All Weather Thermoplastic

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Description

3M™ All Weather Thermoplastic is a traffic marking system consisting of a high performance thermoplastic and 3M bonded core elements.

An accompanying second drop of glass beads, completes the system. Designed for use as long line markings, all weather thermoplastic delivers exceptional levels of all weather reflective performance in a thermoplastic marking.

The thermoplastic is available in three intermix options: All options are part of an MCS with surface drop all weather elements.

1. The highest performance option contains 3M all weather elements, Type 3 and Type 1 beads intermixed into the thermoplastic binder. It is designed to be applied at thickness greater than 60 mils (1.5 mm).
2. An intermediate performance product with Type 3 and Type 1 beads intermixed into the thermoplastic binder, the product should be applied at thickness greater than 60 mils (1.5 mm).
3. A value option containing Type 1 beads intermixed into the thermoplastic binder. It is targeted for applied thickness greater than 60 mils (1.5 mm).

Comparison Chart

	AWT with Intermix Elements	AWT with Type 3	AWT
Reflectivity Performance			
Initial all weather	X	X	X
Retained wet/dry	X		
Retained dry	X	X	
Intermixed Optics			
All weather elements	X		
Type 3 glass beads	X	X	
Type 1 glass beads	X	X	X
Surface optics			
Element double drop	X	X	X
Standard thermo equipment	X	X	X

Bonded core elements

3M's bonded core elements consist of a blend of microcrystalline ceramic beads embedded on a center core to provide optimal performance in both wet and dry conditions. The bonded core elements are used in two places in all weather thermoplastic. As the first drop of a double drop system, the elements provide initial levels of all weather performance. The elements are visible dry, during a rainfall and after rainfall, providing the motorist visibility in all weather conditions.

In order to provide retained levels of all weather performance, 3M bonded core elements are optionally intermixed into the thermoplastic formulation and accompany high performance glass beads in the intermix. As the thermoplastic wears away, new elements are exposed and provide all weather retroreflectivity.

Thermoplastic

The thermoplastic is specially formulated for intended applications, and consist of a mixture of high quality resins, pigments and optics. The optics system intermixed into the thermoplastic binder contains all weather elements and glass beads in the highest performance product option, or glass bead only intermixed into the thermoplastic binder in the value product. 3M all weather thermoplastic is ideal for situations where existing thermoplastic equipment is available.

Second Drop Glass Beads

A second drop of glass beads is necessary to improve the durability of the finished marking and provides increased visibility during dry conditions.

Features and Benefits

- Optimized formulations for both initial and retained performance.
- Provides superior all weather performance for the motorist.
- Outstanding levels of wet recovery approach the dry values of most thermoplastic markings per ASTM E2177.
- Effective performance under rain conditions as shown by measure values per ASTM E2176.

Weather and Pavement Conditions

3M all weather thermoplastic should be applied within established application guidelines for thermoplastic. Optimal performance is achieved when applying at air and pavement temperature of 50º F (10º C) and rising, and thermoplastic temperature of 385-420º F (196-227º C) at the die for proper adhesive to the pavement.
Note: Under some conditions, more restrictive application temperatures will be requires.

Equipment

3M all weather thermoplastic must be installed using a double-drop element/bead delivery system. The elements are installed as the first drop of the two-drop system. The elements must be installed at a truck speed no greater than 8 mph to minimize loss, prevent rolling and ensure adequate sink into the thermoplastic add tank agitation to prevent settling of beads. Contact 3M Technical Service at 1-800-553-1380 for additional information on modifications to existing equipment.

Thickness

3M™ All Weather Thermoplastic is applied at thickness (greater than 60 mil (1.5 mm) for all system options). For applications less than 60 mils, contact 3M technical service for product recommendations and additional application information and restrictions.

Marking Dimensions

In accordance with the Manual on Uniform Traffic Control Devices and the project.

Placement of Elements and Beads

Elements and beads must be applied to all weather thermoplastic so their upper exposed portions are free of thermoplastic material due to rolling.

For maximum performance the elements and beads must be imbedded into the thermoplastic between 50% and 60%. Under-sinking the beads and element will result in premature loss and reduction in brightness. Over-sinking the elements will result in low initial dry and wet brightness.

Application Rates

3M all weather thermoplastic should not be applied less than 60 mil (1.5 mm) thick. Elements and glass beads should be applied at the rates shown in the tables below.

Table 1. Element Application Rates

Units	Composite Reflective Elements
Pounds per 4-inch linear foot	0.022
Grams per 4-inch linear foot	10
Pounds per 100 sq ft	6.6
Grams per square meter	323

Table 2. Glass Bead Application Rates

Units	Utah Beads*	Type 3
Pounds per 4-inch linear foot	0.048	0.026
Grams per 4-inch linear foot	22	12
Pounds per 100 sq ft	14.4	7.8
Grams per square meter	710	388

*Utah or FP03# 718.19 Type 3

Retroreflectivity

Typical initial retroreflectance is shown in table 3 below.

Table 3.

Typical Initial Retroreflectivity* Average values over many applications (mcd (ft-2) (fc-1); {metric equivalent mcd (m-2) (lux-1)}				
	Series 50		Series 90	
	White	Yellow	White	Yellow
Dry (ASTM E1710)	900	700	500	405
Wet recovery (ASTM E2177)	345	280	500	405
Wet Continuous (ASTM E2176)	125	90	180	150

*Note: Typical Retroreflectivity results represent average performance for smooth pavement surfaces. Results may vary due to differences in pavement type and surface roughness. Increased element drop rate may be necessary to compensate for increased surface area characteristic of rough pavement surfaces.

Some reasonable variance should be expected (for example, applications on very rough surfaces or differences in glass beads).

The initial retroreflectance of a single installation shall be the average value determined according to the measurement and sampling procedures outlined in ASTM D 6359, using a 30-meter (98.4 feet) retroluminometer. Wet retroreflectance values measured under a “condition of continuous wetting” (simulated rain) shall be in accordance with ASTM E2176, and to reduce variability between measurements, the test method shall be performed in a controlled laboratory environment while the marking is positioned with a 3 to 5 degree lateral slope. Measurements shall be reported as an average of no less than three measurement locations. Samples of the complete finished all weather thermoplastic pavement marking shall be applied to flat panels during application and brought back to the lab for testing. The 30-meter retroluminometer shall measure the coefficient of retroreflected luminance (RL) at an observation angle of 1.05 degrees and an entrance angel of 88.76 degrees. RL shall be expressed in units of millicandelas per square foot per foot-candle [(mcd(ft-2)(fc-1)]. The metric equivalent shall be expressed in units of millicandelas per square meter per lux [mcd(m-2(lux-1)].

Initial performance of pavement markings should be measured no sooner than 4-7 days after application. For measurements made earlier than this period, wet reflective measurements might encounter some errors due to the initial hydrophobic nature of the material.

The applicator of the markings is responsible for meeting the following requirements.

Gradation of the Second Drop of Glass Bead

The gradation of the second drop must meet or be within the limits in Table 4.

Table 4. Gradation of the Second Drop of Glass Bead

Common bead types with liquid pavement markings Bead Gradations - Mass Percent Passing (ASTM D1214)			
US Mesh	Micron	FP03 718.19 Type 3	Utah Performance Specification
12	1700	100	
14	1410	95-100	
16	1180	80-95	
18	1000	10-40	65-80
20	850	0-5	
25	710	0-2	
30	600		0-30
40	425		
50	300		0-5
70	212		
80	180		
100	150		

**A minimum of 15% of the total weight shall be made from direct melt glass beads.

***All + 30 U.S. Mesh beads shall be 85% minimum rounds.

There are many types of glass beads that meet or fit within this range from various manufacturers.

Quality of Second Drop Glass Beads

The required glass beads shall have an index of refraction of 1.5 when tested by the immersion method at 25ºC (77ºF). The glass beads shall be surface treated for optimal performance with thermoplastic traffic marking. The glass beads shall have a minimum of 70% Rounds as measured according to ASTM D1155. The surface of the glass beads shall be free of pits and scratches. The glass beads retained on the #30 U.S. Mesh Sieve (425 microns) shall have minimum crush strength of 30 pounds in accordance with ASTM D1213.

Storage

For best results store 3M™ All Weather Thermoplastic in a cool, dry, area indoors or outdoors off the ground in a dry location and covered. Use thermoplastic within one year of receipt. Follow glass bead manufacturer recommendations for storage.

Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet (MSDS), and/or product labels of chemicals prior to handling or use. Also refer to the MSDS for information about the volatile organic compound (VOC) content of chemical products. Consult local regulations and authorities for possible restrictions on product VOC content and/or VOC emissions. Electronically, visit us at www.3m.com/us and select search.

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Literature Reference

PB 3M™ All Weather Elements

IF 5.24 3M™ All Weather Thermoplastic Application Guidelines

FOR INFORMATION OR ASSISTANCE CALL:

1-800-553-1380

IN CANADA CALL:

1-800-265-1840

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www.3M.com/tss

3M assumes no responsibility for any injury, loss or damage arising out of the use of a product that is not of our manufacture. Where reference is made in literature to a commercially available product, made by another manufacturer, it shall be the user's responsibility to ascertain the precautionary measures for its use outlined by the manufacturer.

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