R-158

STUDY OF 1950 TRAFFIC PAINT OPERATIONS

DO NOT REMOVE FROM LIBRARY

Part of a General Investigation of Reflectorized Pavement Marking Paints Devoted to the improvement of materials and application methods.

Highway Research Project 47 G-36

Research Laboratory Testing and Research Division Report No. 158 March 15, 1951

STUDY OF 1950 TRAFFIC PAINT OPERATIONS

This is a report concerning an investigation of traffic marking paint operations for the 1950 season. The study was made at the request of Commissioner Charles M. Ziegler at a meeting held January 20, 1950, with respect to the Department's 1950 pavement marking program. It was agreed at that meeting that the research program should include the following objectives.

1. Hold a school for the paint crew personnel and roving superintendents to be handled jointly by the Maintenance, Planning and Traffic, and Testing and Research Divisions.

2. Keep daily records of the operations of each paint rig, including number of hours and lengths of striping.

3. The assignment of a representative of the Testing and Research Division to follow actual field applications and study all factors affecting wearing qualities.

All objectives were successfully completed and will be reported on as presented above.

PAINT SCHOOL

The paint school was held at Department Maintenance Garage in Mount Pleasant May 2 through May 5, 1950. All phases of traffic paint operations, applicable to paints, beads, and application details were discussed before the group by personnel from the Testing and Research laboratories, Planning and Traffic and Maintenance Divisions. The paint crews were also instructed on what was expected in the matter of securing field information and recording data.

At this time special field kits were made available to the paint crew foremen, each containing 1 wind gage, 1 sling psychrometer, 3 thermometers, 1 bottle of distilled water, 1 magnifying glass, pencils, printed forms and clean cloths, and the men concerned were instructed in the use of these instruments.

It was understood that each paint crew foreman would assume the responsibility of seeing that all record forms, samples appended, would be filled out completely, including two recordings in the morning and two in the afternoon. In addition, samples of the stripes would be taken at these same times, when possible, by the foremen, by placing metal "tins" where these would be passed over by the spray guns and bead dispensers. The tins were furnished by the Research Laboratory.

It was also arranged that Mr. Tom Green of Testing and Research Division would act in the capacity of inspector and observer, and would visit each of the paint crews in rotation throughout the State, wherever they should be operating at the time. Mr. Green was equipped with duplicate apparatus, and with forms to be filled out personally.

Complete daily operational records are in the Maintenance Division files.

FIELD OBSERVATIONS

The arrangements agreed upon at the paint school worked out fairly well during the course of the painting season, in spite of the added burden placed on the men. In general, the persons who actually took down the data are to be complimented on doing a good job. Nearly a thousand determinations were made of air temperature, air movement, slab temperature and relative humidity, and over half a thousand determinations of air pressures and drying times for white, yellow and black paint.

- 2 -

Hundreds of actual field samples were received by the laboratory. Field data has been summarized in Table I for reference.

The importance of relative humidity on drying time of paint and operation conditions was for the first time clearly revealed by the study. Further, additional data were secured on the phenomenon of paint wetting of beads and its effect on wearing properties of the paint stripe. Effect of Relative Humidity on Drying Time of Paint

Soon after field operations had started, the paint crews encountered abnormally long drying times. This caused considerable tracking in dense traffic areas. A special study of the situation revealed that the prevailing high relative humidity at the time of paint application was causing the trouble.

Figure 1 shows the daily variation in relative humidity values for the State of Michigan over a five-year period for the months of June through August. From the curves in Figure 1, it may be observed that, at the time paint crews would ordinarily start operating in the morning, 7:30 A.M., the relative humidity would be in the neighborhood of 70 to 90 percent, then dropping to 40 to 60 percent around noon, gradually increasing in the afternoon. The inference from these data would be that painting operations should not start before 8:30 or 9:00 in the morning.

In view of this situation, instructions relative to painting, Supplement No. 3, were issued on June 20, 1950, to the effect that: "If the relative humidity is not more than 65 percent, and is falling it shall be considered satisfactory to paint. If, however, the relative humidity is more than 60 percent, and is rising, painting shall be deferred until the humidity drops below 65 percent and continues to fall."

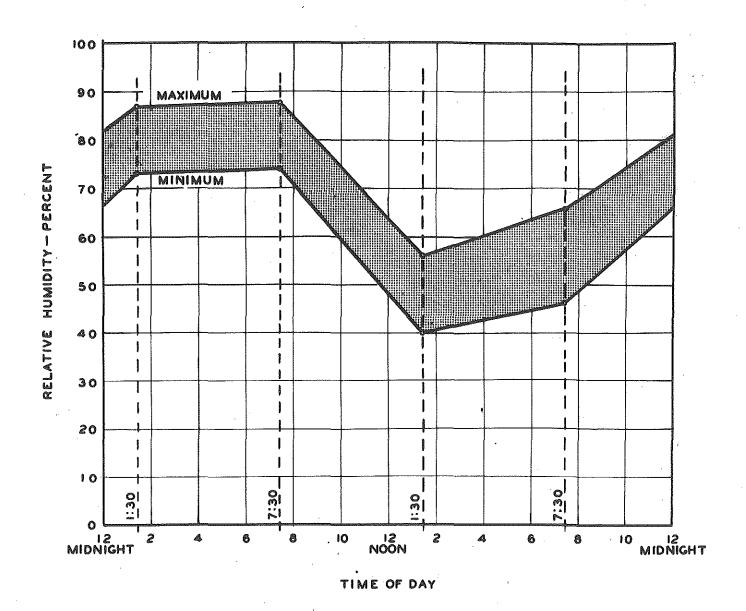
- 3 -

Air temp.,							Slab t	temp.,	White paint				[Yе	1 1 o w	pa.	int		Black pa							
()	degre	es F.	perc	ent	m.p	».h.	degree	es F.		pressu			Drying				ssure,			time,			essure,		Drying time, ave., minutes	
Crew No.	Cases	Ave.	tve. Cases	Ave.	Cases	Ave.	Cases	Ave.	average, psi. On paint Atomization		ave.,	minutes	avera On pa		psi. Atomiza	tion	ave.,	minutes	averag On pai	ge, j int L	psi. Atomizat	tion	ave., :	minutes		
		temp.		rel. hum.		velocity		temp.	Cases		Cases		Cases	min.	Cases		Cases		Cases	mîn.	Cases				Cases	min.
	λ	1	I	1	1	1	1	I	1	۱.		1		port	1	1		1	I	1	I	1 1		į	1	1
	T	1	1	1	ſ		Í	1	1		5 0 0 0	, <u>, , ,</u>	S NG	1 0 1 0	r	1 1		T	ĺ	ľ	1]	1			<u>г</u>
1	12	82	12	69	12	6.7	12	100	5	55 79	5	75 88	5	29	11	55 63 57 50	11	75	11	33	11	31	11	75	- 11	15
3. 4.	18 36	69 73	18 36	61 69	19 36	13.8 12.5	19 37	78	8 28	89	8 28	91 91	7 30	36 50	11 12	63	11 12	76	9 13	47 53	13 34	33 56 41 65	13 34	45 72	11 36	24 17
5	23	73	23	69	23	11.3	23	88	16	52	16	79	19	62	14	50	14	77	21	52	16	41	16	79	13	12
6	33	73	33	72	32	9.9	34	84	20	95	20	92	20	54	7	95	7	102	7	43	16 25	65	25	91	25	19
7	29	77	29 30	60 52	26 29	8.0 11.8	26 25	95 74	16 20		16 20	73 86	13 15	35	5	61	5 7	71 79	7	27 47	31 61	47 38	31 61	57 56	24 57	24 16
Totals (1) 181	1 00	181	52	177	XT . O	176	1 (4	113		113	00	109	. 50	67		67	19	74	41	191	06	191	50	21 177	
Ave s (1)	73		65	- 11	10.9	-10	87		77		85	10/	51		61	01	78	14	45	-/-	46	171	66		1.8
7 (a)	17	73	7	68	9	7.4	6	88	1 7	69	7	79	4	35	1	65	1	75	3	21						
8 (a)	38	76	38	60	37	12.2	36	95	30		18	106	25	30	15	70	15	80	13	32						
Totals (45		46		42		37		25		29		16		16		16	ĺ	·			-		
Avels (2)	76		61		11.3		94		92		98		31		70		79		30						
Totals (3) 226		226		223		218		150	1	138		138		83		83		90		191		191		177	
Ave's (73		64	-	10.9		88	-	80	-	87		46		63	5	79		42		46		66	, ,	18
		1	<u> </u>		l		L	l	4	<u> </u>		1		<u></u>	l	<u>I I</u>		<u> </u>		L	<u> </u>	ì	<u> </u> 	l) I I	i	
	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	, 1	1 17/1/////////////////////////////////	l Ramonman (Think Marked Sain)	, Y		, 		1	?air	at C	rew	s'Re	port	\$	· · ·	. <u></u>		, <u>,</u>		, ,	r Potosenne	, ,	,		
1	34	68	34	59	34	9.6	31	75	5	54	5	68	5	36	29	56	29	69	24	32 .	21	39	21	70	20	26
3	122	71	122	59	119	11.4	120	81	66		66	81	59	47	99	68	99	81	97	41	112	39 36	112	59	111	25
4	.96 172	71	96 171	57	92 123	11.2 11.4	96 162	81 84	59 66	83	59 66	84 31	45 75	47 61	27 108	58 50	27 108	71 81	21 110	34	74	55 39	74	72	70 127	18 27
26	132	69	132	52 58	132	14.3	127	73	67		68	85	55	42	29	66	29	87	21	45 45	139 105	62	139 106	81 89	94	31
7	85	75	85	60	85	12.5	84	77	56	56	56	66	56	33	11	55	11	65	11	36	105 75	50	75	60	73	34
8	55	71	54	63	55	11.0	53	79	38	74	38	82	39	48	17	67	17	78	1.6	33	42	39	42	53	34	30
	4) 696		694		640		673		357		358		334		320		320		300		568		569		529	
Ave!s (4)	71		58		12.0		79		65		80		47		59		79		41		46	Į	72		28
Totals (5) 877		875		817		849		470	4	471		443		387		387		374		759		760		706	
Ave's (5)	71		59		11.7		81		68		81	-	43		60	. .	79	-	42		46		70		25
Totals (6) 922		920		863		891		507		496		492		403		403]	390		759		760		706	
Avels (6)	71		59		11.7		81		70		82		45		60		79		41		46	ļ	70		25

TRAFFIC MARKING STRLPE DATA 1950 Construction Season

Notes: Totals (1) and Averages (1) are for Districts 1-3, inspector's reports. Totals (2) and Averages (2) are for Districts 7,8; inspector's reports for white and yellow, 4 lb/gal. No. 2 beads ing 2 lb/gal No. 1 beads on, Totals (3) and Averages (3) are Totals (1) plus (2) and Averages of Averages (1) and (2). Totals (4) and Averages (4) are for Districts 1-3, paint crews' reports. Totals (5) and Averages (5) are Totals (1) plus (4) and Averages of Averages (1) and (4); white and yellow have 6 lb/gal No. 1 beads on paint, no beads in. Compare with Averages (2) Totals (6) and Averages (6) are Grand Totals and Grand Averages of all reports for all M.S.H.D. 1950 standard practice, including both Type 1 and Type 2 bead application.

TABLE I



MAXIMUM-MINIMUM MONTHLY MEAN RELATIVE HUMIDITY

INCLUDING JUNE - JULY - AUGUST - FOR 5 YEAR PERIOD - 1945-1949 LANSING, MICH.

FIGURE I

By Supplement No. 4, dated June 26, Supplement No. 3 was corrected as follows: "<u>Notice is hereby given to all paint spray crews that</u>, <u>effective immediately, painting shall not be started prior to 8:30 A.M.</u> <u>Painting shall be continued for a regular working day thereafter.</u>" All supplementary instructions relative to painting operations including Supplements 1 through 4, are appended to this report.

A breakdown of all field reports of average daily relative humidity by months is shown below.

Month	Average Relative Humidity in Percent
March	56
June	60
July	64
August	62
September	62
October	69

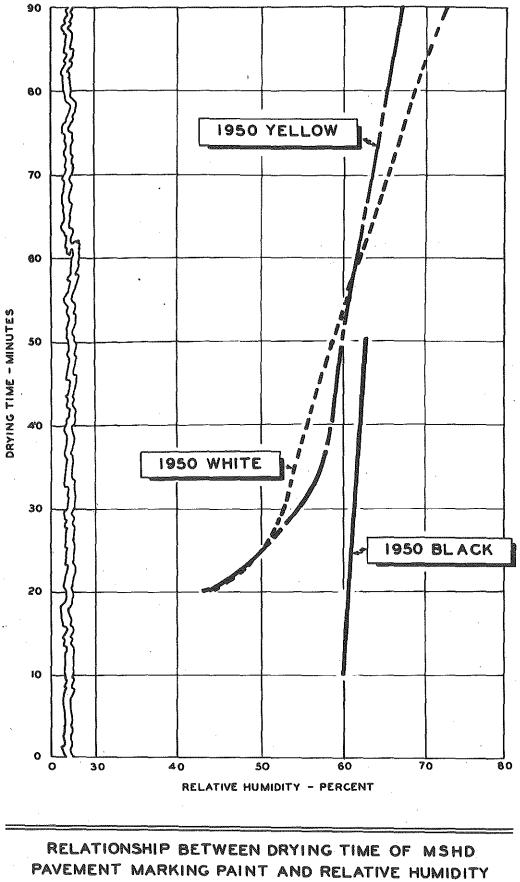
The data from field reports show a pronounced and definite relationship between drying time and relative humidity for both white and yellow paints. No such relationship was noted in the case of black paint products. See Figure 2. It is indicated from the curves in Figure 2 that in case of white and yellow paints, drying times from 20 to 60 minutes may be expected as normal. However, wind velocity, air, and pavement temperature will have considerable influence in lowering this figure in many instances.

Durability in Relation to Climatic Conditions

Until such time as further condition surveys have been made, little can be said about the effect of climatic conditions during painting upon the durability of the paint stripes.

There is, however, some early evidence that relative humidity at the time and site of application is without effect on the durability of standard

- 4 -



AT TIME AND SITE OF APPLICATION

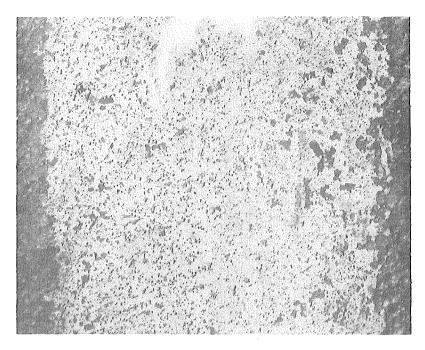
traffic marking stripes applied this year. See Figures 3 and 4. Further surveys will be required to substantiate or disprove this. Wetting of Beads by Paint in Relation to Stripe Durability

It has been recognized that the surface attraction between paint and bead, which results in the wetting or non-wetting of the bead by the paint, must have considerable bearing on the length of time the bead remains embedded in the paint under constant bombardment by traffic and the elements and thus a pronounced effect on ultimate life of the paint stripe. Paints exhibiting a high tendency to climb up the sides of the beads and form deep, high-walled craters should be expected to retain the beads longer than paints which do not wet the beads as extensively or which may even repel the glass surfaces.

An attempt was made to follow the wetting of the beads by 1950 traffic paint and to compare this with other paint-bead combinations whose wetting properties have been recorded.

Reference to Figures 5 through 12 shows the excellent wetting of 1950 beads by 1950 white and yellow paints as compared with very poor wetting in the case of 1949 beads and paint.

- 5 -





1950 WHITE,US-16-WEST OF PORTLAND AT 5 MONTHS. APPLIED AIR TEMP 70°F; REL.HUMIDITY 36%; CLEAR. PAINT REMAINING 70 % OCTOBER 18 1950.

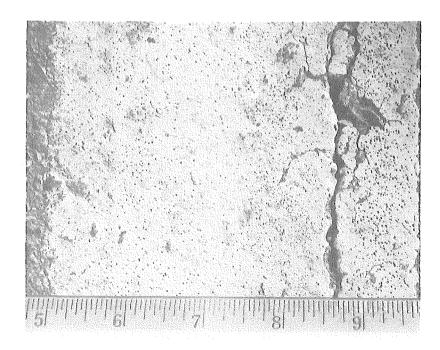


FIGURE 4 1950 WHITE;US-27-S.OF ST. JOHNS, AT 5 MONTHS. APPLIED AIR TEMP. 85°F. REL.HUMIDITY 66%, OVERCAST. PAINT REMAINING 85%, OCTOBER 20,1950.

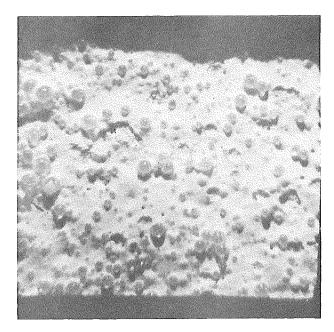
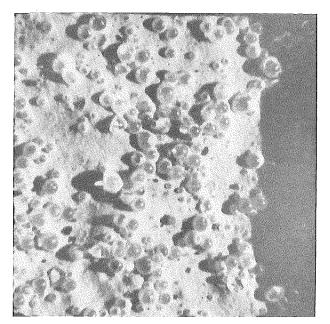
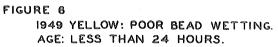


FIGURE 5 1949 WHITE: POOR BEAD WETTING. AGE: LESS THAN 24 HOURS.





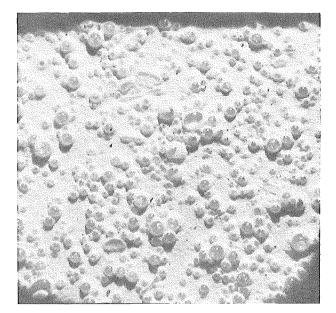


FIGURE 7 1950 WHITE: EXCELLENT BEAD WETTING. AGE: LESS THAN 24 HOURS.



FIGURE 8 1950 YELLOW: EXCELLENT BEAD WETTING. AGE: LESS THAN 24 HOURS.

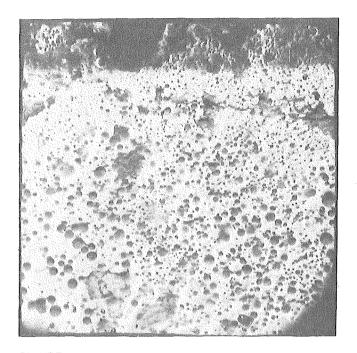


FIGURE 9 1949 WHITE: TOTAL BEAD LOSS, US 16 - EAST LANSING - WILLIAMSTON AGE: 7 1/2 MONTHS.

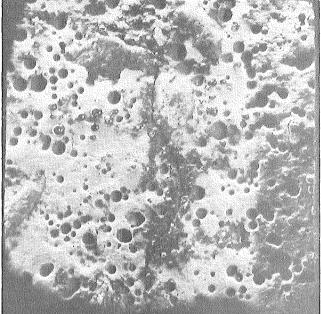
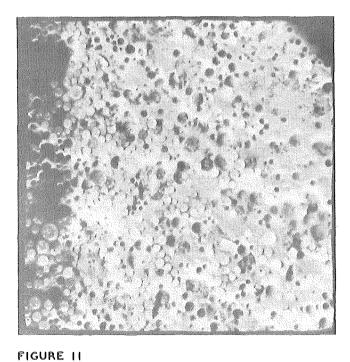


FIGURE 10 1949 YELLOW: LARGE BEAD LOSS, US 16 - EAST LANSING - WILLIAMSTON AGE: 7 1/2 MONTHS.



ISORE II 1950 WHITE: BEADS INTACT, PAINT GOOD. US 16 - EAST LANSING - WILLIAMSTON AGE: 8 MONTHS.

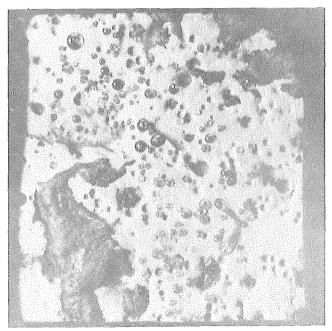


FIGURE 12 1950 YELLOW: BEADS INTACT, PAINT GOOD. US 16 - EAST LANSING - WILLIAMSTON AGE: 8 MONTHS.

SPECIAL TEST AREAS

During the course of the 1950 painting program, special traffic stripe test areas were established on M-43 between Lansing and East Lansing, on M-43 and US-16 in East Lansing, on US-16 west of Lansing City Limits, on US-27 at North City Limits of Lansing, and on US-16 between Fowlerville and New Hudson. In these test areas, paints and beads from various manufacturers were applied to determine the wearing qualities and bead retention properties of these traffic paints as compared to the Department's specification materials.

Personnel of the Testing and Research Division have made periodic inspections of these test installations and the results of their findings will be presented shortly in a separate report as a part of the Research Laboratory's general investigation on traffic marking paints.

SUMMARY

I. The following changes were made in 1950 operating conditions which were bound to give better traffic stripe performance in 1950 as compared to 1949.

- 1. The efficiency of the paint crews was materially increased by the paint school. Not only was the knowledge of the men increased on the subject of traffic paints, beads, and their application, but they were imbued with the desire to do a better job because of the interest being shown by the Administration.
- 2. The influence of humidity on drying time of the paint was determined and consequently immediate steps were taken to conform painting operations with humidity conditions to decrease drying time and insure minimum of tracking. Instructions were issued accordingly to all paint crews.
- 3. Better wetting of the beads by both 1950 white and yellow paints was obtained through modification of 1949 paint formulas.
- 4. The modifications in 1949 paint formulas were also directed toward producing a longer life product for 1950.
- 5. Better police control was experienced in 1950. More State Police were made available to control traffic, They were also more severe on persons crossing fresh traffic stripes. Scheduling of paint operations was better than in the past.
- 6. A greater educational program was put into effect by the Department through news release and radio warning motorists not to cross freshly painted traffic stripes.

II. As a result of the continuous field study during the 1950 painting program, additional changes have been made in 1950 paint and bead specifications which should produce even better wearing qualities for 1951. They are:

- 1. The diameter of the beads has been reduced to insure better penetration into the paint film and thus produce better bond and consequently impart longer wearing qualities to the stripe.
- 2. The white paint formula has been modified to produce a harder paint film, thus improving its wearing properties.

III. It is possible to realize even better paint wearing qualities through the following improvements:

- 1. Use of a paint stripe with small beads premixed in the paint and a quantity of large beads applied on top of the paint film.
- 2. By continuing studies to improve paint formulas, beads, and application methods.

CONCLUSION

Through the concerted efforts of those involved in the 1950 paint program there has resulted a definite improvement in workmanship accompanied by a marked increase in production. Also the wearing qualities and bead retention properties of the 1950 traffic paints have been found to be considerably better than those used in previous years.

Traffic Marking Stripe Investigation Highway Research Project 47 G-36

INSTRUCTIONS FOR TAKING PAVEMENT MARKING DATA

SUPPLEMENT NO. 1

Under item "REMARKS", include the exact number of hours the paint striping machine worked and the exact length in miles of each color and type of striping done during the day.

Research Laboratory Testing and Research Division May 8, 1950

Traffic Marking Stripe Investigation Highway Research Project 47 G-36

INSTRUCTIONS FOR TAKING PAVEMENT MARKING DATA

SUPPLEMENT NO. 2

1. Revision to Supplement No. 1 (5-8-50).

Change the wording "and the exact length in miles of each color and type of striping done during day" to read - "and the total miles of each type of stripe laid during the day".

In other words, disregard the break-down of miles completed each day by color. This information is what you normally record on your daily report sheet.

2. Reports received to date indicate a very cooperative spirit from the paint crews and the data submitted so far is very complete. However, we would like at this time, to stress care in recording data. For example, we note such irregularities as failure to record <u>both</u> air pressures; reversing the recordings of wet and dry bulb readings; also not recording data in proper place on forms. Such things will no doubt disappear as the work progresses.

General information about the work being supplied under "REMARKS" is quite satisfactory and of great value.

Research Laboratory Testing and Research Division May 17, 1950

Traffic Marking Stripe Investigation Highway Research Project 47 G-36

INSTRUCTIONS RELATIVE TO PAINTING

SUPPLEMENT NO. 3

Notice is hereby given to all paint spray crews that, effective immediately, the relative humidity of the air will be considered as a factor in determining whether or not to paint.

If the relative humidity is not more than 65 percent, and is falling, it shall be considered satisfactory to paint. If, however, the relative humidity is more than 60 percent, and is rising, painting shall be deferred until the humidity drops below 65 percent and continues to fall.

The data forwarded to the Laboratory have made possible a correlation of drying time with relative humidity which makes this step appear advisable at this time. It is hoped that by following this procedure, a considerable amount of trouble with traffic pick-up will be eliminated.

> Research Laboratory Testing and Research Division June 20, 1950

Traffic Marking Stripe Investigation Highway Research Project 47 G-36

INSTRUCTIONS RELATIVE TO PAINTING

SUPPLEMENT NO. 4

Notice is hereby given to all paint spray crews that, effective immediately, painting shall not be started prior to 8:30 a.m. Painting shall be continued for a regular working day thereafter.

This supplement does not replace previous instructions but is in addition to them. All provisions of previous supplements are still in effect.

Research Laboratory Testing and Research Division June 26, 1950

	Michigan State Nighway Department Charles M. Ziegler State Highway Commissioner				nt											Research Laboratory Research Project 47 G-36 Observer					
						TRAFFIC	MARKING S	TRIPES ~	FIELD RE1	EOROLOGI	AL ARD PA	VEMENT D	ATA								
u na na Upore	$= \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_$	Б <u>с</u> .		ور به الاستفادية مركز مربوع موسوق من المراجع الم	ی میکند. بیش میکند میکند میکند و این میکند این میکند. همچنی میکند این میکند و این میکند و این میکند این میکند این میکند و این میکند و این میکند. این میکند این میکند و این میکند و این میکند و این میکند و این میکند.	Lo(ention*	یون میں ایک	مه در می می در می در می در می می می می می در می می از می می در می در می می می می می می می می می می می می م	na – na zako konstruktor (konstruktor) – tenen – stanografia andro (konstruktor) – tenen – stanografia	ೆಲ್ಲಿ ನಿರ್ದೇಶವು ಎಂದು ಎಂದು ಕೇಂದ್ರ ಕೆಂದು ಕ ಇದು ಎಲ್ಲಾ ಸುದ್ದಿಗಳುವು ಎಲ್ಲಿ ಕೆಂದು ಕ	ana - 1944 at - 1946 at - 1946 An - 1946 at	an Chanada a san ta gana ang mang ang mang ang mang ang mang na san ta gana ang mang mang mang mang mang mang	алан талан талу - Энн булуун талын талу 1999 - Энн тал талар талар талан талу тал 1999 - Энн булгар талар талар талар талар тал	المراجع المراجع المراجع المراجع		المراجع من المراجع الم المراجع المراجع المراجع المراجع المراجع	د روین میکند. محمد این و میکند (۱۹۹۵ میکند) و میکند (۱۹۹۵ میکند) میکند میکند میکند این و میکند (۱۹۹۵ میکند) و میکند (۱۹۹۵ میکند)	an a	Standburnen directi da structur (ferri i - 1) u - en algorida completa en estador (f 1) u - en algorida en estador (f 1)	
	ral weather conditions		an a gan gut a time again an	na an ang na ang na ang taong	lander fan en de kennen af en sen son af en gelegen (m. e. e. y. e. e. The ends on the ends of the set of the	ngangan, naturagi nggy 156 naturagingan nggy nggy nggy nggy nggy nggy nggy ngg	ాయా ఎసిగా 62 గురిజాగారిపిరిపా ఇంకాలావుగురా గ అద్దారంభుగా ఎస్రోహ్యాసాలు కుపోషారుకుళ్ళాగా క్రిమారాగణా	ander samme ander and an ander and a second and a s	an Barrawan an Internet an Alfrin an Alfr Margina (agus an Alfrin an Alfr	1987 - 18 marking S.200 kernigta atgent atgenty (* 1995) 19. m - 19. marking talenty (* 19. markaty) (* 19. markaty)	ndenn må 1984 i slöke Könn fra skillender söger. Namn må 1984 i slöke Könn fra skille som som som sögerade forsjonder.	l (maa 175 - 51 maan maan ay balan dhiin 1840 - 184 ah	tegentynesterette rafetersende romanenette egye ogeraaderette rafeterse sternaster	aura - manananangi munyun sistan su nu yun ang	nyn y ffind fa statum - y yn charl fan char o a angel arhef mae fennen och angel an angel a sta	annarandig a sunnar seja negaranda - salu ne Kara seja maganakija na 1922 kaj politika senanaraju negaratetete	مىرىكى بىرىكى بىرى بىرىكى ب بىرىكى بىرىكى	understand for for a serie of galaxy and the series of the	ala na sangang pana ngang pana ng pang pang pang	an and a survey a new second as	
i can	of Day 1	3:00	3:30	9:00	9: 30	10:00	10: 30	11100	11:30	12:00	12:30	1:00	1:30	2:00	2:30	3:00	31 30	4:00	43 30	5:00	
- Day Day	Paveneart Alg		Y T - The strength and a set of the	ang ka ang ang ang ang ang ang ang ang ang an		and the second s	n an	n an 1964 - 18 - 19 - 19 - 19 - 19 - 19 - 19 - 19	ultimet Carlston = perio, il Trador Monte (c - anno 1000	an a	الواسية من الا المحمد الله الموافق المحمد الله المحمد المحمد المحمد المحمد المحمد المحمد المحمد المحمد المحمد ا المحمد المحمد		and a fair and a second	ang na ana ang tang tang tang tang tang		generation (1) − (1) − (2) −	a standard og skallen o Skallen og skallen og sk	an gana di sa sa sa gaman da mada di sa di gana di sa	derpront,en n∯erpröße Alforgende (1664 mende i Generation niger pröße Alforgende (1664 mende i Generation i ferende i generation	en men en e	
Tet (tol: Sive humidity							an a	999 999 99 90 00 00 00 00 00 00 00 00 00	25		5	an a						an a constanti a constanti a constanti della constanti a constanti a constanti a constanti a constanti a consta nel constanti a		
Clean	nicipalita i comunicadore una calculata propria comunicada en encontra de comunicada en encontra en encontra en En encontra en encontra encontra encontra encontra encontra encontra encontra encontra encontra en encontra en En encontra e					ο βιαδι με ματοπορίου το το Τηματοπορίου 2 βιαδι με διατρία το το ματοπορία το το στοποίο το						2, 2, 2)			and the second			ا میں دور میں میں دور میں		م. ۵۵. میراند - ۱۰۰۰ میلوی ۱۹۵۰ - ۱۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰۰ - ۲۰ ۲۰۰ - میرسمی - میروندی میکان است.	
Clour Raint			l - 	and a second and a	5		agangar i yina ya Ngaaata na iyo	ىلەر ھەمەركە 21- 10- 10- 10- 10- 10- 10- 10- 10- 10- 1								and the contract of the second		د کې روستېند د د کې ور ورسې	s===• , _, _, _, _, _, _	یند از سال اور	
£ О// ₃	an a		 Solar Constraint and Solar So	2 personal conjunction and a subsection of the second s	المريح من المريح من المريح المريح المريح المريح	andersegne and a second s	a fan sef fan en fan en fan en fan ster fan sefter fan en fan ster fan ster fan en fan ster fan ster fan ster en fan ster fan en fan en fan en fan en fan ster fan en fan ster fan en fan ster fan en fan ster fan ster fan s	2000-000-000-0020-0020-0020-0020-0020-	1997-1998-1998-1998-1998-1998-1998-1998-	an a	,		angengan maga malikansi sa ang palakan ang palakan ang palakansa sa s	a tha angle and the second secon		A determinant is an effective effecti	g alle e men more me () a sour e e gan an you alle a gan a gan	antana ang ang ang ang ang ang ang ang ang	25 - 25 - 26 , 26 , 27 , 27 , 27 , 28 , 29 , 29 , 20 , 20 , 20 , 20 , 20 , 20	20 may may man manager () mager () man	
Party in a start the	Direction Velocity		2 5 6 9 9 9 9 9 9 9 9 9 9 9 9 9	a and a second and a second seco		and an all of a second se	and a second sec	and a subsequence and a sign of a subsection of the subsection of	anga manga ata ang ata	anda , 10 andara - 20 a mar is daga 20 anga 10 ang	ally one has been an	anto Prince Contractor (1997) at the analysis of the Society of th	a fillen for a state of a state o	an a	and a state of the		9 427 428 (1 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -	9 m 20 m 2	aler en	njensji zakonek angele kan kan sekonek ingelek kan kan kan kan kan kan kan kan kan ka	
di 194 Shermer	Type Portland			 	$\mathcal{L} = \sum_{i=1}^{n} (1 - i) \sum_{i=1}^{n} (1 - $	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i$	alanati eta astaria astaria (h. 1960). La la 1970, eta 1970, interneta da astaria (h. 1970).	an a	a tiga manana ta minja an tina ang mang ta sa		alle e se l'angle annu annu an						an a	an The State State Strategy and the State	میں مریک دیک میں کر میں میں کر میں کر	samaan aa aasalaa yoo aa aa aa aa	
	Width	a de la construcción de la constru la construcción de la construcción de			and the second sec	ა კოკი იგიი, კელიკე იკაფიკი, ია სიავი იკი იკი კოკი იგიი, კელიკე იკაფიკი, ია სიავი იკი იკი	n ga ana ang mang mang mang mang mang ma	and the second s		an a	مىرى دەرىكى بىرى يېرى يېرى يېرى يېرى يېرى يېرى يېرى ي	aller och der och soller sollten sollten sollten sollte sollte sollte sollte sollte sollte sollte sollte sollte	ستۇچىنىر مەرىپى مەرىپى مەرىپى بىرى يېرى يېرى يېرى يېرى يېرى يېرى يېرى ي	می در باری میکور بین میکور این می میکور بین میکور می می میکور می میکور می می	and the state and the second sec	n se	an search a thair a fair an	n	ار پار میشود و دارد از بار بیش می در این میشود از این میشود این میشود این میشود این میشود این میشود این میشود ا میشود و می می میشود این می و دارد این می و دارد این میشود این میشود این میشود این میشود این میشود این میشود این	(for magnet generalise constraints of the state software to	
	Mumber of lanes Longitudinal Seal o k			الم الحريق المراجع الم المراجع المراجع	and the same state of the same	ana biç çillereriz eş jarî ter dişariyi ve		geographic and the second	- - 	a second and a second se	an an air an	a Star, Landy all hands in interesting of some		and the second sec		and a second a	an a	an maintean an mailtean an anta anta	agi ujuji usan u alis kujun titi yara stiti g	an a	
	Joint Seal bad			2 	200						and a second grant of a second s	anna an ann an an ann an ann an an an an	C					an a	an a	, , , , , , , , , , , , , , , , , , ,	
ŝ	Vigitaria and a second and as				۰۰ می ایند ایند ایند ایند ایند ایند ایند این	and a second sec	δ (δ ₁₀ − δ ₁₀ − σ ⁻¹) - ¹ δ ¹⁰ - ² δ ²⁰ − ¹ δ ²⁰ - ¹ δ ²⁰ −	↓ processor = samp ² = 5 + 72 + 20 + 100 + 100		n Sang Landon () - San () - San () - San ()	9		, generally and the second sec				1 	al	1999	ang panan da ang kanan ang kanan da kanan ang kanan da ka	
	27.62.0 121.7 ty			2	e e e e e e e e e e e e e e e e e e e								a fan en gegenen gener fan en fan Fernensen en fan en				- 	· · · · · · · · · · · · · · · · · · ·		مىرىنى يېرىنى مەربىيە يېرىكى يېرى يېرىكى يېرىكى	
	Oily Snooth		 Constant of Relinations access 		and a second	e Pereta general to compare a la terrativa Pereta general to compare a la terrativa P		i control of the second state of the second s			an a		farmeline for a fast state of the	alterney with a subject subject of a state of a state of a			-		tementa de constructor en entre d	n an an an an an an an an an Anna an Anna Anna.	
* 0 01 01	Cough Na Sundanana an Salaga		a sets kerne som stationer som		2017 7 10 10 10 10 10 10 10 10 10 10 10 10 10		and a second sec				andressen and a set of a graph of the set of the	an a	a organization and a substantial and a	- 1997 - 1997 - 200 - 1997 - 199		n forman and an an annual and a second se ? 	Annual representation (1) Annual (1)	,, + 1, -, -, -, -, -, -, -, -, -, -, -, -,		ا المن الارتخاب الارتمان ويستهين ومن محمد	
	Dituminous yntches Old paint	a a de la competencia de la co	1 2 2 2 2 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4													2) }		- sand	n ministration and a state of the state of t	
	1977) – C.C. They are a set of the s The set of the																	An and a spin of the state o	unan Brand () ann a suis aige an Anna an Anna a	na na na far anna an an Anna an Anna an Anna an Anna an Anna Anna Anna anna a	
	99999999999999999999999999999999999999		i i i i i i i i i i i i i i i i i i i									A second		and a second secon		and a start we have a provide start of the s				n sang ning nganagan nga nga nga nganagan nganagan nganagan nganagan nga nga	
		··	ی در در میکی رو در در به میکینه به میکرده میک				ana 12,000 a sa sa sa	، باری به محمد این ور برد بر بر در به محمد این ور برد	-97		• مەلەرىيەن يەرىپى بەرىپىرىسى بەرىپىرىسى . مەلەر بەر بەر بىرى بىرىپارىرىيەر بەرىپىرى		ad - na - a - ² - ² 2 - 25 - 45 - 27 - 28 - 29 - 19 - 10 - 20 - 10 - 20 - 10 - 20 - 10 - 20 - 10 - 20 - 10 - 20 - 2		ng nation = 17,2000 = = taman i tama na natang naganan na natang natang atang atang satang	میں میں میں میں میں اور		an allen Barton o some "a and o Se ble - boorten og af an and			
		an magamath na saddadaa a sa	<u>.</u>	······································	e manage anna a grain	er fer disse ander soll in som		er na nana wang mang jau				an sala - man serien si si ange ingen me	shan da an an an t- Star a Statum	age and an any other house to be	n - San Marana an Andrea an San Angala	• • • • • • • • • • • • • • • • • • • •	n an		··· · · · · · · · · · · · · · · · · ·		

Michigan State Highway Department Charles E. Ziegler State Highway Commissioner

TRAFFIC MARKING STRIPES - APPLICATION DATA

Operatio	n No.	ین میکند. این می سیست میکند. به در میکند این میکند که ۲۵۵ کار ۲۵ میکند. به ۲۰ میکند می ساله میکند میکند این می این این میکند این میک میکند این میکند این م	Date	ور می از می از می از می از می مرابع می از می			Loge	tion*	279		and a second and a s	and de la construction de la con				، سوال المراجع من من المراجع من من المراجع م مراجع المراجع من المراجع	مىرىكى دەرىك ئۇلىرى بىرىكى كەركى يېلىرى بىرىكى يېلىپىلىكى بىرىكى يېلىپىلىكى بىرىكى يېلىپىلىكى بىرىكى بىرىكى بى يەرىكە ئىك بىرىكى يېلىپىلىكى يېلىپىلىكى يېلىپىلىكى بىرىكى بىرىكى بىرىكى يېلىپىلىكى بىرىكى بىرىكى بىرىكى بىرىكى ب يىلىپىلىكى بىرىكى يېلىكى يېلىكى يېلىكى يېلىكى بىرىكى بىرىكى بىرىكى بىرىكى بىرىكى بىرىكى بىرىكى بىرىكى بىرىكى بى	- شریف کردی کردی برد	موری میروند. ۵۰ - موری مورد که مورد میروند میروند میروند میروند میروند میروند. ۱۹۹۰ - میروند مورد میروند		کار در میکرد میکرد در این کرد ا این کرد این کرد این کرد این کرد
	addalaadaanaa ahoo ahoo ahoo ahoo ahoo ahoo ahoo	anda (20 a de 1979) ao que de actual de 1979 de 1979 de 1979 de 1979, a se a cuenca de 1979, a se a cuenca de	Eq	uipment	No.	929223	Pore	onnel	n ta ang ang ang ang ang ang ang ang ang an		, I and a second			Seletion chairs an		n ann - Arrabitan-arraya <u>a</u> 1977 an Saray an di	~~ m ynos os ∞sed sjo	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	اردور میکرد. که سیری ین وقت می د معمیکارده) to Stange of a
Time of	d.e. T	A statistical stati	8:00		ر استاده ویستورینه است. در استاده ویستورینه استان میشود میشود می	مریک میروند دارد	10:00	ان معاون میکند. این معاون میکند. این معاون میکند. میکندی از معاون میکند. این معاون میکند میکند میکند. میکند	11:00	11:30	12:00	12:30	1:00		2:00	2:30	. 3:00	3: 30	4:00	4: 30	5:0
Pavonent	Type	Portland Bituminous						, , , , , , , , , , , , , , , , , , ,								م گوگه - دیگر - (رای میکانید) در اینکه می می باید و باید می	المنتخب			, 1999 -	
TRAGHOIL	Number of lanes				aliterretundense under son eine eine eine eine eine eine eine ei	an - an an an tai a tai a sa a sa a sa a sa a sa a sa	روسین مرکز میکرد.			anna		an and the second se				ىسىبىرىمەتكىرىمەت مەد - تەدىرىمەتچە، مەدەرىمەتكە يېرىمەرىمەتكىرىمەتكەر مەدەرىمەت مەدەرىمەتكە مەتمە	and the second and the second and the second s	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	agunaga ayya ⁴ 000000000000000000000000000000000000	all in a state of the state of	
Paint	Type Color Vendor	na an a						mp+++ -ng++2g++3m2+−2g+ng++++4 													
Beads	On Paint(Brand 1) Vendor Coverage #/gal. Brand					۵۵ ، ۵۵ میلی ۵۰ ، ۲۵ – ۲۵ میلی (۱۹۵۵ ، ۲۵ ۱۹ - ۲۰ - ۲۰ - ۲۰ - ۲۰ - ۲۰ - ۲۰ - ۲۰ - ۲													یک مانی دیگر	
= เกรา์ กละรับหมูเป็นการแกรกรุ่มหลุกเลย และสิทรูรูร	in Paint	(2 Vendor Concentration#gal			مى بىرىمى مەركەت بىرىمى مەر مەركەت بىرىمى	199								and a standard and a standard from the standard	Terdiganov			аналиянын аланын ал Орон илийн аланын ал	a far an an an Sharafan y San an Anna an San an San Anna an San Anna an San Anna an San Anna Anna	ار این میراند. در میراند از میراند و میراند این میراند این میراند این میراند این میراند. میراند این میراند و میراند و میراند این میراند این میراند این و میراند. میراند این میراند و میراند و میراند این میراند این میراند این و میراند این و میراند.	n jang dalama di Kalang pengangkan s
	Kind o Air Pr sure	f stripe On paint es Atomization					ماری میرون کردی کردی کردی کردی کردی کردی کردی کردی			10-5-5-5-555555555555555555555555555555		9994929-384-3940-3940-3959-4949 4			م میں ماہ سیسین سیکھی ہے۔ میں ماہ میں	- 1995, 1997				دوروی سایق می به می می بینی می بینی می بینی می این می بینی می مرابع می بینی می	n for a first of the second se
	Time	To touch To no pickup				ve@ve@ve@ve@ve_ge_ege.	م معالم و مربع با معام میک مربع	and a state of the second s				ag Laggar (Sen Sen Sgin Carner (Sen Sgin				anterniter faurelliter and high laster shall - a	 	- 73- e 1300 ar refer (m 30- , q	میکندانه در مناطقهای ۲۰ مطلب این در دارد. 	- بوموسور در بازی بر برد. مایه اختراب رو با بازی بر بازی	
ntion	Stripe Closed t <u>Traffi</u> Paint Film	o Longth Thickness		2 		ماریند بیان در این میراند. بیا میران میران میران میران میران میران میران میران میران میران میران میران میران می میران میران میران میران میران میران میران میران م								2017-05222-05-05 (32004 - 1)2)2)2017-052-052-052-052-052-052-052-052-052-052	ال المحمد ال المحمد المحمد المحمد المحمد المحمد	ال ا	an	. an	ین اے سرائی میں بیان ہے۔ 		la antoin guna strain
÷, G	1	Gallons/mile Speed t Direction of travel Mechanical trouble	a standard (all) an		,			9999		nga-3	alge vejje vejjelov a navelje čenetova i naj		۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ 		En al Constant and a second	المراجع من المراجع الم المراجع المراجع		29		المراجع المراجع المراجع المراجع	
	Total 10 bends us	llons paint applied s. Type 1 ed Type 2					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			angland (frank an angle angle angle ang angle angle ang angle angle ang	میکند. میران با این میران م میران میران می	الم			۲۳۵۵٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬	ار از	ار المحمد الم المحمد المحمد المحمد المحمد المحمد	میں سے ایک اور میں میں میں ایک میں میں میں میں ایک میں میں میں میں ایک میں میں ایک میں ایک میں ایک میں ایک میں میں میں ایک میں ایک میں ایک میں	natori <u>22 a denator - San Anna an</u> Nana inan <u>126 - Anna Anna Anna Anna Ang</u> ina Mana inan <u>126 - Anna A</u> ndrea ang Angina ang	مى ئەرىپىلىيە بىلەر ب بىلەر بىلەر بىل بىلەر بىلەر بىل	
and a State State and a state of the state o	Paint wo Paint fi	les involved tting beads? Im uniform? erage uniform?					944-444-445-445-445-445-445-445-445-445-								میک با این میکند. ۱۳۰۹ (میلی این این این این این این این این این ای		الاست. د	- 24 / 44 - 45 - 49 - 49 - 49 - 49 - 49 - 49 -	999) march a hay a - 101900 (2019) - 2014) - and an hydro (2019) - 101900 (2019) - and an hydro (2019) - 10190 (2019)	, 2800-1992 page of 26 galaxies, and an an annual faceton 4460-2014 Mark 2010 2010 and an a same of 2014 page page of a mark 2014 and page of 2014 page of	
	Edges sh	arp or ragged? ckening?	· · · · · · · · · · · · · · · · · · ·	an dite differente unit entre estatoria		** \${	2.540(3)-9.3-2.444(2-7.5-43-43.44) 2.44(720-271-500-33-472; 271-234-534-538-64 	6-107-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1									- 19		می این این این این این این این این این ای	1
2 	Blisteri Tracking Bead ret	ng? ? ention, %															الا و رویس می این این این این این این این این این ای	میروند و با است که در میروند میروند و بیروند و بیروند و بیروند میروند داشت. در میروند و این میروند و بیروند و بیروند و بیروند و بیروند و بیروند میروند و این میروند و بیروند و			
	Hunter m Nos. of Nos. of	etration, % oter readings photographs taken photomacrographs															۲۰۰۰ ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۰ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۰ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۰ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار ۲۰۰۵ کار		n en fan it f fan fan it fan 187 - Fliger en gener stêd it fan	n na	
 Eventsky met generative statistics and the second statist	Nos. of *Locatio	sheet metal samples n						ىرىمىيە بىرىمىيە بىرىمىيە يەرىپىيە بىرىمىيە بىرىمىيە بىرىمىيە بىرىمىيە بىرىمىيە بىرىمىيە بىرىمىيە بىرىمىيە بىر مەرىپىيە بىرىمىيە بىرى		angen generen in der som den s	anga ang ang taon taon taon taon 1000 kang taon taon 1000 kang taon taon 1000 kang taon taon 1000 kang taon tao		و یک میکند. ۲۰۰۰ این میکند از میکند این م ۲۰۰۰ این میکند این می	- 10 - 17 - 17	a an a star an	ار میکر میکر اور اور اور اور اور اور اور اور اور او	a Sanda Yana a Kata Kata Kata Kata Kata Kata Kata	unter a conserva quadra Conserva - a que a conserva da	ال من المراجع (المر المراجع (المراجع (ال	Sama i ama gana ang ang ang ang ang ang ang ang a	- A Star - Star Park (Star - Star - S
te 7 ûne tûnden derokasentêrê birêk	Remarks															<u></u>			(1997), 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1997, 1	and the second	And the second s
y and you want a growth and a start of a growth of a start of a st	د این سروره بیشد این این این میشوند. برای سروره بیشد این	an a	an freeder of the state of	an a				ى بى بىرىكى بى بىرىك يەرىپى بىرىكى	,		- Colora - and Color-Colorado 17		925	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		**************************************	-2525-2525-2545-2555-2555-2555-2555 1997-1997-1997-1997-2555-2555-2555-2555-2555-2555-2555-2	12820		مىدىتۇمىمىر ھىرىمار، ئىرىمىرىك ،	، ــــــــــــــــــــــــــــــــــــ

Researc	sh Labors	ato	ry
Research	Project	47	G-3
Observer			

A-87.1

TRAFFIC MARNING SIRIPES - PAVEMENT MARKING CREW DATA

Dete Torati	lon A		Equipment MoRoute											
	(¹)		D											
TIME		1	A.Mo	1	A.M.	11	C P.M.		D	P.H.				
Bry Bulb														
······································														
Rel. Humi														
Wind Dir						-	1	1000		An				
Vel	locity													
Weather														
Direction	1 of work						.e.							
Speed						·								
	Type		2000		해외 I PLAL 4 년 년 사 전 30 20 20 20 20 20 20 20 20 20 20 20 20 20		<u> </u>							
	Condition			······										
Pavement	Width .													
	Temperature													
	Frand						: · ·							
විදයට ප	In Paint													
	On Palat				· · ·									
	Kind (C.L.NP)									_				
Stripe	Colór			ŀ		l	<u> </u>							
ло <u>н</u>	Vendor				18 8 M.U. (1407 - 167 - 177 -									
Air	On Paint													
<u>Fressure</u>	Atomizetion													
<u>Drying Ti</u>	me							-1-a-u						
Gallons F	<u>'aint per Mile</u>													
Paint Wet	ting Beads													
<u>Remarks:</u>					·····		-							
			-		NO DAVID-TELEVISIONETING-77				- 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.					
						· ·				-				
			1 Maria Decomposition				· · · · ·							
										110 ₁₁₀				
						· · · ·								
					Signed									