

Appendix A

The Paper form of Striper Operations Daily Log

The paper form of the Striper Operations Daily Log is a data collection form used to track all pavement marking installations. Once this form is completed, a selected crew, or office employee should transfer the information into the database. If multiple crew are installing markings, and are tracking their own installations they should come to a consensus, or common ground, on everything they are tracking. It is important that each crew tracks, and records the information the same way.

It is recommended that each day a striping related activity is done a Striper Operation Daily Log, or Contract Daily Log should be filled out. In other words, a form should be filled out for each day that: equipment maintenance, material handling (shipping, receiving, or moving), equipment or whether delays, striping related training/conferences was done. To make data input into the computer easier this form has been intentionally designed to look like the computer data-input screen.

The tables (A, B, and C) below are intended to resemble the Striper Operations Daily Log. They will be referred to throughout this description. Again, as it was earlier, the term RUN (or pass) is used. A single striping pass includes all material applied from a beginning reference point (or mile marker), to an ending reference point in one direction. A run is listed on this form on table C under T.H. (trunk highway); therefor, each individual line filled out under T.H. is considered a run, or a pass of the striper.

Table "A" is the top of the Striper Operations Daily Log. This portion of the form will track equipment, employee(s), and employee daily regular and overtime hours. Each column has been given a specific number (i.e., 1,2,3). Use the column number to find the written description for each column.

TABLE A

Column No.

(1) (2) (3) (4) (5) (6) (7)

Equipment	Job	Employee ID	Last Name	First Name	Reg Hrs	O.T. Hrs
Striper:						
Nurse:						
Nurse:						
Traffic:						
Aux Equip:						

Equipment: (Table A, Column No. 1)

Record in column 1 the unit number, and the total hours, for each piece of equipment assigned to that day's operation. Aux. Equip. (i.e., auxiliary equipment) should be used to indicate any additional equipment that is used.

Job: (Table A, Column No. 2)

Indicate in this column each crew members assigned job. For example, on the line that is identified Stripper (with the unit number next to it) describe in the job column "operator" to identify the crew member that is driving the stripper unit. There are five activities that are associated with striping: 1. Operator, 2. Cons. Op. (i.e., console operator, or button pusher), 3. Nurse truck, 4. Traffic control, 5. Training.

If during a single day a crewmember does two different jobs (i.e., drives for 4 hours, and runs the console for 4 hours) identify this on the form. When the information is entered into the computer two lines will be used to cover this situation.

Employee ID, Last Name, First Name: (Table A, Column 3,4 8 5)

These three columns identify each member of the crew. If additional room is needed turn the form over and identify each additional employee's information of the back of the form.

Reg. Hrs. and O.T. Hrs: (Table A, Column 6 & 7)

Indicate total daily hours in these two columns. Again, a sheet should be filled out anytime anyone on a crew is doing a striping related function. These include, but are not limited to equipment repair/maintenance, striping related training, and whether delays.

TABLE B

	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
	Materials	Begin	Added	End	Net	Begin	Added	End	Net	Gallons
Line 1										
Line 2										
Line 3	Beads									

Materials: (Table B , Column 6)

Indicate in this column the type of material used. This is a column that has changed from the original form. A quick check of this column will reveal if two materials were installed within a given segment, or within a given day. Notice that two columns are included in the material section. For most of our day-to-day maintenance operations only one material will be used. It is important to track whenever multiple materials are used within the same reference points (e.g., tape centerlines and epoxy edge lines). When recording a run(s) that have multiple materials within them, please break each nm out by a single material.

WHITE Begin Added, End, Net: **(Table B , Column 9,10, 11 & 12 Line 1)**

Document the amount, or quantity, of WHITE material used throughout the day. In column number 9 indicate how much material is in the white tank at the beginning of the striping day. Example, if your truck has a total white of 3000 gallons and you are starting with a half tank indicate 1500 in column 9 line 1. In column number 10, line 1, indicate how much white material was added during the day. At the end of each day, inspect the white tank to determine how much material is left and add that amount to End (column 11, line 1). You do not need to do anything for the net column (number 12). Once the data is entered into the computer, the software will automatically calculate the material used. If you would like to do math, so that you will have a quick check, please do. Doing the calculations is an excellent way to spot check to see if the equipment is working properly.

YELLOW Begin Added, End, Net: **(Table B , Column 13,14,15 & 16 Line 1)**

Document the amount, or quantity, of YELLOW material used throughout the day. In column number 13, line 1, indicate how much material is in each tank at the beginning of the striping day. In column number 14, line 1, indicate how much material has been added to the yellow tank during the day. Inspect the bead tank at the end of each day to determine how much material is left and add that amount to End (column 15, line 1). Again column 16 will be filled out automatically by the computer.

BEADS Begin, Added, End, Net: **(Table B , Column 9,10,11 & 12 Line 3)**

Document the amount, or quantity, of BEADS used throughout the day. In column number 9, line 3, indicate how much material was added to the bead tank at the beginning of the striping day. In column number 10, line 3, indicate how much material was added to the bead tank during the day. At the end of the striping day, inspect the bead tank to determine how much material is left and add that amount to End (column 11, line 3). Column 12 will be filled out automatically by the computer.

Again, one of keys to the Pavement Marking Management System is making sure that correct information is collected. Please, take the time necessary to make sure that each days log is filled out **as accurate** as possible The bottom portion of the Striper Operations Daily Log (table C) tracks where markings are installed.

TABLE C

Column No.

(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
R S	T.H.	Beg. R.P.	End R.P.	Int. Sect	Int. Chg	Mat	C	Trav Time	Equip. Delay	Wthr Delay	Work Types
	169	30.25	35.25			Latex	W	.5			B
	169	35.25	30.25			Latex	W				A
	35W	57	67			Tape	Y				B
	35W	57	67		3	Latex	W	.5			AC

RS or Route System: (Table C , Column 17)

Indicate in the Route System column whether a county or municipality was striped. Use a "C" to indicate county, or "M" to indicate municipal. A blank column will indicate that a state road was striped.

T.H. or Trunk Highway: (Table C , Column 18)

Record in this column the trunk highway, county, or municipal road number for each striping run.

Beg. R.P. and End R.P.: (Table C , Column 19 & 20)

Indicate the beginning (column 19) and ending reference points (column 20) for each run. In the example above you will notice that four striping runs were completed. On run one pavement markings were installed from reference point 30.25 to reference 35.25. During run two markings were installed in the opposite direction (35.25 to 30.25). Reference points in the state of Minnesota progress in numerical number from West to East, and Tom South to North. Trunk highway 169 runs from north to south; therefore, from the information in this example we can tell that the first run one was done in a northerly direction and second run was done southbound.

Int. Sect and Int. Chg.: (Table C , Column 21 8 22)

Indicate in these two columns the total number of Intersections or interchanges that were completed. The indication given in the column should be the total number of completed for each day. Example, if you are striping a two lane two way roadway and you do not stripe the turn lanes during a striping run do not indicate anything in column 15. From the example above, if during a single day you completed everything (including intersections or interchanges) within the reference points you indicate you should also indicate the total number of completed Intersections or interchanges.

Material and Color: (Table C , Column 23 8 24)

Identify the type and color of material applied during each run. Material has been added to the form so that different materials, within an individual run, can be identified. Example, when two types of material are installed within the same reference points (i.e., tape centerline, and epoxy edge lines). In column 18 indicate W (white), Y (Yellow), or B (Both). B should be indicated when ever a striper is shooting a yellow edge line, and a white skip line within a run. In most cases the material identified in column number 17 will be- the same as that identified in table B column 6.

Travel Time: (Table C , Column 25)

Include in this column the time spent deadheading. Also included in this column. (or within each run): time it takes to get to a job location, time it takes to return to your home location, if there is significant time spent driving between job locations. For striping operations the definition of significant time is a half-hour or more. From the table above, notice that the crew completed two runs on T.H. 169 and then headed to I 35W to continue striping. In the Travel Time column, I have indicated the time that it took the crew to travel from one job location to the other.

Equipment Delay: (Table C , Column 26)

Indicate in this column any time that a crew is not installing markings because the equipment is either down for service, or is broken. Again, indicate, or track, only significant (one half hour or more) of down time. This column could show as much as 8 or 10 hours of delay. This would be appropriate if the major delay or breakdown (i.e., engine, transmission, paint gun failure, etc.) keeps the crew from installing markings. In the event of a major equipment failure, indicate just the employees assigned (e.g., operator, and console operator) to fixing the equipment. This is especially important if the other crewmembers are assigned to other daily jobs. We want to track the time that the equipment is down, but we only want to track the employees that are assigned to the crew during the breakdown.

Weather Delay: (Table C , Column 27)

This column is intended to track any time the crew is held up because of whether. Again, this is intended to track significant time only. This column is intended to work the same as the equipment delay column. In other word, track the time that the crew is held up due to whether, but in the case of extended whether days we only want to track the employees assigned to the crew during the delay. Example, if crew members are servicing equipment during the delay, there total hours should be included on the form.

Work Types: (Table C , Column 28)

Include in this column each type of line applied during a run. For a description of the Work Types see the Description of Work Type Key table.

Appendix B

Description of Work Type Key

<u>KEY</u>	<u>DESCRIPTION</u>
A. White Edge	Includes all continuous white edge lines
B. Yellow Edge	Includes all continuous yellow edge lines
C. White Skip	Include all skip lines (lane lines) 4", 8" and cat tracks in any spacing configuration (example, 40' gap with a 10' skip, or any metric combination)
D. Yellow Ctl.	Indicates that the striper installed a yellow centerline during this run. This category includes skips, no passing zones, or <u>any</u> combination of skip and solid lines.
E. 8" White gore	Use this work type to Indicate white 8" gore areas were painted
F. 8" Yellow gore	Use this work type to Indicate yellow 8" gore areas were painted
G. Messages	Indicates the installation of pavement marking messages. On the back side of the sheet indicate what type and the total number of messages installed.
H. Stop Bars	Indicates the installation of stop bars. On the backside of the sheet indicate the total number of bars installed.
I. Cross Walk	Indicates the installation of Cross Walk (s). On the back side of the sheet indicate the total number of bars that were installed
J Misc.	This is a catchall category. For items not included on the list, indicate a "J" in the work type column. Then, turn the sheet over and give a brief explanation of your entry and the total hours (if necessary). For example, it is appropriate to use this work type indicator for such items as, training, service equipment, conferences, or construction delay (e.g., on the back of the sheet indicate construction delay = 2 hours.).
K. Painted Durable	Using this work type indicates that durable materials are within the run, and that the striper (you) painted over them. In other words, you have replaced the durable material.
L. Skipped Durable	Using this work type indicates that durable materials are within the run, and that the striper did not paint over them. In other words, the materials are still in place.
M. Other Work	Use this work indicator to identify work done under a cooperative agreements, such as working for a county, or city.
N. Only Intersection/ Interchanges	The ONLY indicator ("N") indicates that intersections or interchanges were striped separately from main line. In other words, when N is indicated in the work type indicator column it means that material was only added to intersections or interchanges.

Construction Striper Operations Daily Log

DATE: / /

SP #:

STRIPING CONTRACTOR:

DISTRICT:

Equipment Numbers	Material Supplied	Suppliers Name(s)	Material Lot Number	Inspector(s) & Contract Supv. Name(s)	Reg Hrs	O.T. Hrs
Striper:	Tape					
Nurse:	Epoxy Type I					
Traffic:	Epoxy Type II					
Traffic:	Thermo					
Aux. Eq:	Beads					

Materials (in gal./ft.)	White				Yellow			
	Begin	Added	End	Net	Begin	Added	End	Net
BEADS					Pounds			

HWY	Begin Ref. Pnt	End Ref. Pnt	Int. Sect.	Int. Chg.	Material	Color	Wthr Delay	Work Types

- A.** White edge **B.** Yellow edge **C.** White skip **D.** Yellow Ctl. **E.** 8" White gore **F.** 8" Yellow gore
G. Messages **H.** Stop bars **I.** Cross walk **M.** Other Work **N.** Only Intersections/Interchanges

Striper Operations Daily Log

DATE: ___/___/___

DISTRICT: _____

Equipment Number	Job	Employee ID	Last Name	First Name	Reg Hrs	O.T. Hrs
Striper:	Operator					
Nurse:	Console					
Traffic:	Console					
Traffic:	Nurse					
Aux. Eq:	Traffic					

	White				Yellow				
Materials	Begin	Added	End	Net	Begin	Added	End	Net	Gallons
BEADS									

COUNTY: _____

CITY: _____

SP NUMBER: _____

R S	HWY	Begin Ref. Pnt	End Ref. Pnt	Int. Sect.	Int. Chg.	Material	C	Trav Time	Equip Delay	Wthr Delay	Work Types

- A. White edge B. Yellow edge C. White skip D. Yellow Ctl. E. 8" White gore F. 8" Yellow gore
 G. Messages H. Stop bars I. Cross walk J. Misc. K. Painted durable
 L. Skipped Durable M. Other Work N. Only Intersections/Interchanges

Appendix C

Description of Pavement Marking Management Systems Database Tables

All of the data entered into the PMMS input screens are stored in database tables. To retrieve information stored in these tables you can use the Paradox Query function. A query is a question you ask Paradox about information in your tables. It can be anything from a simple question about the information in one table, to a complex question about information in several tables. To learn more about running a query you can use the main menu help, or the manual supplied with every version of Paradox. To view all of the tables associated with the program highlight the Tables option on the Project Viewer. The table will be listed on the right side of the Project Viewer. Any of these tables are accessible by double left clicking on the one you want to use.

The following described what type of data that is captured in each table. Some of the information may appear repetitive when in fact it is captured this way to make querying easier.

City

The city (bd) database table is used for ease of data entry. Access this table to add/remove cities from this table.

County

County is used the just like the City database. Access this table to add/remove Counties from this table.

Matltype

This table tracks each variety (i.e., tape, epoxy, latex, etc) of marking material. It is used as an aid in speeding up data input. This table can be accessed to add/remove material types.

MMJDI

This table aids in the tracking of each District/Areas where materials are being installed.

MMJCL

Default table used by the program. Do not enter any information into this table.

MMJCS

Default table used by the program. Do not enter any information into this table.

MMJSU

Default table used by the program. Do not enter any information into this table.

MMJTS

Default table used by the program. Do not enter any information into this table.

MMSEM

Default table used by the program. Do not enter any information into this table.

MMSEMS

This table tracks employee name and numbers.

MMSEMT

This is a default table used by the scripted program. Do not enter any information into this table.

STRACTE

Job titles or types (i.e., Operator, Console, Training, etc) are tracked in this table.

STRDEF1

This is a default table used by the scripted program. Do not enter any information into this table.

STRDEF2

This is a default table used by the scripted program. Do not enter any information into this table.

STRIPE1

This is a default table used by the scripted program. Do not enter any information into this table.

STRLOG

The STRLOG, or stripe log, along with the STRLOGE and STRLOGR are the main database tables. Most of the information that you will want to get out of the system is stored in these tables. This STRLOG table will track equipment, SP (special project or state project numbers), city/counties, and material quantities used. The STRLOG table contains the following items:

- * Log Date
- * Striper unit number
- * Sequence number
- * District number
- * SP number
- * County
- * City
- * Nurse unit number
- * Traffic control unit(s) number
- * Material quantities (beginning, added, ending, and net)
 - White
 - ✖Ⓜ●●□•
 - Beads

STRLOGE

This table tracks the amount of employee hours used. The STRLOGE table contains the following items:

- Log Date
- Striper Unit
- Seq Num or Sequence number
- Emp Seq Num or Employee sequence number
- ActNum or activity number
- Empl ID or employee identification number
- Reg Hrs or regular hours
- OT Hrs or overtime hours

STRLOGM

This table tracks the amount of employee hours used. The STRLOGM table contains the following items:

- Log Date
- Striper Unit number
- Seq Num or sequence number
- Strmemo or the memo field

STRLOGR

This table tracks location of marking installation, what specific lines were installed, and other aspects of efficiency of operations. The STRLOGR table contains the following items:

- * Date
- * Striper unit number
- * Seq Num or sequence number
- * Rte Seq Num or route sequence number
- * Route System
- * Route Number
- * Beg Ref Point or beginning reference point
- * End Ref Point or ending reference point
- * County
- * Intersections
- * Interchanges
- * Material
- * Color
- * Travel Time
- * Equipment delay
- * Weather delay
- * Work Type

Appendix D

Sample Reports

These reports are provided as examples of reports that can be generated from the data that PMMS collects. At this time, the reports are not automated. In other words, the system is not programmed to generate these reports automatically.

The following is a report which outlines a single striping crews Labor, Material, Equipment usage for a past striping season.

Labor

PMMS data can be broken out to reflect true labor costs. Fringe benefit rates, heavy equipment additives, and labor rates will vary from agency. This is only one example of hdw'labor data could be retrieved from of the system. For example, queries can be developed to breakout monthly, specific job, or location data as needed.

		Reg. Hrs.	O.T. Hrs.	Total Reg.	Tot. O.T.	Heavy Eq. Additive	Total
Operators	Jan -Jun	420.00	0.00	13534.29	0.00	525.00	14059.29
	July - Dec	814.00	0.00	27014.26	0.00	1017.50	28031.78
Console	Jan -Jun	420.00	0.00	13684.67	0.00	399.00	14083.67
	July - Dec	814.00	0.00	27014.26	0.00	773.30	27787.56
Nurse	Jan -Jun	410.00	0.00	13358.85	0.00	225.50	13584.35
	July - Dec	814.00	0.00	27014.26	0.00	447.70	27461.98
Traffic	Jan -Jun	350.00	0.00	11403.89	0.00	192.50	11596.39
	July - Dec	758.00	0.00	25089.41	0.00	415.80	25505.21
Totals		3692	0	121620.5826	0	3388.00	
Total Labor							\$162,110.18

Labor Hours Jan thru Jun reflect an HMWsr rate of pay for July thru Dec rate after contract raise
 Labor hours reflect a fringe benefit cost 55%, and Maint. Overhead 36.5% The overtime rate labor x 1.5%.
 Heavy Equipment pay differential for Operator, Console operator, and Tandum are included

Materials

The following is an example of how material usage can be developed for a complete season. Again, queries could be developed to meet the needs of the user. Note the use of actual and reported figures. Actual is the total quantity of material delivered. Reported is the total quantity of material reported in PMMS. This crew is very good at reporting their operations. PMMS is a tool that supervisors can use to manage day-to-

operations. Keeping close track of material quantities can lead to many business efficiencies. For example, this information could be used to schedule JIT (i.e., just-in-time) deliveries of materials. This would keep materials on hand to a minimum.

	White Gal.	Yellow Gal	Beads Lbs	White Net	Yellow Net	Beads Net	Mat Total
Actual	29500	17450	269550	199726.8	136960.69	67221.862	403909.35
Reported	28770	19140	308800	194784.41	150225.08	77010.242	422019.73

Material costs reflect cost of material x Maint. overhead 36.5%

Equipment

Equipment can also be broken out in many of the ways previously mentioned. This example shows the equipment breakdown for an entire season.

	Pro. hrs.	Travel	Delay	Weather	Cost. Of Pro.	Delay Cost	Wthr.Cost
68425	722	161.5	169	99.5	57,515.53	13,612.63	14,244.80
90085	203				8,232.49		
95335	447				18,750.06		
Crash Att	722				7785.69		
2 Arrowbd.	722				1527.57		
Forklift	99				1678.38		
Totals	2915	161.5	169	99.5	95,489.72	13,612.63	14,244.80

Total Line Miles Applied

Calculating line miles applied are one of the critical aspects of PMMS. Again, this example shows how many line miles were calculated from a crews entire striping season. Ratio of labor hours and Equipment to Materials used is another management opportunity that PMMS can reveal.

		86425	3175
int-chg			
irk-sect	539	Total	<u>3175</u>

Lineal footage of 4" equivalent line have not been included in any of the line miles applied for: No passing Zones, Ramps, turn lanes.
Ratio of labor hrs & Equipment to Materials 63.78

For managers, supervisors, or owners it always comes down to the bottom line, or how much does it cost to stripe. From the figures given in this report a yearly total cost or cost-per-foot of applied marking can be developed. Again, these are examples that could be tailored to meet specific needs.