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 markings.

Bonded Core Elements

3M manufactured bonded core elements are supplied as a mixture of dry and wet reflecting elements. The elements are applied in the first drop of a double-drop process. Depending on the thermoplastic used, they may also be intermixed in the thermoplastic binder along with glass beads.

Thermoplastic

3M all weather thermoplastic is specifically formulated to work with the bonded core elements as part of a matched component system. It is supplied in granular form either as a binder intermixed with bonded core reflective elements and glass beads included, or intermixed with just glass beads.

Equipment Description

3M all weather thermoplastic is applied using specialized, mobile trucks or application carts designed to apply thermoplastic materials in a molten liquid state with a double drop of reflective media in a continuous and skip-line pattern. Three types of application methods may be used:

- Screed (Applied from a trough or shoe) - Typically applied at a 90 mil (2.3 mm) thickness minimum, a lower thickness of 60 mil (1.5 mm) minimum maybe used for application on existing pavement markings.
- Extrusion (or ribbon) - Applied under pressure or by an auger. Typically applied at a 60 mil (1.5 mm) minimum thickness.
- Spray - Air assisted pressurized application. 3M all weather thermoplastic is best applied at a typical minimum 60 mil (2.0 mm) thickness. If thinner applications are being considered, 3M Technical Service should be contacted at 800-553-1380 for product recommendations, application conditions and restrictions.

Special Note: For all application methods, the target thickness used will depend on agency requirements and the roughness of the pavement surface.

Melt Vessel

- The thermoplastic melt vessel is capable of providing continuous uniform heating to the thermoplastic at normal operating temperatures between 385º F - 440º F and must be equipped with a thermostatic temperature control for maintaining temperature.

The melt vessel must also provide sufficient agitation to the molten thermoplastic material to provide a homogeneous mixture without stratification.

Surface Preparation Recommendations

Proper application of 3M all weather thermoplastic is essential for completion of a successful project. Below are some surface preparation recommendations that should be followed.

Note: Contact 3M Technical Service at 800-553-1380 for guidance on surface preparation questions.

Temperature

Application of 3M all weather thermoplastic System is recommend at the following temperatures:

- Screed or Extrusion application: Air and pavement 50º F (10º C) and rising.
- Spray application: Air and pavement 55º F (13º C) and rising.

Note: Wind (wind chill) can cause quicker cooling. Application is not recommended at wind chill less than 45º F (7º C). Also be aware that pavement temperature for a shaded area can be lower.
Moisture
Road surfaces must be clean and dry prior to application of 3M all weather thermoplastic. After periods of prolonged rainfall on pavement surfaces, use extra caution to verify the pavement is completely dry prior to application. Periods where dew is present should also be avoided.

A quick test for moisture presence is as follows:
Tape a 12 inch x 12 inch clear plastic wrap on an area exposed to sunlight. (Shaded areas can give false results). Examine the underside of the plastic wrap after 15-30 minutes. If moisture is present, delay application until no moisture is noted for the test.

Oil, Debris and Dust
At the time of application, the pavement surface must be free of oil, dust, grease and similar foreign materials. The surface must be blown with a high velocity – high pressure air source (185 cfm, 90 psi) to remove any loose material prior to application of the product. Use a grinder or shot blaster to remove any surface contamination from automotive fluids such as oil and grease.

Note: Refer to the 3M Road Surface Guide for surface preparation guidelines on questionable road surfaces.

New Asphalt Cement Concrete (ACC)
3M™ All Weather Thermoplastic may be applied directly on new asphalt surfaces. Application of the product can be completed as soon as the asphalt material has cooled and can support the weight and movement of application equipment. New asphalt surfaces must be free of excess oils and asphalt emulsions for proper adhesion of the thermoplastic pavement markings.

In general, new asphalt should be open to traffic 3-7 days before marking to help prevent tracking of asphalt on to the marking surface.

Chip Seal or Slurry Seal
3M all weather thermoplastic can be applied to chip seal or slurry seal surfaces. Allow the slurry seal surface to completely cure per manufacturer recommendations prior to application. New chip seal surfaces must be swept clean of all loose aggregate. A waiting period between application of the chip seal and the thermoplastic pavement markings is desired to allow vehicles to wear-off all loose aggregate from the road surface.

Application Over Existing Pavement Marking Tape
Prior to application of 3M all weather thermoplastic, the best results can be achieved by removing existing pavement marking tapes to expose a minimum of 80 percent of the pavement surface below the old markings. Existing pavement markings should be removed using methods such as grinding, shot blasting, or sand blasting.

Application Over Existing Liquid-Applied Markings
3M all weather thermoplastic may be applied over most existing liquid pavement markings provided that the line is well worn with few intact beads and is well anchored to the pavement surface. For lines with substantial bead coverage, a light grinding step should be used to roughen the surface.

Application Over Temporary Paint
3M all weather thermoplastic can be applied over existing latex or water based temporary pavement marking paint provided the temporary paint is adequately bonded to the surface. The temporary paint should have been applied at a dry mil thickness of 7-8 mils or less and be well worn with minimal glass beads remaining. If epoxy or oil-based paint was applied as a temporary marking, the temporary markings should be removed prior to application of 3M all weather thermoplastic.

New Portland Cement Concrete (PCC)
Contact 3M Technical Service at 800-553-1380 for guidance on any concrete application.

Thermoplastic Application into Grooved Pavement
3M all weather thermoplastic can be applied in a properly prepared groove cut into the pavement surface. Application of pavement marking products in a groove provides several benefits including enhanced protection of the pavement marking and retroreflective media from snowplow damage in the northern climates.

For more information on applications of 3M all weather thermoplastic in a groove, see 3M Information Folder 5.18, “Guidelines for Pavement Marking Applications in Grooved Pavement Surfaces.”
Primer Application
Primer may be required for application over some existing pavement marking materials or old pavement surfaces. Contact 3M Technical Service at 800-553-1380 for recommendations on the use of primer for these situations.

Application Rates
Application of 3M™ All Weather Thermoplastic at the proper thickness and proper application of reflective media at the correct application rates is critical to achieve optimal performance of the finished product.

The recommended thermoplastic usage will vary depending on the roughness of the pavement.
Note: Very large aggregate sizes for open grade friction course or stone matrix asphalt mixes will require a higher thermoplastic application rate than on smoother pavement surfaces to achieve the same desired thickness above the pavement surface and or prevent voids.

Recommended Thermoplastic Application Thickness
For 3M all weather thermoplastic systems the recommended minimum binder thickness is 60 mil (1.5 mm). This lower thickness is typically used for refurbishing existing pavement markings. The target binder thickness used will depend on agency requirements and the roughness of the pavement surface.
Note: Contact 3M Technical Service at 800-553-1380 for any application less than 60 mil.
Prior to starting a project, apply a line of thermoplastic at a test location and check the thickness of the material.
A method for checking the thickness of the material is to apply a test line to a flat metal sheet and allow the thermoplastic to cool. After cooling, check the thickness of the material using a micrometer or metal plates of known thickness.

Reflective Media Application Rates
Glass bead and microcrystalline element application rates are shown in Tables 2 and 3.

<table>
<thead>
<tr>
<th>Units</th>
<th>Utah Blend</th>
<th>Type 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds per 4-inch linear foot</td>
<td>0.048</td>
<td>0.026</td>
</tr>
<tr>
<td>Grams per 4-inch linear foot</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Pounds per 100 square ft.</td>
<td>14.4</td>
<td>7.8</td>
</tr>
<tr>
<td>Grams per square meter</td>
<td>710</td>
<td>388</td>
</tr>
</tbody>
</table>

Table 2 - Glass Bead Application Rates

<table>
<thead>
<tr>
<th>Units</th>
<th>Composite Reflective Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds per 4-inch linear foot</td>
<td>0.022 lbs/4-inch lf</td>
</tr>
<tr>
<td>Grams per 4-inch linear foot</td>
<td>10 grams per 4-inch lf</td>
</tr>
<tr>
<td>Pounds per 100 square ft.</td>
<td>6.6 lbs/100 ft²</td>
</tr>
<tr>
<td>Grams per square meter</td>
<td>323 grams per square meter</td>
</tr>
</tbody>
</table>

Table 3 - Microcrystalline Element Application Rates

General Equipment Operating Procedures
Consult your application equipment operation manual and appropriate bead/element gun operation manual available from the thermoplastic application equipment manufacturer and bead/element application equipment manufacturer respectively, for information on specific recommendations for vehicle speed and thickness of the application. Application guidelines will vary from one piece of equipment to another.
Maintaining thermoplastic application equipment in good working order before and during an application reduces the chances for product application problems.
When operating trucks, material temperatures and pressures must be maintained within an acceptable window to properly apply the product.
Note: Ineffective thermoplastic temperature and application speed control can lead to variable application results.
Below are some general operating procedures that should be followed when applying 3M all weather thermoplastic.

**Thermoplastic Application Temperature (on the road)**

3M™ All Weather Thermoplastic processes at temperatures lower than conventional commercial thermoplastics.

**Recommended Application Temperature Range:** 385°F (196°C) to 420°F (215°C)

**Maximum Temperature:** 440°F (227°C)

**Note:** Settling of intermixed beads and elements can occur at these temperatures. **It is critical to have sufficient agitation to prevent settling.**

For application above 420°F (215°C) contact 3M Technical Service at 800-553-1380.

**Note:** Use of a non-contact thermometer is recommended.

**Number of Reheats Allowed:**
Granular Thermoplastic - **3 to 4 times**
Block Thermoplastic - **2 times**

**Note:** 3M all weather thermoplastic is supplied in granular form only.

**Application Speed:** 8 mph (13 kph) maximum.
**Control speed to prevent bead and element rolling.**

**Bead and Element Calibration for Trucks:**
Prior to starting a project, check the bead and element calibration using a pan to catch the reflective media coming out of the guns for a set length of time, usually 15-30 seconds. Pour the reflective media into a large graduated cylinder to check the volume and compare this volume with the calibration rate tables available from the truck or bead gun manufacturer to verify that the reflective media application rate is correct. (See Figure 1). Check to make sure the bead and element gun is set properly to start and stop at the right time relative to the liquid application start and stop for the skip dash. Adjust the setting using the bead advance/retard control if necessary. After all required adjustments are made, reapply another test line to verify that adjustments were made correctly.

**For Carts:**
Run a short line at a fixed speed over a catch pan with beads only and then elements only. Weigh the resultant material in the pan or use a volume measurement with a graduated container.

**Test Line Application**

Before starting application operations, apply a test line in a location where the line can be safely checked to be within product specifications. Choose a location where a test line can be applied to the road surface or place a long, narrow sheet of heavy duty roofing on the road for the test.

After application of the test line, verify that the material thickness if correct as outlined in “Recommended Material Thickness and Element/Bead Application Rates” section. Also look for uniform width and uniform coverage of beads and elements across the width of the line. Adjust the thermoplastic applicator head or bead/element guns if necessary.

**Note:** Repeat calibration steps when speed changes.

**Inspection**

Inspection of the final applied line is important to ensure a consistent quality line has been installed. Inspection should include:

1. **Width** – correct and consistent – Must conform to agency requirements.
2. **Thickness** – Measure using milled bars or plates of a known thickness or by other approved method.
3. **Color** – Must look consistent with no evidence of scorching.
4. **For Skips** – Distance between skip lines and skip length must meet agency requirements and be consistent.
5. **Bead and Element Embedment** – Must be 50%-60%. Inspect using a 7X-10 magnifying glass.
6. **Bead and Element Distribution** – Must be even across the width of the marking.

**Note:** 1/4” margins of (6.4 mm) may be used for element distribution.
7. Adhesion

ACC – While the line is still pliable, pry at the edge with a screw driver or knife. Properly adhered material will remove with asphalt attached.

PCC – Using a hammer, strike the line with a glancing blow. The line will shatter if adhesion is not adequate.

Note: If this method is used for asphalt surfaces, inspect chips for attached asphalt. This indicates good adhesive to the ACC surface.

8. Reflectivity – Use an approved retroreflectometer capable of measurement using a 30 meter geometry. If wet reflectivity measurements are required, use of an external beam type unit is recommended.

Application Record
Application records should be kept for the project. This document should include among other things the lot identification for the materials used, date of application, location of application, calibration results, weather conditions, etc. This can be helpful should a question arise about this application in the future.

Storage and Material Handling
Review the recommended safety and handling procedures outlined in the 3M Material Safety Data Sheet (MSDS) any applicable supplier documents for non-3M materials.

Store all thermoplastic, bonded core elements, and beads in a clean, dry area. Wet materials must be allowed to dry before use.

Before use, inspect for and remove any box residue, debris, and wrapping material unless it is a part of the final mix.

Use materials within 12 months after receipt.

Health and Safety Information
Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use. Follow all precautions on the MSDS during the filling, use or cleaning of the application equipment. This product is intended for outdoor use. Application in tunnels or enclosed areas may necessitate the use of additional precautions. All vehicles with product on board must have MSDS sheets available for the product being transported.

Disposal
Dispose all materials in accordance with local, state or province, and federal or country requirements.
### Appendix A

#### 3M™ All Weather Thermoplastic Trouble Shooting Guide

<table>
<thead>
<tr>
<th>Issue</th>
<th>Possible Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth or lightly dimpled surface appearance</td>
<td>Bead and/or element sink too deep</td>
<td>Adjust thermoplastic temperature. Move element and bead guns back from the thermoplastic discharge.</td>
</tr>
<tr>
<td>Glassy or smooth surface appearance</td>
<td>No beads or elements or malfunctioning application gun</td>
<td>Repair bead or element gun, increase bead rate, move bead gun, check bead coating.</td>
</tr>
<tr>
<td>Cratered surface</td>
<td>Beads or elements popped out</td>
<td>Increase thermoplastic temperature and re-check bead/element coating, move bead/element gun closer to the thermoplastic gun.</td>
</tr>
<tr>
<td>Rough edges</td>
<td>Material temperature too low, resulting in poor adhesion, mechanical problem, moisture in pavement</td>
<td>Check thermoplastic temperature, check application equipment, reduce application speed on rough surfaces, check for presence of moisture and stop application if present.</td>
</tr>
<tr>
<td>Uneven edges</td>
<td>Temperature too high resulting in flowing material, uneven road surface</td>
<td>Reduce temperature if flowing noted.</td>
</tr>
<tr>
<td>Off-color appearance</td>
<td>Scorching / burning of material, caused by overheating or too many reheats, yellow color thermo contamination</td>
<td>Discard material, check temperatures, thoroughly clean applicator.</td>
</tr>
<tr>
<td>Stretched or pulled appearance</td>
<td>Material applied too cold or too fast</td>
<td>Check temperature and application speed.</td>
</tr>
<tr>
<td>Bubbly/severely dimpled/pitted/pinhole appearance</td>
<td>Moisture present in pavement or undried primer resulting in poor bond, air trapped in pavement surface</td>
<td>Stop operation, check for moisture allow primer to dry and cure. Check for proper temperature and reduce application speed for trapped air.</td>
</tr>
<tr>
<td>Cracks in finished line</td>
<td>Reflection cracking from road surface, misaligned applicator trough/shoe, thickness too low, overheating</td>
<td>Check trough or shoe for proper alignment, check thermoplastic thickness and adjust as necessary, check temperature.</td>
</tr>
<tr>
<td>Grooved or scarred appearance</td>
<td>Plugging in thermoplastic discharge</td>
<td>Check for foreign material or hardened thermoplastic and remove.</td>
</tr>
<tr>
<td>Thermoplastic appears too thick and does not flow properly</td>
<td>Too many reheats, temperature too low, contamination with material previously in the pot</td>
<td>Check temperature and agitation, clean out unit; especially if different thermoplastic type has been used.</td>
</tr>
<tr>
<td>Reflectivity is uneven or inconsistent</td>
<td>Variable bead/element application, poor or excessive embedment</td>
<td>Check thermoplastic Temperature. Check calibration for bead/element application. Inspect bead/element applicator discharge for plugging and consistent application across the line width.</td>
</tr>
<tr>
<td>Thermoplastic has grinding noise. Screen clogged with beads and/or elements</td>
<td>Thermoplastic tank has insufficient agitation to keep beads and elements suspended. (Thermoplastic is too hot for agitation.)</td>
<td>Maintain higher agitation at all times. Keep temperature in range of 385°F-420°F.</td>
</tr>
<tr>
<td>Adhesion failure from the pavement</td>
<td>Contaminants or moisture in the pavement surface, application temperature too low, application speed too fast, pavement temperature too low</td>
<td>Check for contaminants and moisture. Check application temperature and agitation. Reduce application speed. Check if primer should be used for this surface. Check pavement temperature.</td>
</tr>
<tr>
<td>Glazed surface appearance</td>
<td>Beads/elements not embedded enough - material temperature too low or thickness too low, bead or element gun too far from thermoplastic discharge point, pavement temperature too low</td>
<td>Check temperature and bead/element gun position, check thickness, check pavement temperature.</td>
</tr>
</tbody>
</table>
Literature Reference
PB–3MTM All Weather Elements
PB–3MTM All Weather Thermoplastic Pavement Marking
3M Road Surface Guide
IF 5.18 – Guidelines for Pavement Marking Application in Grooved Pavement Surfaces.

For situations not specifically covered in this folder, or questions regarding application of 3MTM All Weather Thermoplastic Pavement Markings, it is the responsibility of the installer to contact the appropriate 3M Sales Representative or 3M Pavement Marking Technical Service representative at 1-800-533-1380 for guidance.

FOR INFORMATION OR ASSISTANCE
CALL:
1-800-553-1380

IN CANADA CALL:
1-800-265-1840

Internet:
www.3M.com/tss

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