) 3.529 (3.282)	44.635
1.80	- Bentone 38	0.96	15.02	0.064	0.960
2.85	- Nytal 300	36.00	23.78	1.514	36.000
2.71	- Snowflake	148.00	22.61	6.546	148.000
2.82	- Mica 325	36.00	23.53	1.530	36.000
5.629	- Med. Chrome	104.00	46.97	2.214	104.000
0.93	- 6% Cobalt	0.48	7.76	(71%) 0.062	0.341
1.12	- 24% Lead	0.96	9.35	(64%) 0.103	0.614
0.8729	- Aromatic 100	2.40	7.28	0.330	444.044
0.906	- Exkin # 1	1.44	7.56	0.190	
1.0469	- Styrene Oxide	1.45	8.74	0.165	
		~~573.68~~		~~41.057~~	
		568.56		41.10	

13.705 LBS./GAL. - CALCULATED
13.700 " - MEASURED
13.83 " - ADJUSTED

77.40% SOLIDS - CALCULATED
78.10% " - MEASURED
78.10% " - ADJUSTED

Volume Solids - ~~55.51%~~ 56.54%
PVC - 50.80%

% VOL. SOLIDS

Alkyd - 4.365
C-40 - 3.471
S-20 - 3.282
Epi-Rez - 0.250
Bentone - 0.064
Nytal - 1.514
Snowflake - 6.546
Mica 325 - 1.530
Med. Chrome - 2.214
23.236 ÷ ~~41.85~~ 41.1
~~55.51%~~ 56.54

PVC

Nytal - 1.514
Snowflake - 6.546
Mica 325 - 1.530
Med. Chrome - 2.214
11.804 ÷ 23.236
50.80%

* 5.12 LBS. MEK LOST

HERCULES INCORPORATED
DATE 11/82 NO
AUTHOR

MIX IV - PULPEX (YELLOW)

DENSITY		LBS.	LBS./GAL.	GAL.	TAV
0.805	- MEK *	94 ~~116.5~~	6.72	13.988 ~~14.475~~	
1.029	- Alkyd	41.6	8.59	4.842 (3.632)	31.2
1.16	- Chlorlin 40	30.0	9.68	3.099	30.0
1.63	- Parlon S-20	40.0	13.60	2.941 (2.735)	37.2
1.80	- Bentone 38	0.8	15.02	0.053	0.8
2.85	- Nytal 300	30.0	23.78	1.261	30.0
2.71	- Snowflake	140.0	22.61	6.191	140.0
5.629	- Med. Chrome	90.0	46.97	1.916	90.0
0.2025	- Pulpex P-ADHR	2.5	1.69	1.479	2.5
1.12	- 24% Lead	0.8	9.35	0.085	0.52
0.93	- 6% Cobalt	0.4	7.76	0.051	0.26
0.8729	- Solvesso 100	2.0	7.28	0.274	362.48
0.906	- Exkin #1	1.2	7.56	0.158	
1.0469	- Styrene Oxide	1.2	8.74	0.137	
		~~475.5~~		~~39.600~~	
		474.5		36.475	

12.51 LBS./GAL. - CALCULATED
13.14 " - MEASURED
13.01 " - ADJUSTED

73.15 % SOLIDS - CALCULATED
76.40 " - MEASURED
76.39 " - ADJUSTED

Volume Solids - 55.84 %
PVC - 46.00 %

% VOL. SOLIDS
3.632
3.099
2.735
0.053
1.261
6.191
1.916
1.479
20.366 ÷ 36.475
55.84

PVC
1.261
6.191
1.916
9.368 ÷ 20.366 = 46.00

* Assume 21.0 LB. MEK LOSS

NL IN - CELLOLYN 604 (YELLOW)

HERCULES INCORPORATED
DATE 11/6- NO.
AUTHOR

	LBS.	LBS./GAL.	GALS.	TMV
MEK *	105.8 ~~115.0~~	6.72	~~17.115~~ 15.74	
Cellolyn 604	52.0	8.37 (60.5%)	6.212 (3.758)	31.4
Cloisite 40	30.0	9.68	3.099	30.0
Parlon S-20	40.0	13.60	2.941 (2.735)	37.2
Bentone 38	0.8	15.02	0.053	0.8
Nytal 300	30.0	23.78	1.261	30.0
Snowflake	140.0	22.61	6.191	140.0
Mod. Chrome	90.0	46.97	1.916	90.0
24% Lead	0.8	9.35	0.085	0.5
6% Cobalt	0.4	7.76	0.051	0.2
Solvesso 100	2.0	7.28	0.274	360.2
Exkin #1	1.2	7.56	0.158	
Styrene Oxide	1.2	8.74	0.137	
	~~503.4~~		~~37.491~~	
	494.2		38.12	

12.75 LBS./GAL. - CALCULATED
12.78 " - MEASURED
12.96 " - ADJUSTED

71.56 % SOLIDS - CALCULATED
72.90 " - MEASURED
72.9 " - ADJUSTED

Volume Solids - ~~48.15%~~ 49.88%
PVC - 49.27%

% VOL. SOLIDS

3.758
3.099
2.735
0.053
1.261
6.191
1.916
19.013 ÷ ~~38.491~~ 38.12
~~48.15%~~
49.88%

PVC
1.261
6.191
1.916
9.368 ÷ 19.013
49.27%

* 9.2 LBS. MEK LOST.

HERCULES INCORPORATED

DATE 11/82 NO. ____

AUTHOR ____

T.I.V. - FLA. PIGMENTATION (YELLOW) (LOW PRIME)

		LBS.	LBS./GAL.	GAL.	T.I.V.
MEK *	-	~~115.0~~ 111.36	6.72	16.57~~17.11~~	
ALKYD	-	41.6	8.59	4.84 (3.68)	31.2
CLORAFIN 40	-	30.0	9.68	3.10	30.0
PARLON S-20	-	40.0	13.60	2.94 (2.74)	37.2
BENTONE 38	-	0.8	15.02	0.05	0.8
NYTAL 300	-	45.0	23.78	1.89	45.0
SNOWFLAKE	-	138.0	22.61	6.10	138.0
MICA 325	-	20.0	36.00	0.56	20.0
MED. CHROME	-	23.2	46.97	0.49	23.2
24% LEAD	-	0.8	9.35	0.09	0.52
6% COBALT	-	0.4	7.76	0.05	0.26
SOLVESSO 100	-	2.0	7.28	0.27	326.18
EXKIN #1	-	1.2	7.56	0.16	
STYRENE OXIDE	-	1.2	8.74	0.14	
		~~459.2~~		~~37.79~~	
		455.56		37.25	

12.15 LBS./GAL. - CALCULATED
12.15 " - MEASURED
12.23 " - ADJUSTED

71.03% SOLIDS - CALCULATED
71.60% " - MEASURED
71.60% " - ADJUSTED

VOLUME SOLIDS - 49.83%
PVC - 48.71%

VOL. SOLIDS
3.63
3.10
2.74
0.05
1.89
6.10
0.56
0.49
18.56 ÷ 37.25
49.83

PVC
1.89
6.10
0.56
0.49
9.04 ÷ 18.56 = 48.71

* ASSUMED 3.64 LBS. MEK LOST.

DENVER EXPOSURE RATING SUMMARY
6 MONTHS INTERSTATE 70

	WHITE		YELLOW	
PAINT	CONCRETE	ASPHALT	CONCRETE	ASPHALT
NJ	48	48	47	45
WY	32	42	40	43
PA	33	48	39	39
IL	10*	14*	23*	13*
IN	8*	13*	--	--
NB	--	--	12*	9*
AZ	7*	7*	11*	9*
NM	8*	11*	9*	7*
OR	5*	4*	10*	12*
CO-CR	44	40	42	37
CO-AK	25*	46	32*	43
WY-AK	20*	45	19*	23*
NJ	48	48	47	45
HS	45	46	46	48
PULPEX	52	47	47	48
604	45	44	46	50
LO PRIME	49	50	43	38

*FAILURE

DENVER EXPOSURE DATA
6 MONTHS INTERSTATE 70
ASPHALT YELLOW

PAINT	APPEARANCE	DURABILITY	REFLECTANCE	RATING
NJ	5.5	5.6	30	45
WY-CR	5.1	5.3	29	43
PA	4.5	4.7	27	39
IL	1.2*	.9*	16*	13*
OR	.9*	1.3*	14*	12*
AZ	.8*	.5*	12*	9*
NB	.8*	.7*	10*	9*
NM	.8*	.3*	11*	7*
CO-CR	4.3	4.7	25	37
CO-AK	5.7	5.3	25	43
WY-AK	2.7*	2.8*	17*	23*
NJ	5.5	5.6	30	45
HS	6.3	6.3	24	48
PULPEX	6.3	6.3	25	48
604	6.5	6.7	27	50
LO PRIME	5.0	4.7	22	38

*FAILURE

DENVER EXPOSURE DATA
6 MONTHS INTERSTATE 70
ASPHALT WHITE

PAINT	APPEARANCE	DURABILITY	REFLECTANCE	RATING
NJ	5.4	6.0	33	48
PA	6.0	5.8	30	48
WY-CR	5.3	5.3	26	42
IL	1.6*	1.1*	16*	14*
IN	.8*	1.5*	14*	13*
NM	1.3*	.7*	13*	11*
AZ	.7*	.2*	10*	7*
OR	0*	0*	10*	4*
CO-CR	4.9	4.9	26	40
CO-AK	5.7	5.5	30	46
WY-AK	5.5	5.3	31	45
NJ	5.4	6.0	33	48
HS	5.5	5.8	30	46
PULPEX	5.9	5.8	30	47
604	5.3	5.4	29	44
LO PRIME	6.5	6.1	31	50

*FAILURE

DENVER EXPOSURE DATA
6 MONTHS INTERSTATE 70
CONCRETE YELLOW

PAINT	APPEARANCE	DURABILITY	REFLECTANCE	RATING
NJ	6.0	6.0	27	47
WY-CR	5.0	4.8	25	40
PA	4.7	4.3	30	39
IL	2.8*	2.2*	19*	23*
NB	.8*	1.3*	13*	12*
AZ	1.1*	.6*	14*	11*
OR	.7*	.7*	14*	10*
NM	.8*	.4*	13*	9*
CO-CR	5.5	5.0	26	42
CO-AK	3.8*	3.9*	21	32*
WY-AK	2.0*	2.2*	15*	19*
NJ	6.0	6.0	27	47
HS	5.8	6.2	24	46
PULPEX	6.0	6.3	25	47
604	6.3	6.1	24	46
LO PRIME	5.3	6.0	22	43

*FAILURE

DENVER EXPOSURE DATA
6 MONTHS INTERSTATE 70
CONCRETE WHITE

PAINT	APPEARANCE	DURABILITY	REFLECTANCE	RATING
NJ	6.1	5.8	30	48
PA	3.7	3.7	28	33
WY-CR	3.7	3.7	24	32
IL	1.0*	.5*	14*	10*
IN	.8*	.3*	12*	8*
NM	.7*	.3*	13*	8*
AZ	.7*	.2*	12*	7*
OR	0*	0*	12*	5*
CO-CR	5.8	5.3	27	44
CO-AK	2.4*	2.6*	24	25*
WY-AK	1.9*	1.8*	21	20*
NJ	6.1	5.8	30	48
HS	5.8	5.4	29	45
PULPEX	6.7	6.5	30	52
604	5.7	5.3	30	45
LO PRIME	6.3	6.0	31	49

*FAILURE