

808-T-210 GROOVING FOR DURABLE PAVEMENT MARKINGS

(Revised 12-17-15)

The Standard Specifications are revised as follows:

SECTION 808, BEGIN LINE 17, DELETE AS FOLLOWS:

~~Extended Warranty Preformed Plastic.....921.02(b)~~

SECTION 808, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

**808.05 Transverse Markings and Pavement Message Markings**

**(a) Transverse Markings**

~~(a)~~ Transverse marking lines shall be used as specified or directed to delineate channelizing lines, stop lines, crosswalk lines, and parking ~~limit~~ lines. *Parking lines for ADA accessible parking spaces shall be 4 in. wide and blue in color. Unless otherwise specified or directed, all other parking lines shall be 4 in. wide and white in color.* ~~The~~ All other transverse markings shall consist of all necessary lines, of the width specified or directed and shall be in accordance with the MUTCD.

**(b) Pavement Message Markings**

~~(b)~~ Pavement message marking shall be used as specified or directed for railroad crossing approaches, intersection approaches, crosswalk approaches, ~~handicap parking spaces~~ *ADA accessible parking space symbol*, and other messages applied to the pavement with pavement marking material. The markings shall consist of all necessary lines, words, and symbols as specified or directed, and shall be in accordance with the MUTCD.

SECTION 808, BEGIN LINE 135, DELETE AND INSERT AS FOLLOWS:

**808.07 Pavement Marking Material Application, Equipment, and Performance Requirements**

All double line markings, such as a no passing zone or the center line of an undivided multi-lane roadway, shall be applied in one pass. When a hand propelled machine is used, the single pass application of double line markings will not be required and control points shall be spaced at a maximum of 10 ft longitudinally.

For contracts with completion dates when conditions do not enable application of the specified marking materials, *or grooving for durable marking materials*, other materials may be substituted with an appropriate unit price adjustment if approved by the Engineer.

Markings shall be installed in accordance with the manufacturer's recommendations, except that the minimum requirements stated herein shall also apply. Products specifically designed for application temperatures below the stated minimums herein are not required but may be used if approved by the Engineer. When directed, the Contractor shall provide the Department with original copies of all necessary current manufacturer's installation manuals prior to beginning installation work, and no installation work shall begin prior to the Department's receipt of these manuals. These manuals shall become the property of the Department.

The markings shall be protected from traffic until dry to eliminate tracking.

The markings shall meet or exceed the following performance criteria:

1. Color. The daytime and nighttime color of the applied markings shall be in accordance with ASTM D 6628 when determined in accordance with ASTM E 811 and E 1349.
2. Durability. The pavement markings shall have a minimum resistance to wear of 97% in accordance with ASTM D 913.
3. Retro-reflectivity. Contracts with 50,000 lft or more of longitudinal paint line or 10,000 lft or more *for each type of* longitudinal durable marking line *applied* shall have retro-reflectivity measured, *except markings placed on seal coat pavements placed in accordance with 404*. Longitudinal lines shall meet required minimum initial and retained average retro-reflectivity measurements. All other contracts and markings, *except parking lines*, shall meet the required longitudinal line minimum measurements and will be measured by the Department at the discretion of the Engineer, except that quality adjustments will not apply. Retained retro-reflectivity is the value at the time of the warranty expiration in accordance with 808.09 and will be measured by the Department at the discretion of the Engineer.

Retro-reflectivity testing equipment shall be furnished, calibrated, and operated in accordance with ITM 931. The markings shall be tested in a period of not less than 14 days to not more than 30 days after the materials are applied. The retro-reflectivity equipment shall remain the property of the Contractor. The measurement of retro-reflectivity shall be supervised or performed at all times by an operator trained and certified by the unit's manufacturer. A report as described in the ITM and including the specified test results and calculations shall be prepared and provided to the Engineer within three days of each day of testing.

Quality adjustments will be applied to the payment of markings ~~which fail to meet the required minimum initial average retro-reflectivity values as indicated in the table below~~. The required minimum initial and retained average retro-reflectivity values for longitudinal line measured in mcd/m<sup>2</sup>/lx are as follows:

Material Type	White	Yellow	Quality Adjustment*	Retained White	Retained Yellow
Paint	≥ 250	≥ 175	1.00	N/A	N/A
Required Minimum	150 to 249	125 to 174	0.70		
Thermoplastic	≥ 300	≥ 200	1.00	<del>200</del> See 808.09	<del>150</del> See 808.09
Required Minimum	250 to 299	150 to 199	0.70		
Multi-Component	≥ 300	≥ 200	1.00	<del>200</del> See 808.09	<del>150</del> See 808.09
Required Minimum	250 to 299	150 to 199	0.70		

Preformed Plastic	<del>≥ 300</del> 650	<del>≥ 200</del> 450	1.00	<del>200</del> See 808.09	<del>150</del> See 808.09
Required Minimum	<del>250 to 299</del> 550 to 649	<del>150 to 199</del> 350 to 449	0.70		
<del>Extended Warranty</del> Preformed Plastic	<del>≥ 650</del>	<del>≥ 450</del>	<del>1.00</del>	See 808.09.1	See 808.09.1
<del>Required Minimum</del>	<del>550 to 649</del>	<del>350 to 449</del>	<del>0.70</del>		

\* Quality Adjustments do not apply to the retained retro-reflectivity values

SECTION 808, BEGIN LINE 246, DELETE AND INSERT AS FOLLOWS:

**(b) Durable Pavement Marking Material**

Durable pavement marking material consists of thermoplastic, preformed plastic or multi-component markings. *Durable pavement marking materials used for center lines, lane lines, or edge lines shall be installed within a groove in the pavement unless otherwise indicated on the plans. Durable pavement marking materials used for barrier lines, pavement message, and transverse markings shall be surface applied unless otherwise indicated on the plans.*

**1. Grooving for Durable Pavement Markings**

**a. Application**

*The pavement shall be grooved prior to the placement of longitudinal durable pavement markings, excluding bridge decks and approach slabs. The groove or recess shall be installed in a single pass using dry cut equipment that utilizes diamond cutting blades and that is approved by the pavement marking manufacturer. If there are no markings on the pavement, a guide line shall be placed using paint without glass beads as a template for the grooving operation. The groove shall be at least 1 in. and no more than 2 in. wider than the pavement marking to be placed. The Contractor may leave a gap in the grooving for longitudinal lines that delineate the radii of lane usage transitions, driveways, intersections, or adjacent to a curb that does not have a curb offset to the marking of at least 12 in.*

*The depth of the groove shall be in accordance with the manufacturer's recommendations and shall be at minimum 5 mils greater than the thickness of the marking material including exposed glass beads, up to a maximum allowable depth of 150 mils. A continuous groove shall not be allowed for broken or dotted lane lines. The groove may extend up to 3 in. at either end of a lane line. Grooves shall be no closer than 2 in. to the edge of a longitudinal joint.*

**b. Groove Finish and Cleaning**

*The grooved surface shall be cleaned with vacuuming equipment immediately following the grooving operation. The surface shall be clean and dry prior to pavement marking installation. The finished groove surface shall have a fine corduroy-like appearance with a maximum variation in depth of 10 mils.*

**12. Thermoplastic**

**a. Application**

Thermoplastic marking shall be applied in molten form by conventional extrusion

when the pavement and ambient air temperatures are *a minimum of 50°F or above and rising*; or by ribbon type extrusion or spray when the pavement and ambient air temperatures are a minimum of ~~60~~50°F ~~or above and rising~~. Heat bonded preformed thermoplastic may be used for transverse or message markings. The average final thickness of each 36 in. length of thermoplastic marking shall be no less than 90 mils and no more than 125 mils. Immediately following the application of the thermoplastic markings, additional retro-reflectorization shall be provided by applying beads to the surface of the molten material at a uniform minimum rate of 8 lb/100 sq ft of marking. Individual passes of markings shall not overlap or be separated by gaps greater than 1/4 in. longitudinally.

#### **b. Equipment**

The equipment used for the application of thermoplastic markings shall consist of a kettle for melting the material and an applicator for applying the markings. All of the equipment required for melting and applying the material shall maintain a uniform material temperature within the manufacturer specified limits, without scorching, discoloring or overheating any portion of the material.

A truck-mounted machine shall be equipped with the following: an air blast device for cleaning the pavement ahead of the marking operation; a guide pointer to keep the machine on an accurate line; at least two spray guns which can be operated individually or simultaneously; agitators; a control device to maintain uniform flow and application; an automatic device which will provide a broken line of the required length; and an automatic bead dispenser which is synchronized with the marking application.

A hand-propelled machine may be used to apply markings.

The equipment for applying heat bonded preformed plastic shall be in accordance with the manufacturer's recommendations. An open flame shall not come into direct contact with the pavement.

#### **c. Performance Requirements**

When the initial average retro-reflectivity measurement is below the required minimum the segment of line shall be removed and replaced with no additional payment. Pavement markings segments which have more than five of 20 individual readings below the minimum required shall be removed and replaced with no additional payment.

### **~~23. Preformed Plastic and Extended Warranty Preformed Plastic~~**

#### **a. Application**

~~The installation method for extended warranty preformed plastic markings shall be the overlay method for PCCP and the inlay or overlay method for HMA. The overlay method is defined as placement of preformed plastic markings on the finished pavement surface. The inlay method is defined as placing preformed plastic markings on newly placed HMA immediately prior to the last roller pass. The pavement shall be grooved prior to the placement using the overlay method. This groove shall not exceed 110 mils in depth or 1 in. wider than the pavement marking to be placed. The equipment used for grooving shall not damage pavement joints.~~

~~For non-extended warranty preformed plastic, the overlay installation method is acceptable for both HMA and PCCP pavements, and no grooving is required.~~

~~There is no minimum temperature requirement for preformed plastic installed by the inlay method. When installed by other methods, the markings shall be applied when the air temperature is a minimum of 60°F and rising, and the pavement temperature is a minimum of 70°F. The markings shall not be applied if the ambient air temperature is expected to drop below 40°F within 24 h after application. *The markings shall be applied when the air temperature is a minimum of 40°F and rising. A primer is required if the ambient air temperature is below 50°F.* The pavement surface shall be primed with a binder material in accordance with the manufacturer's recommendations.~~

If there is a dispute regarding installation, the manufacturer shall provide a trained representative to ensure that the installation is properly performed.

### **b. Performance Requirements**

When the initial average retro-reflectivity measurement is below the required minimum the segment of line shall be removed and replaced with no additional payment. Pavement markings segments which have more than five of 20 individual readings below the minimum required shall be removed and replaced with no additional payment.

## **34. Multi-Component**

### **a. Application**

This material shall be applied only when the pavement and ambient air temperatures are 40°F ~~or above~~ *and rising*. The wet film thickness of the marking material shall be a minimum of 20 mils. Immediately following the application of the markings, additional reflectorization shall be provided by applying beads to the surface of the wet marking at a uniform minimum rate of 20 lb/gal. of marking.

### **b. Equipment**

The machine used to apply the marking material shall precisely meter each component, and produce and maintain the necessary mixing head temperature within the required tolerances. The machine shall be equipped in accordance with 808.07(a)2.

### **c. Performance Requirements**

Pavement marking segments which are found to have an average retroreflectivity reading below the required minimum shall be re-stripped with no additional payment. Pavement markings segments which have more than five of 20 individual readings below the minimum required shall be re-stripped with no additional payment. The re-stripping shall begin within 14 calendar days of the completion of the retro-reflectivity measurement. Line segments may be re-stripped with no additional payment. Following each re-stripping, additional retro-reflectivity measurements shall be made with no additional payment. Quality adjustments will be based on the final retro-reflectivity measurements. The alignment of all re-stripped markings shall be placed within  $\pm 1/4$  in. in width and  $\pm 2.0$  in. in length of the original placed markings. Re-stripping will not be allowed more than two times, after which removal and replacement of the markings will

be required.

SECTION 808, BEGIN LINE 417, DELETE AND INSERT AS FOLLOWS:

**808.09 Warranty for Durable Pavement Marking Material**

Durable pavement marking material shall be warranted against failure resulting from material defects or method of application, or the result of snowplowing and deicing activities. The material shall be warranted to retain its color, ~~retroreflectivity, durability~~ *adherence to the pavement*, and shall be free of other obvious defects or failures. *Grooved durable pavement markings shall also be warranted to retain retroreflectivity as specified below.*

All pavement traffic markings which have failed to meet the warranted conditions shall be replaced with no additional payment.

For the terms of the warranty a unit shall be defined as a 1,000 ft section of line of specified width in any combination or pattern.

***(a) Surface Applied Durable Pavement Marking Warranty***

The warranty period *for surface applied durable markings* shall be 180 days beginning with the substantial completion date for the contract as defined in 101.59, but not prior to November 1 of the calendar year in which the last pavement markings were installed. If more than 3% of a unit or 3% of the total of any one intersection or set of transverse markings fails, the failed portion shall be replaced. All pavement markings required to be replaced under the terms of this warranty shall be replaced within 60 days of the notification of failure.

***(b) Grooved Durable Pavement Marking Warranty***

*The warranty period for durable markings placed in a groove shall be 2 years beginning with the substantial completion date for the contract as defined in 101.59, but not prior to November 1 of the calendar year in which the last pavement markings were installed. The retained retro-reflectivity, mcd/m<sup>2</sup>/lx, as determined by ITM 931 shall meet or exceed the minimum values at all times during the warranty period as follows:*

<i>Material</i>	<i>Year</i>	<i>White</i>	<i>Yellow</i>
<i>Thermoplastic</i>	<i>1</i>	<i>225</i>	<i>150</i>
	<i>2</i>	<i>175</i>	<i>125</i>
<i>Multi-Component</i>	<i>1</i>	<i>225</i>	<i>150</i>
	<i>2</i>	<i>175</i>	<i>125</i>
<i>Preformed Plastic</i>	<i>1</i>	<i>400</i>	<i>300</i>
	<i>2</i>	<i>300</i>	<i>200</i>

*If more than 5% of a unit or 5% of the total fails, the failed portion shall be replaced. All pavement markings required to be replaced under the terms of this warranty shall be replaced within 60 days of the notification of failure.*

**~~808.09.1 Extended Warranty for Preformed Plastic Pavement Marking Material~~**

~~Extended warranty markings shall be warranted for a period of two years~~

~~beginning with the substantial completion date for the contract as defined in 101.59. The markings will be subject to snowplowing and deicing chemicals. The material shall be warranted to retain its color, retro-reflectivity, and durability and shall be free of other obvious defects or failures.~~

~~For the terms of the warranty a unit shall be defined as a 1,000 ft section of line of specified width in any combination or pattern.~~

~~The retained retro-reflectivity,  $\text{med/m}^2/\text{Ax}$ , as determined by ITM 931 shall meet or exceed the minimum values at all times during the warranty period as follows:~~

Year	White	Yellow
1	400	300
2	300	200

~~When a unit of markings is found to have an average retro-reflectivity reading below the required value, the entire unit of markings shall be removed and replaced. If more than 5% of a unit of markings fails due to color or durability, the entire unit shall be removed and replaced.~~

~~All pavement markings required to be replaced under the terms of this warranty shall be replaced within 60 days of the notification of failure.~~

SECTION 808, BEGIN LINE 572, DELETE AND INSERT AS FOLLOWS:

~~Transverse~~*Except as otherwise specified, transverse* marking lines will be measured as the total distance in linear feet of lines placed or removed. *Transverse marking yield lines will be measured transversely including the entire extent of the marking line and gaps.* Curb markings will be measured by the linear feet along the front face of the curb. *Grooving for pavement markings will be measured as the total distance of grooving for each pavement marking line in linear feet.* Pavement message markings will be measured by the total number of each type placed. A railroad crossing pavement message marking shall include the two R's, the X, and the three stop lines per traffic lane. Railroad crossing pavement message markings will be measured by the total number of each marking place. Lane indication arrow pavement message markings will be measured by the number of lane indication arrowheads placed. Removal of pavement message markings will be measured in square yards using areas shown in the following table. The material will not be considered when measuring such markings for pavement.

SECTION 808, BEGIN LINE 622, INSERT AS FOLLOWS:

### **808.13 Basis of Payment**

Lines and transverse markings placed will be paid for at the contract unit price per linear foot for the material, type, color, and width specified. *Grooving for pavement markings will be paid for at the contract unit price per linear foot.* Curb markings will be paid for at the contract unit price per linear foot for curb painting, of the color specified. Pavement message markings placed will be paid for at the contract unit price per each, for the material and message specified. Lines and transverse markings removed will be paid for at the contract unit price per linear foot. Pavement message markings removed will be paid for at the contract unit price per square yard.

SECTION 808, BEGIN LINE 608, DELETE AND INSERT AS FOLLOWS:

Payment for furnishing, calibrating, and operating retro-reflectivity testing equipment will be paid for at the contract price for lump sum. The cost of report preparation shall be included in the cost of retro-reflectivity testing. Adjustments to the contract payment with respect to retro-reflectivity of performance based pavement markings will be included in a quality adjustment in accordance with 109.05.1. The Engineer may waive retro-reflectivity testing due to weather limitations. Retro-reflectivity testing will be waived for markings applied after October 31 and before April 1. If retro-reflectivity testing is waived, no payment will be made for retro-reflectivity testing ~~and no quality adjustment for retro-reflectivity will be made.~~ If retro-reflectivity testing ~~is not performed and~~ is not waived by the Engineer due to weather *or waived by the seasonal time restriction and retro-reflectivity testing is not performed*, no payment will be made for retro-reflectivity testing and payment for the marking items will be made at 70% of the unit price.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit Symbol</b>
Curb Painting, _____ color	LFT
<i>Grooving for Pavement Markings</i> .....	<i>LFT</i>
Line, _____, _____, _____, _____ in. material type color width	LFT
Line, Remove .....	LFT
Pavement Message Marking, _____, _____ material message	EACH
Pavement Message Marking, Remove .....	SYS
Prismatic Reflector .....	EACH
Retro-Reflectivity Testing .....	LS
Snowplowable Raised Pavement Marker .....	EACH
Snowplowable Raised Pavement Marker, Remove .....	EACH
Transverse Marking, _____, _____, _____, _____ in. material type color width	LFT
Transverse Marking, Remove .....	LFT

SECTION 808, BEGIN LINE 662, DELETE AND INSERT AS FOLLOWS:

Beads, binder material for thermoplastic and preformed plastic, adhesive for snowplowable markers, patching material for snowplowable marker removal, *guide lines for grooving operations*, pavement cleaning and surface preparation, and all necessary incidentals shall be included in the cost of the pay items.

~~The cost of grooving prior to placing extended warranty preformed plastic shall be included in the cost of the pay item.~~

SECTION 921, BEGIN LINE 27, DELETE AS FOLLOWS:

**(b) Preformed Plastic and Extended Warranty Preformed Plastic**