SECTION M: PAVEMENT MARKING PLANS

INDEX OF SHEETS

M1  General Layout with Index
M2  Estimate with Plan Notes
M3  Pavement Marking Layouts and Tables
M4  Rest Area Marking Layout
M5  Standard Plates

BEGIN IM-FP 0908(95)362
Sta. 473+02
MRM 362.02 +0.033

OVERHEAD STRUCTURE
Str. No. 44-124-126
Sta. 444+25.48
MRM 362.02 +0.125

OVERHEAD STRUCTURE
Str. No. 44-210-126
Sta. 545+56.57
MRM 363.05 +0.215

Sta. 547+69.42
MRM 368.05

OVERHEAD STRUCTURE
Str. No. 44-209-126
Sta. 630+42.71
MRM 369.06

OVERHEAD STRUCTURE
Str. No. 44-230-126
Sta. 580+31.25
MRM 376.02

END IM-FP 0908(95)362
Sta. 631+82.09
MRM 371.02 +0.000
HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT

All materials will be applied as per manufacturer’s recommendations.

This material will consist of a durable high build, low VOC, fast drying, waterborne traffic paint with a 100% acrylic polymer (Arkema DT-400, Dow HD-21A, or equivalent). The Contractor will provide certification that the material is one of the following products or an equivalent as approved by the Operations Traffic Engineer:

Diamond Vogel's Waterborne High Build Polymer Marking Paint

Ennis-Flint's High Build Polymer Marking Paint,

No further testing of this material will be required. Reflective media consisting of glass beads as well as bonded core reflective elements will be adhered to the paint.

The bonded core reflective elements will contain either clear or yellow tinted microcrystalline ceramic beads bonded to the outer surface. The bonded core reflective elements will provide a 50:50 blend of dry to wet ratio of reflective element. All microcrystalline ceramic beads bonded to reflective elements will have a minimum index of refraction of 1.8 for dry retro-reflectivity and 2.4 for wet retro-reflectivity when tested using the liquid oil immersion method.

The Department will take retro-reflectivity readings on the pavement marking lines no sooner than 3 days and no later than 30 days after the completion of all line applications required for an individual highway route using a portable retro-reflectometer conforming to 30-meter geometry. Retro-reflectivity readings will be taken on a test location with cleaning being limited to light hand brooming.

Pavement markings not conforming to the retro-reflectivity requirements will be removed and replaced. If replacement of markings cannot be applied within the same year, the Contractor will schedule subject work to be completed no later than June 15th in the following year. Upon replacement, the retro-reflectivity testing process will be done again requiring new readings.

The Department will randomly select one test location per mile of each edge line including ramps and one test location per mile of centerline (solid and/or skip line will be considered as one centerline). Three retro-reflectivity readings will be taken at each test location. The three readings will be averaged and become the reading for that test location.

Initial readings:

<table>
<thead>
<tr>
<th>Pavement Marking Color</th>
<th>Minimum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>350 mc/m²/lux</td>
</tr>
<tr>
<td>Yellow</td>
<td>275 mc/m²/lux</td>
</tr>
</tbody>
</table>

All pavement markings not conforming to the requirements provided in these plans will be considered deficient and will be removed and replaced. Additional retro-reflectivity readings will be taken by the Department to determine the limits of removal. The removal will be accomplished using suitable sand blasting or grinding equipment unless the Engineer authorizes other means. The removal process will remove at least 90% of the deficient line, with no excessive scarring of the existing pavement. The removal width will be one inch wider all around the nominal width of the pavement marking to be removed. Removal and replacement of the pavement markings will be at the Contractor’s expense, with no cost incurred by the State.

High Build Waterborne Pavement Marking Paint applied after October 15 must be formulated as cold-weather waterborne paint. Cold weather waterborne paint will meet the requirements of Section 980.1B.

TYPES OF MATERIALS FOR HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT

Solid 4" line = 27.8 Gal/Mile
Glass Beads = 5.3 Lbs/Gal.
Composite Reflective Elements = 2.1 Lbs/Gal.

All cost for materials, labor and equipment necessary to furnish and install the pavement markings will be incidental to the contract unit price for the respective High Build Waterborne Pavement Marking Paint items.

MOBILE RETRO-REFLECTIVITY MEASUREMENTS

All retro-reflectivity measurements will be taken by an Independent Consultant hired by the Contractor. Measurements will be taken in accordance with the ASTM testing methods E1710 and E2177.

A retro-reflectivity report of the measurements from the Independent Consultant will be provided to the Engineer.

The Independent Consultant will take measurements using a vehicle-mounted mobile retro-reflectometer. The mobile retro-reflectometer will utilize 30 meter CEN geometry in accordance with ASTM E 1710 (Standard Test Method for Measurement of Retroreflective Pavement Markings Materials with CEN-Prescribed Geometry Reflectometers).

The retro-reflectometer will be calibrated no less than twice a day in accordance with the operating manual and calibration guide for the particular machine and vehicle.

Measurement will consist of the average retro-reflective readings and standard deviations for pavement marking placed under this Contract. Retro-reflectivity measurements will be taken on each mainline edgeline, ramp edgeline, mainline and ramp gore marking, and skip centerline marking. Measure each line type separately. Measurement units will be mcd/mt/lux.

Retro-reflectivity will be measured by taking a minimum 40 retro-reflectivity readings within 528" (1/10 mile) on solid lines and a minimum 20 retro-reflectivity readings within 528" (1/10 mile) on skip lines. Gore markings will have a minimum of two retro-reflectivity readings taken on each marking. The average retro-reflectivity readings for each individual 4" wide line will be obtained at 528" (1/10 mile) intervals.

Payment will be made for the actual length of retro-reflectivity measured. This is based on one laser instrument scanning a line that reads one line or each pass. Three passes are required for each length of two interior lines in one direction; LEL – Left Edgeline, REL – Right Edgeline and all gore markings along right edgeline, CL- Centerline. One additional pass per the length of the gore marking on the left side of the ramp will be required.

Two passes will be required for each ramp; RREL – Right Ramp Edgeline and LREL – Left Ramp Edgeline. Measurements will be obtained no sooner than 7 days and no later than 30 days after the completion of all line applications required for an individual highway route. Excess reflective media must not be visible when the retro-reflectivity testing is conducted.

The retro-reflectivity measurements will be collected when pavement markings and markings are dry, clean and no visible moisture is on the road surface. These criteria define initial pavement marking retro-reflectivity values. Markings will be measured in the direction of intended vehicular travel.

The Independent Consultant should expect to retest failed segments after the markings have been replaced at no additional cost to the State.

The averaged retro-reflectivity measurements must meet the requirements for retro-reflectivity as specified. Any retro-reflectivity readings not meeting the minimum average retro-reflectivity requirements for pavement markings will be considered failed. Failed markings will be removed and remarked by the Contractor in 528’ lengths.

The Contractor will mark the begin and end of the length of line to be removed and remarked that is represented by the failed averaged reading.

The measurement report will be in the form of an electronic database file, or delimited text file, and contain all raw data collected. The electronic file must also contain a summary of findings. The retro-reflectivity report, including the summary and a copy of the electronic file with all data, will be provided to the Engineer. The measurement report will include:

- State Project number
- Trunk Highway number
- Date the measurements were taken
- Geographical location the measurements were taken including a distance from the nearest permanent site identification, such as a mile reference marker. The beginning and ending reference points of data collection rounded to the nearest thousandth of a mile and the beginning and ending coordinates determined by a Global Positioning System receiver with 3 meter accuracy, including the direction of travel in terms of increasing or decreasing reference points
- Identification of the pavement marking material including line type, color, and transverse location on the road. Identification of the marking to be included in the format: LEL – Left Edgeline, REL – Right Edgeline, CL – Centerline, LL – Lane Line Skip, RREL – Right Ramp Edgeline, LREL – Left Ramp Edgeline, 1LL – left most LL in multilane, 2LL – second to left most LL in multilane, etc.
- Identification of the retro-reflectometer
- A summary of the average retroreflective measurements for each continuous length of 0.1 mile measured
- A separate summary of the gore marking retro-reflectivity measurements
MOBILE RETRO-REFLECTIVITY MEASUREMENTS (CONTINUED)

Should another mobile unit be available, the maximum acceptable deviation for measurements made by the two different instruments of the same manufacturer and for the same roadway length will be ± 10%.

Repeatability for the given mobile unit will be ± 6%.

The locations of the measurements will be randomly selected.

No final payment for pavement markings will be made until the retro-reflectivity measurements are taken and the retro-reflectivity report is provided to the Engineer.

Cost for all mobile retro-reflectivity measurements, reports, marking of failed lengths, equipment, materials and labor will be included in the contract unit price per Mile for “Mobile Retro-reflectometer Measurements.”
PAVEMENT MARKING

DIVIDED ROADWAY

Typical pavement marking as shown on this sheet will be applied throughout the entire length of divided roadway.

Traffic Control will be incidental to the cost of application. The stripe and advance or trailing warning vehicle will be equipped with flashing amber lights and advance warning arrow board.

Application rates will be as follows:

<table>
<thead>
<tr>
<th>Pavement Marking</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Yellow Edgeline</td>
<td>27.8 Gals./Pass-Mile</td>
</tr>
<tr>
<td>Dashed White Centerline</td>
<td>7.6 Gals./Pass-Mile</td>
</tr>
<tr>
<td>Solid White Edgeline</td>
<td>27.8 Gals./Pass-Mile</td>
</tr>
</tbody>
</table>

ESTIMATED QUANTITIES (BASED ON ONE APPLICATION)

<table>
<thead>
<tr>
<th>Description</th>
<th>Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>623</td>
</tr>
<tr>
<td>YELLOW</td>
<td>465</td>
</tr>
</tbody>
</table>

Additional Quantities

- Additional White (1 Application): 92
- Additional Yellow (1 Application): 48

Rates of Coverage:
- 4", 8" and 12" Lines: 50
- 24" Lines and Bars: 30
- Arrows, Messages, and Solid Areas: 20

All pavement marking dimensions are based on 12' driving lanes.

Pavement marking at On Ramps and at Off Ramps will be applied as detailed in these plans.

CROSSROAD MARKING

Typical pavement marking as shown on this sheet will be applied throughout the entire length of two lane roadway.

Traffic Control will be incidental to the cost of application. The stripe and advance or trailing warning vehicle will be equipped with flashing amber lights and advance warning arrow board.

ESTIMATED QUANTITIES (BASED ON ONE APPLICATION)

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>25 Gallons</td>
</tr>
<tr>
<td>YELLOW</td>
<td>25 Gallons</td>
</tr>
</tbody>
</table>
Pavement Marking Layout for Tapered Interstate Ramps

Plan View (Off Ramp):
- 4" White
- 4" Yellow
- 12" White

Key Item:
- Traffic Direction
- Theoretical Gore Point

GENERAL NOTES:
- When tying into existing ramps, striping will be adjusted to match existing lane configuration.
- Shoulder widths might be different than shown.
- ** Edge line location will be determined by the Engineer.

See Detail A

Plan View (On Ramp):
- 4" White
- 4" Yellow
- 12" White

Key Item:
- Traffic Direction
- Theoretical Gore Point

GENERAL NOTES:
- When tying into existing ramps, striping will be adjusted to match existing lane configuration.
- Shoulder widths might be different than shown.
- ** Edge line location will be determined by the Engineer.

See Detail B

December 23, 2019

Planim View (Off Ramp):

No additional textual content provided.