

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**DATA LOGGING SYSTEM FOR WATERBORNE, REGULAR DRY, AND TYPE NR  
PAVEMENT MARKINGS**

PMK:MKB

1 of 4

APPR:GJD:KJK:04-05-24  
FHWA APPR:04-08-24

**a. Description.** This work consists of furnishing equipment containing a Data Logging System (DLS) for long line waterborne, regular dry, and Type NR striping trucks. This special provision provides the requirements for the DLS which must record environmental conditions and material application parameters during striping operations and be able to generate reports.

**b. Equipment Requirements.** Equip long line striping trucks for this project with a DLS that meets the following requirements:

1. Operational Requirements.

- A. Measures and records application vehicle speed to nearest 0.1 mph.
- B. Measures and records weight in pounds (lbs) and/or volume in gallons (gals) of binder as measured through a positive displacement pump mechanism, a flow meter or load cells under the material tanks.
- C. Measures and records weight in lbs of reflective glass beads/elements used as measured with load cells under the bead/element tanks.
- D. Measures and records pavement surface temperature (°F).
- E. Measures and records air temperature (°F).
- F. Measures and records dew point (°F).
- G. Measures and records humidity (percent).
- H. Calculates and records average material application rates and film thicknesses over each segment painted.
- I. Furnishes the highway number with the beginning and ending reference points rounded to the nearest thousandths of a mile, the beginning and ending coordinates determined by a GPS receiver with 16-foot accuracy, and the direction of travel in terms of increasing or decreasing reference points.
- J. Furnishes cellular capabilities for field data transport to website.

2. Documentation Requirements.

- A. Date and beginning and ending time of application.
- B. Vendor and product (binder and reflective material).
- C. Lot number(s) of product used.
- D. Specific weight of binder lot(s) used (lbs/gals).
- E. Striping contractor (MDOT Certification Number).
- F. Width of marking being applied.
- G. Application vehicle speed to the nearest 0.1 mph.
- H. Weight in lbs and/or volume in gals of binder used by color as measured per the requirements in subsection b.1.B of this special provision.
- I. Weight in lbs of reflective glass beads/elements used as measured per the requirements in subsection b.1.C of this special provision.
- J. Pavement surface temperature (°F).
- K. Air temperature (°F).
- L. Dew point (°F).
- M. Humidity (percent).
- N. The system must calculate and report average material application rates and film thicknesses over each segment painted.
- O. The system must report the total footages painted for each segment broken down by line color and width (e.g. – total 4 inch yellow in segment, total 6-inch white in segment, etc.).
- P. Furnish the highway number with the beginning and ending reference points rounded to the nearest thousandths of a mile, the beginning and ending coordinates determined by a GPS receiver with 16-foot accuracy, and the direction of travel in terms of increasing or decreasing reference points.
- Q. Furnish GPS mapping system that is capable of real time (within 20 minutes) tracking of material application rates, film thickness, beads pounds per gallon, vehicle speed, time, date, project numbers, operator manual data, and color-coded alarms for film thickness. Film thickness alarms must have a tolerance of  $\pm 0.5$  mils.
- R. Furnish access to stored data on a secure password protected website.

The system must record and report the average material application rates for paint and beads on a road-by-road basis. Each road (segment) will be evaluated over an entire MDOT physical reference (PR) in increments of 5 miles. When the PR is less than 5 miles long, it will be evaluated over its entire length and considered a segment. PRs greater than 5 miles long, will be broken

into 5-mile segments, (e.g. a PR 20 miles long would have 4 segments each 5 miles long, a PR that is 17 miles long would have 3 – 5 mile long segments and 1 – 2 mile long segment).

Ensure the DLS is operational, calibrated and in use during pavement marking operations. Collect data for any non-handwork longitudinal pavement marking application of 300 feet (drive length) or greater. Completion of work for the individual day will be permitted if the DLS equipment fails. Document the application and material usage quantities from the time of the DLS failure and make calculations to determine the gals of binder per mile and lbs of beads per mile. Repair the DLS before resuming work, or as approved by the Engineer.

Furnish the Engineer the DLS manufacturer's recommendations for equipment calibration frequency and furnish certification that the equipment meets manufacturer's recommended calibration. Ensure a signed DLS calibration sticker is present in the driver's door and carries a date of the current calendar year prior to the DLS system being placed into use for the season. Calibrate every DLS a minimum of once each year.

**c. Materials.** None specified.

**d. Construction.** Field personnel may randomly perform field verifications of the DLS operation and calibration at any time to ensure the accuracy of the DLS data and output. If field personnel believe that the DLS data and output is not accurate, then additional checks may be performed. Furnish DLS equipment certified by the manufacturer.

**e. Reporting.** The DLS must store data and export to a secure server on a daily basis. Ensure the data is in Microsoft Excel format, or a comma or spaces delimited text file adequate for insertion into a computerized spreadsheet. Ensure the data is available to the Engineer within 24 hours of the pavement marking work and may be retrieved by the Engineer or designated field personnel for inclusion with documentation reporting. Ensure the electronic records are completed in their final form prior to the records being removed from the pavement marking equipment.

Furnish the GPS mapping information as detailed in subsection b.2.Q of this special provision to the Engineer on a weekly basis. Furnish the data in a CSV file formatted for importation into and use with ArcGIS version 10.1.

**f. Measurement and Payment.** No separate or additional payment will be made for the use of DLS. The costs to furnish and operate the DLS, all manufacturer representation, labor, equipment, reports, documentation, and materials necessary for striping operations will be included in the price bid for other items.

No price adjustment or corrective action will be applied based solely upon information from the DLS.

Submit DLS reports to the Engineer for payment and compared to the project plan quantities (logs). Plan quantity will be paid if the DLS quantities fall within the following thresholds when compared to plan quantity, per line color and width within a segment:

For quantities 10,000 feet or less:  $\pm 500$  feet

For quantities 10,001 – 50,000 feet:  $\pm 1,000$  feet

For quantities greater than 50,000 feet:  $\pm 2$  percent of plan quantity

When a DLS quantity falls outside of these thresholds, ensure the affected line color and width for that segment is remeasured and agreed upon between the Engineer and the Contractor.

When a full segment cannot be striped due to a construction project, the DLS quantities will be paid for that segment.

When a segment is not completed at the end of the workday, DLS quantities may be used for daily payment. Ensure the segment quantities are balanced once the specified line color and width within the segment has been completed. Final balancing will adhere to the threshold system outlined above.