

## Section 811. PERMANENT PAVEMENT MARKINGS

**811.01 Description.** This work consists of furnishing and applying the specified retroreflective permanent pavement markings according to the *Michigan Manual of Uniform Traffic Control Devices* and this specification. All markings, shapes, spacing, and dimensions shall conform with the MDOT Pavement Marking Typical Plans.

The Department will not provide buildings or space to store Contractor's equipment or materials.

**811.02 Materials.** Materials shall meet the following requirements.

Glass Beads . . . . .	920
Waterborne Marking Material . . . . .	920
Regular Dry Marking Material . . . . .	920
Epoxy Pavement Marking Material . . . . .	920
Cold Plastic Pavement Marking Materials . . . . .	920
Thermoplastic Pavement Marking Materials . . . . .	920
Raised Pavement Markers . . . . .	920

The Contractor shall provide the Engineer with Material Safety Data Sheets for all materials and supplies used for the contract. The Contractor shall properly dispose of unused material and containers in compliance with the Federal Resource Conservation Recovery Act (RCRA) of 1976 as amended, and Part III (Hazardous Waste Management) of Public Act 451 of 1994 (Natural Resources and Environmental Protection Act).

The Department reserves the right to sample any permanent pavement marking materials. The Contractor shall provide samples when requested by the Engineer.

### 811.03 Construction.

- A. **Equipment.** The pavement marking equipment shall be self-propelled when used to apply longitudinal lines. Where the configuration or location of a pavement marking is such that the use of a self-propelled pavement marker is unsuitable, other methods and equipment approved by the Engineer may be used. The Engineer will determine if other equipment is suitable for a particular use such as special marking, etc.

The Department reserves the right to inspect the Contractor's equipment before the start of the project and anytime during the contract.

Equipment shall be capable of applying material to the required length and width and assure uniform application of the materials.

All self-propelled equipment must be certified by the Department prior to use. The certification must be attached to the inside of the drivers door, it must be from the current year, and it must be signed by the MDOT Traffic and Safety Division. The maximum speed at which the self-propelled equipment can be operated to ensure the appropriate quantities of pavement marking materials are delivered to the pavement surface shall be as shown on the certification.

Markings will not be paid for if placed in excess of the certified working speed. In the event a striper is found to be working in excess of the certified working speed, it will be assumed that the entire days work was performed at that speed.

The self-propelled pavement marker equipment used to apply centerline shall be capable of applying three, four-inch minimum width lines on a two-lane road, in one pass of the equipment. When applying multiple centerlines three spray guns at 6 inch center to center shall be used. For two-lane freeways the lane line shall be applied from the left lane. For freeways having three or more lanes the right lane line may be applied in conjunction with the right edgeline.

The Contractor shall use a dashing mechanism, capable of being easily adjusted, to retrace existing lane or centerline markings.

The self-propelled pavement marker shall allow pavement marking to be applied in either direction on a given roadway and the skip cycle shall be continuous. The cycle control unit shall not zero or return to the beginning or start of a new cycle even though the skip line markings are interrupted by intersections, double solid lines no passing zones, school/pedestrian crossings, railroad grade crossings, etc.

The Contractor's equipment shall include a distance meter to measure the length of each applied line.

The Engineer shall check the calibration of any metering device prior to the start of work and may check calibration of any metering device at the Department's discretion during the duration of the contract. The accuracy and reliability of the equipment being used shall be satisfactory to the Engineer. When the equipment is unsatisfactory other methods determined to be acceptable by the Engineer shall be used. No work shall progress until this determination has been made.

All equipment for applying hot-applied thermoplastic material shall have the capability of maintaining the material's temperature as required by the manufacturer of the material.

All traffic control devices used during the marking operation shall be according to the pavement marking convoy requirements in the proposal. If markings are applied when the roadway is closed to traffic, pavement marking convoy devices as shown in the pavement marking convoy requirements are not required, unless directed by the Engineer. The Contractor shall provide sufficient time for the Engineer to inspect all traffic control devices. Any corrections shall be made before continuing.

- B. **General.** The Department is responsible for all layout work or reviewing Contractor layout work necessary for the location and placement of pavement markings. For the layout of all lines see the pavement marking typical plans.

Prior to the application of pavement markings, the pavement surface shall be clean, dry, and free of foreign materials. The Contractor shall be responsible for removing all foreign materials which can be removed by air-blasting. The Contractor shall also be responsible for removing occasional debris or dead animals from the line track.

Line widths are a nominal 4 inches or 8 inches with a tolerance of  $+1/4$  inch. A solid line shall have no gaps or spaces. An edge line shall be a solid line. A double line shall be applied as either two solid lines or one solid line and one broken line.

A new (not retraced) broken line, shall be a nominal 12 feet 6 inches long with a tolerance of +4 inches. The cycle for new broken lines shall be 37 feet 6 inches. The lateral deviation of new (not retraced) lines shall not exceed one inch from the proposed location alignment.

When applying centerline and lane lines on new construction a minimum of five existing adjacent skips shall be retraced to match the existing pavement marking cycle.

Existing pavement markings are to be retraced with lines of equal width and length. For existing 4-inch or 8-inch wide lines (nominal), the tolerance of the retraced line shall be + $\frac{1}{4}$  inch. Total line width, existing and retraced, shall not exceed 5 inches and 9 inches, respectively. For existing 12 feet 6 inch (nominal) broken lines, the longitudinal tolerance of the retraced line shall be +4 inches. Total broken line length, existing and retraced, shall not exceed 13 feet.

All liquid materials shall be thoroughly mixed at all times during application. Thinning of materials will not be permitted. Pavement marking material shall be applied uniformly at the rate shown in Table 811-1. Application rates will be determined by dividing the quantity used by the length of line painted.

**Table 811-1 Pavement Marking Material Application Rates per Mile**

Line Type	Waterborne		Thermoplastic		Sprayable Thermoplastic		Epoxy		Regular Dry	
	Binder (gal)	Beads (lbs)	Binder (lbs)	Beads (lbs)	Binder (lbs)	Beads (lbs)	Binder (gal)	Beads (lbs)	Binder (gal)	Beads (lbs)
BROKEN										
4 inch	4	32	455	44	180	125	5	100	4	24
8 inch	8	64	910	88	360	250	10	200	8	48
SOLID										
4 inch	16	128	1820	176	720	250	20	400	16	96
8 inch	32	256	3640	352	1440	500	40	800	32	192

For initial application and occasionally during the course of work, the Engineer may check application to a pre-weighed sheet specifically placed for test purposes. Prior notice to the Contractor is not required.

All pavement marking materials shall be loaded on the pavement marking machine in a manner that will not interfere with or delay traffic.

If markings are applied when the roadway is open to traffic, traffic shall be maintained at all times according to the MDOT pavement marking convoy requirements. The striping equipment shall be operated in a manner that will make it unnecessary for traffic to cross the uncured markings.

When markings are applied in off road areas such as rest areas, roadside parks, or car pool lots open to traffic, traffic shall be maintained so it is not necessary for traffic to cross the wet markings. The protection of the wet line shall be the responsibility of the painting Contractor. Suitable devices such as traffic cones shall be placed by the Contractor.

If markings are applied when the roadway is closed to traffic, maintaining traffic operations as shown in the pavement marking convoy requirements are not required, unless directed by the Engineer.

Applied markings shall be sharp and well defined and shall provide uniform application of beads. Bead guns shall be positioned so all beads are directed uniformly into the line material. The markings shall be free of uneven edges, overspray, or other readily visible defects which, in the opinion of the Engineer, detract from the appearance or function of the pavement markings. The Contractor is responsible for taking appropriate care to prevent motorists from being sprayed.

Pavement marking lines shall be straight or of uniform curvature.

Pavement markings that are not placed as specified shall be removed at the Contractor's expense and re-applied in the correct locations at no cost to the Department.

Pavement markings damaged by traffic, that were not protected shall be re-applied and tracked lines shall be removed at the Contractor's expense .

- C. **Removal.** When specified, existing pavement markings on old pavement or curing compound on new concrete shall be removed. The material shall be removed by methods meeting the approval of the Engineer and cause as little damage as possible to the surface texture of the pavement. Methods which can provide acceptable results are grinding and air or shot blasting. Collected residue generated by the removal of pavement markings and curing compound must be properly disposed of.

The Contractor will not be allowed to use paint or bituminous bond coat to obliterate existing pavement markings. When special markings are removed (i.e., legends, symbols, arrows, crosswalks, and stop bars etc.), the new markings shall be installed within five working days of removal.

When removing cold plastic the removed material must be collected and disposed of properly.

Material deposited on the pavement as a result of removal shall be removed as the work progresses. Accumulation of material which might interfere with drainage or might constitute a hazard to traffic will not be permitted.

Where blast cleaning is used for the removal and such removal operation is being performed within 10 feet of a lane occupied by public traffic, the residue, including dust, shall be collected immediately after contact between the abrasive and the surface being treated. Collection shall be by a vacuum attachment operating concurrently with the blast cleaning operation, or by other equally effective methods meeting the approval of the Engineer.

- D. **Application, Temperature and Seasonal Restrictions.** Refer to Table 811-2 for a summary of this information

1. **Waterborne.** Waterborne paint shall be applied when the surface temperature of the pavement is 50 °F or higher and the pavement is dry. The Contractor shall be responsible for making the decision to apply waterborne paint on any specific day when there is a high probability of rain in the forecast. If applied lines are washed away because of rain the Contractor shall be responsible for re-applying the lines at no additional expense to the Department. Waterborne pavement marking materials may be placed immediately on new bituminous pavement. Waterborne pavement marking material shall not be placed before May 1 nor after October 1.

2. **Regular Dry Paint.** This marking material shall be applied when the surface temperature of the pavement is 25 °F or higher. New bituminous wearing surface shall be in place for a period of not less than 14 days prior to application of regular dry pavement markings. When it is necessary to apply regular dry paint after November 1, the 14-day waiting period may be waived by the Engineer. No liquidated damages will be assessed if the waiting period is in effect and the project is otherwise complete. If waterborne paint cannot be placed due to temperature or date limitations, regular dry paint may be used if approved by the Engineer. It will be paid for at the same unit price as waterborne paint.
3. **Epoxy Material.** This marking material shall be applied when the surface temperature of the pavement is 35 °F or higher. All existing non-epoxy pavement marking materials shall be removed prior to placement of any epoxy materials.
4. **Thermoplastic Material.** Since subsurface moisture can be present in amounts sufficient to affect proper bonding of the hot-applied thermoplastic material, the contractor shall be responsible for insuring that the pavement is free of all excess moisture that may effect proper bonding prior to beginning work. All testing for moisture shall be documented and provided to the Engineer. The minimum ambient air temperature shall be 48 °F and rising at the start of marking operations. If work is started and the air temperature falls below 45 °F, and continual cooling is indicated, all work shall be stopped.

The thermoplastic material shall be heated and applied within the temperature range recommended by the manufacturer. Thermoplastic material shall not be placed before May 1 nor after October 1.

5. **Cold Plastic .** The primer or contact cement shall be thoroughly mixed at all times during application. Thinning of contact cement and primer shall not be permitted.

Unless otherwise specified, cold plastic tape legends, crosswalks, and stop bars shall be white as shown on the typical plans for pavement markings.

Cold plastic shall not be placed before May 1 nor after October 1. Cold plastic tape shall not be applied unless the air temperature is at least 60 °F, the pavement surface temperature is at least 70 °F, and both temperatures are rising.

Preformed thermoplastic applied with heat as per the manufacturers specifications will be used if temperatures are not sufficient for the use of adhesive applied cold plastic markings. There will be no additional cost to the department for the change in materials.

Curing compound on new concrete surfaces shall be removed prior to application of the adhesive. When there are two or more layers of existing overlay cold plastic material on the pavement, all of the existing marking material shall be removed prior to installing cold plastic.

The Contractor shall apply a contact cement recommended by the material manufacturer and approved by the Department. All stop bars and crosswalks shall be non-adhesive backed. One application of contact cement shall be applied to the back of the cold plastic and two coats shall be applied to the pavement. The contact cement

shall be applied beneath the entire marking by a method recommended by the manufacturer. The Contractor shall allow adequate time for all solvents to evaporate from the adhesive before application of the marking.

Immediately after placement, all transverse and special markings shall be rolled at least four times with a minimum 200-pound roller. Additional rolling is not required for longitudinal applications when the equipment installing the line is equipped with a roller.

6. **Sprayable Thermoplastic.** Sprayable Thermoplastic material and glass beads shall be sprayed uniformly at thickness of no less than 40 mils. Since subsurface moisture can be present in amounts sufficient to affect proper bonding of the Sprayable Thermoplastic material, the contractor shall be responsible for insuring that the pavement is free of all excess moisture that may effect proper bonding prior to beginning work. All testing for moisture shall be documented and provided to the Engineer. The minimum ambient air and surface temperature shall be 50 °F and rising at the start of marking operations. If work is started and the air temperature falls below 50 °F, and continual cooling is indicated, all work shall be stopped, as directed by the Engineer.

**Table 811-2 Minimum Material Placement Temperature and Seasonal Restrictions**

Material	Minimum Air Temperature (a)	Minimum Pavement Temperature (a)
Waterborne	50° F	May 1 to October 1
Thermoplastic	48° F	50° F
Sprayable Thermoplastic	50° F	50° F
Epoxy	35° F	35° F
Cold Plastic Tape	60° F	70°F
Regular Dry	(b)	25° F
Raised Pavement Markers	(b)	50° F
a. See text for more detailed information.		
b. If a minimum air temperature is not given the minimum pavement temperature will prevail.		

- E. **Second Application.** On new construction where permanent pavement markings were properly installed initially and deteriorate prematurely, retracing of deteriorated markings will be measured as pavement marking second application. Second application shall be done no sooner that 30 days nor later than 60 days after initial application unless directed otherwise by the Engineer. Second application shall not be performed beyond the calendar year the initial application was placed.
- F. **Call Back Painting.** The Engineer will provide a list of locations and the respective limits to the Contractor. The Contractor shall begin within seven days of notification. The order in which the locations are to be painted shall be as directed by the Engineer. Pavement marking (call back) shall be waterborne pavement marking material.

- G. **Raised Pavement Marker (RPM).** RPMs are to be located so that the reflective face is perpendicular to the roadway longitudinal joints. On multi-lane roadways, offset the marker 4 to 6 inches left of the longitudinal joint. If the longitudinal joints do not approximate 12-foot lane widths, the offset location must be reviewed and approved by the Engineer prior to installation. RPMs shall not be located on longitudinal or transverse pavement joints or in cracks in the pavement surface.

RPMs shall be omitted from bridge decks. However, the spacing of the RPM cycle shall be maintained across the bridge to accommodate RPM placement on bridge decks at a later time. The spacing and location of the RPMs shall conform to the drawings and dimensions contained in the pavement marking typical plans.

A slot will be cut out of the pavement of the dimensions and depth specified by the manufacturer. The entire cut shall be made in a single plunge of the cutting apparatus. The cut shall have clearance (side-to-side movement) as per the manufacturer's specifications and match the bottom contour of the marker casting. The saw cut area must be dry and free of dust, dirt or any material which will adversely affect the bond of the adhesive. The casting shall extend above the finished pavement surface per the manufacturer's recommendation.

The casting keels and web shall be free of scale, dirt, rust, oil, grease, or any other containment which may reduce its bond to the epoxy adhesive.

The reflector may be attached to the casting prior to or after placement of the casting in the road. If the latter option is selected, the epoxy adhesive shall be cured before installing the reflector on the castings.

An epoxy adhesive shall be used to affix the RPM to the pavement. The epoxy adhesive shall be that specified by the RPM manufacturer and applied within the temperature range recommended by the manufacturer. However, the pavement surface temperature and the ambient air temperature at the time of RPM placement shall not be less than 50 °F. No RPM shall be installed if the pavement surface is wet.

Ambient Air Temp (°F)	Min Allowable Period Protected from Traffic (minutes)
100	15
90	20
80	25
70	30
60	35
50	45
<50	(do not apply)

In no case shall traffic be permitted on the RPM until the adhesive has properly cured. The minimum allowable period protected from traffic may be extended by the Engineer to allow proper adhesive curing.

The casting epoxy adhesive shall be mixed in accordance with the manufacturer's recommendations. The mixing operation and placing of the markers shall be done rapidly. Any mixed batch that cannot be readily extruded from under the RPM with light pressure shall not be used.

The clean slots shall be filled with epoxy adhesive. Sufficient epoxy shall be placed in and between the slots (generally to within  $\frac{3}{8}$  inch of the road surface) to assure that all voids beneath and around the casting are filled.

Place the RPM by hand into the epoxy-filled saw cut. The keels of the casting shall be placed into the slots in such a manner as to assure that the deflecting tips of the casting are below the surface and that all four lugs on the keels are in direct contact with the pavement. Make certain that the epoxy does not flow onto the reflective face or the surface in front of it.

1. **Raised Pavement Marker Lense Replacement.** Removal of the old reflector and installation of the new reflector shall be performed according to the manufacturer's recommended installation procedures and as described below: Replacement raised pavement marker lenses shall be selected from the department qualified products list.

Pry out the old reflector. Remove the original adhesive or butyl material out of the reflector pocket in the RPM casting. Sandblast or wire brush (electric or pneumatic) any remaining adhesive, butyl material, dirt or rust from the reflector pocket. The reflector pocket must be entirely clean and dry prior to adhesive application.

- a. **Reflector Installation on butyl tape backed lenses.** Air temperature shall be 45 °F or higher. Peel the release paper from the back of the new reflector and apply one bead of adhesive  $\frac{3}{8}$  inch wide lengthwise on the center of the butyl tape. Immediately after applying the reflector adhesive, place the new reflector into the casting pocket. Apply pressure sufficient to extrude a small amount of adhesive around the reflector edge. Proper adhesive coverage (90 percent of bond area or more) can be checked by prying up the new reflector, inspecting visually, then re-installing the reflector.
  - b. **Reflector Installation on non-butyl tape backed lenses:** Air temperature shall be 25 °F or higher. Place a 1½ inch wide by  $\frac{1}{8}$  inch thick ribbon of reflector adhesive across the clean, dry reflector pocket. (Note: The standard nozzle furnished on the applicator is cut back to about  $\frac{1}{8}$  inch exposed to adapt the special flared applications). Immediately after applying the reflector adhesive, place the new reflector into the casting pocket. Apply pressure sufficient to extrude a small amount of adhesive around the reflector edge. Proper adhesive coverage (90 percent of bond area or more) can be checked by prying up the new reflector, inspecting visually, then re-installing the reflector. The top of the new reflector must lie below the top of the casting.
2. **Raised Pavement Marker Removal.** Raised Pavement Markers (RPM) shall be removed with a jack hammer or other approved equipment. The area of the pavement disturbed by removal of the RPM shall not exceed 3 inches in depth from the pavement surface nor 3 inches out from the perimeter of the marker casting. The marker removal operation shall be stopped by the Engineer if it is determined damage to the pavement is exceeding the allowable depth or distance from the casting. Patching will be required even when milling is to be performed on the existing surface unless the Engineer determines that the damaged areas are not hazardous to traffic.

The patching material used to fill the holes left by the removal of raised pavement markers shall be selected from the Qualified Products List. Existing concrete and bituminous pavement which is to be overlaid with bituminous material as part of the

contract shall be patched with bituminous leveling mix. Concrete pavement which is not to be overlaid as part of the contract shall be patched with one of the prepackaged hydraulic fast-set materials for patching structural concrete and shall be applied in accordance with the manufacturer's specification for that patching material. Bituminous pavement which is not to be overlaid as part of the contract shall be patched with the epoxy adhesive used to affix raised pavement markers to the pavement.

**811.04 Measurement and Payment.**

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Pavt Mrkg, Waterborne, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Waterborne, 2nd Application __ inch, (color) . . . . .	Foot
Pavt Mrkg, Waterborne, for Rest Areas, Parks, and Lots, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Regular Dry, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Regular Dry, 2nd Application, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Thermoplastic, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Thermoplastic, __ inch, Crosswalk . . . . .	Foot
Pavt Mrkg, Thermoplastic, __ inch, Stop Bar . . . . .	Foot
Pavt Mrkg, Thermoplastic, __ inch, Cross Hatching, (color) . . . . .	Foot
Pavt Mrkg, Sprayable Thermoplastic, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Epoxy, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Overlay Cold Plastic, __ inch, (color) . . . . .	Foot
Pavt Mrkg, Overlay Cold Plastic, __ inch, Stop Bar . . . . .	Foot
Pavt Mrkg, Overlay Cold Plastic, 12 inch, Cross Hatching, (color) . . . . .	Foot
Pavt Mrkg, Overlay Cold Plastic, __ inch, Cross Walk . . . . .	Foot
Pavt Mrkg, Overlay Cold Plastic, (legend) . . . . .	Each
Pavt Mrkg, Overlay Cold Plastic, (symbol) . . . . .	Each
Removing Curing Compound, for Spec Mrkg . . . . .	Square Foot
Removing Curing Compound, for Longit Mrkg __ width . . . . .	Foot
Removing Spec Mrkg . . . . .	Square Foot
Call Back, Mobilization . . . . .	Each
Call Back, Pavt Mrkg, Waterborne, __ inch, (color) . . . . .	Foot
Call Back, Intermediate Transportation . . . . .	Mile
Raised Pavt Marker, Retrflec, Amber, Mono-directional . . . . .	Each
Raised Pavt Marker, Retrflec, Amber, Bi-directional . . . . .	Each
Raised Pavt Marker, Retrflec, Crystal, Mono-directional . . . . .	Each
Removing Raised Pavt Marker . . . . .	Each
Replace Prism Retrflec Lens (on RPMs), Amber, Bi-directional . . . . .	Each
Replace Prism Retrflec Lens (on RPMs), Crystal, Mono-directional . . . . .	Each
Replace Prism Retrflec Lens (on RPMs), Amber/Mono-directional . . . . .	Each
Replace Prism Retrflec Lens (on RPMs), Crystal, Bi-directional . . . . .	Each

**A. Delayed Acceptance.**

1. **Delayed Acceptance of Pavement Markings.** Delayed acceptance is that period of time when the Contractor must replace markings that have failed. Final acceptance of completed pavement marking work will be delayed 180 days. During this 180-day period, inspections of the markings placed according to the contract will be conducted at the Department's discretion. Markings with less than 90 percent of the original markings in place shall be replaced immediately at the Contractor's expense.

If the Contractor wishes to have the project accepted for final payment prior to the 180-day period, the Contractor must, when the balance of the contract work has been satisfactorily completed, furnish the Department with a maintenance bond equal in value to 90 percent of the value of the pavement marking work performed.

2. **Delayed Acceptance of Raised Pavement Markers (RPM).** Delayed acceptance is that period of time when the contractor must replace RPMs that have failed prior to the acceptance date established. Final acceptance of the completed work on RPMs will be delayed until May 1 of the following year. During this period, inspections of the RPMs placed will be conducted at the department's discretion. During inspection if any of the original RPMs installed or lenses are missing, the missing RPMs or lenses shall be replaced immediately at the Contractor's expense.

If the Contractor wishes to have the project accepted for final payment prior to May 1 of following year, the contractor must, when the balance of the contract work has been satisfactorily completed, furnish the department with a maintenance bond equal in value to 90 percent of the value of the RPM work performed.

#### B. **Raised Pavement Markers.**

1. Payment for **Raised Pavt Marker, Retrfllec** shall include all materials and labor to furnish and properly install each RPM complete with retroreflectant lenses and all traffic control devices necessary to maintain traffic. Installation shall include all work and equipment necessary to cut the proper slot for the casting and clean-up of all debris from this operation. All debris shall be removed and properly disposed of.

Castings installed on bridge decks by error shall not be removed or paid for. Castings installed in longitudinal or transverse joints or cracks shall be removed and replaced at the contractors' expense. Castings with epoxy on the web or lens; or castings that do not have all four lugs in contact with the pavement surface, or installed within the minimum offset requirements shall be removed and replaced at the contractors' expense. RPMs installed in violation of specifications are not considered a part of the delayed acceptance and shall be corrected immediately at the contractor's expense.

2. Payment for **Removing Raised Pavt Marker** shall include patching materials and all incidentals necessary to complete the work including removing markers and patching the depressions.
3. Payment for **Replace Prism Retrfllec Lens (on RPMs)** shall include all materials and labor to remove and properly install each RPM lens and all traffic control devices necessary to maintain traffic. All debris shall be removed and properly disposed of.

- C. **Call Back, Pavt Mrkg, Waterborne** supersedes the pay item for the specific pavement marking material selected and included in the proposal. Regular-dry markings applied in lieu of waterborne markings between October 1 and May 1 will be paid for at the contract unit price for **Call Back, Pavt Mrkg, Waterborne**. All markings installed during a call back will be at the same unit price as the original installation.

Travel to the first call back painting location will be paid for as **Call Back, Mobilization**.

Travel between intermediate locations will be paid for as **Call Back, Intermediate Transportation**, at the contract unit price based on map distances.

- D. **Pavement Marking Removal.** The area of full removal for special marking will be determined from the pavement marking typical plans. The payment for partial removal of special marking legends will be paid according to the actual legend removal area.

Where multiple layers of pavement marking materials exist, payment for removing will only be paid for once. Additional layers of material beyond the first layer will not be paid for separately.

- E. **Material Deficiency.** Material shortages will not be permissible without contract unit price reductions. All determinations of pay deduction resulting from shortages in marking materials shall be based on measurements obtained and the required application rate shown in the application rate table. If material shortages exist the contract unit price will be reduced in direct proportion to the deficiency, up to 6 percent maximum. If the daily deficiency of either pavement marking material or beads is more than 6 percent, the day's work shall be considered unsatisfactory and the day's markings shall be re-applied at no cost to the Department. All re-applied markings shall be applied to the full application thickness as described in the specifications. Use of a thin application to make up for the deficiency will not be allowed.

The quantity of pavement marking material and glass beads applied per unit of measurement will be computed by the Engineer at the end of each work day. A day's applied length of less than 10 miles of line may be included in the next day's applied markings for the purpose of computing marking material and bead application amounts.

F. **General.**

1. Payment shall be compensation for materials, labor, traffic control, mobilization, and equipment necessary for placement of the pavement marking material. The skips in dashed lines are not included in the measurements.
2. Disposal of removed cold plastic and collected residue generated by the removal of pavement markings and curing compound is included in the bid price for removal.
3. Payments for contact cement and adhesives for long lines, legends, symbols, arrows, crosswalks and stop bars will not be paid separately, but will be considered as having been included in the price bid for the overlay method.
4. If waterborne paint cannot be placed due to temperature or date limitations, regular-dry paint may be used if approved by the Engineer. It will be paid for at the same unit price as waterborne paint.
5. Preformed thermoplastic applied with heat as per the manufacturers specifications will be used if temperatures are not sufficient for the use of adhesive applied cold plastic markings. There will be no additional cost to the department for the change in materials.