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Transportation Safety Division

3M™ Stamark™ Pavement Marking Tape and Liquid Pavement Markings

Guidelines for Installing Pavement Markings on Grooved or Scarified Pavement Surfaces

Information Folder 5.18
February 2022

Replaces IF 5.18 Dated September 2019

1 Introduction

Applying pavement markings, including 3M™ Stamark™ Pavement Marking Tapes and 3M™ Liquid Pavement Marking Series 5000, to properly prepared pavement surfaces enhances marking adhesion, durability, and performance. Pavement preparations can include removing existing pavement markings by grinder or preparing grooves in pavement to recess markings to help protect markings from snowplow damage. Both grinding and grooving remove paving material, stress and weaken pavement surfaces, and can result in pavement failures that can lead to roadway marking losses.

This document describes the roadway surface characteristics required to achieve reliable, stable pavement marking installations on abraded road surfaces and procedures for producing such surfaces. When 3M pavement marking materials are applied to surfaces that have been prepared as described in this document and that conform to the descriptions provided herein, markings have been found to adhere well. 3M is not responsible for pavement marking damage resulting from substrate failures, regardless of preparation methods, installation methods, or equipment used. Pavement integrity is solely the responsibility of the installing contractor and 3M accepts no responsibility for any pavement marking failure resulting from pavement failure.

The following sections can be found in this information folder:

- Existing Marking Removal
- Groove Specifications
- Cutting Equipment and Surface Recommendations
- Stamark Tape Application Guidelines
- 3M Liquid Pavement Marking Application Guidelines
- Measuring Uniform Groove Depth
- Surface Wetting Test
- Health and Safety Information
- Appendix A: Measuring Groove Depth with a Depth Plate

Follow the detailed application instructions for “Overlay Applications” found in 3M Information Folder 5.7 “3M Stamark Tapes Pavement Surface Preparation and Application Techniques” when applying pavement marking tapes in grooves. All climate and weather conditions specific in 3M Information Folder 5.7 for the relevant 3M pavement marking product (liquid or tape) must be met before markings are installed into grooves.

For situations not specifically covered in this information folder, or for questions regarding the installation of 3M products in grooves, it is the responsibility of the installer to contact the appropriate 3M Sales Representative or 3M pavement marking Application Engineer for guidance at 1-800-553-1380.

2 Existing Marking Removal

Existing markings may be removed from roadway surfaces by means of sandblasting, hydroblasting, shotblasting, or grinding.

Existing pavement markings must be removed prior to the application of 3M Stamark pavement marking tape products. A minimum of 90% of the road surface under the existing markings must be exposed prior to installation of Stamark tape and the pavement surface must not be damaged.

Note: Flail-head surface grinders are not suitable for preparing roadway surfaces for Stamark pavement marking tape installations.

3 Groove Specifications

Grooves only protect pavement markings if they fully recess markings below the pavement surface, provide structurally sound surfaces that markings can adhere to, and allow for proper marking alignment. Proper marking alignment within grooves requires that grooves be at least one inch (2.5 cm) wider than the markings. Figure 1 illustrates the cross-section of a typical pavement marking in a groove. Required groove depths for different pavement markings are specified in Tables 1 and 2 below.

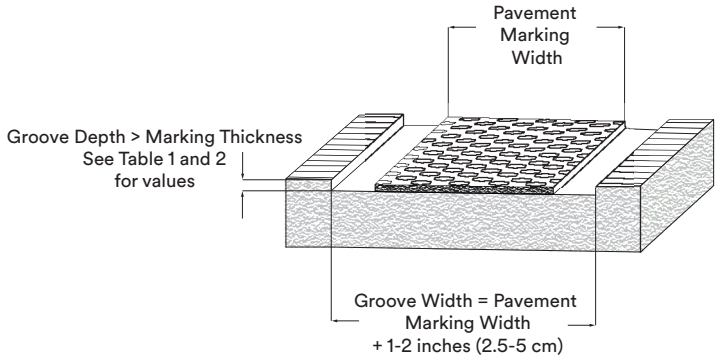

Figure 1. Cross-sectional illustration of a typical section of pavement marking installed in a groove.

3.1 Groove Cutting Considerations

Pavement marking adhesion is affected by both pavement surface and groove quality. A poorly cut groove can result in damage to the pavement surface and subsurface of the application area, increasing the risk of adhesion-related issues. Groove quality helps promote strong adhesion and is affected by, but not limited to, the following factors:

- Pavement quality
- Groove surface strength
- Groove surface roughness
- Cutting head condition
- Cutting head pressure on surface
- Cutting head rotational speed and direction
- Cutting head bladed spacing
- Depth cut per pass
- And more

Careful consideration of these factors is vital to achieving acceptable grooves for pavement marking applications.

3.2 Groove Depth

Tables 1 and 2 present required groove depths for different 3M Stamark pavement marking tape and liquid pavement marking materials, respectively.

Table 1. Uniform groove depths required for 3M Stamark pavement marking tape products.

Pavement Marking Material	Required Groove Depth	
	Minimum	Maximum
3M™ Stamark™ Pavement Marking Tapes (Series 380AW, 380I ES, and 270 ES)	150 mils (3.81 mm)	200 mils (5.08 mm)

Note: Deeper grooves, not exceeding the maximum groove depth identified in Table 1, help protect markings from more aggressive traffic and harsher climates. Local agencies may require grooves deeper than the maximum groove depths indicated above, however, grooving too deeply can hinder pavement marking retroreflective performance due to excessive water pooling within grooves.

Table 2. Uniform groove depths required for 3M™ Connected Roads All Weather Elements in liquid binders.

Pavement Marking Material	Required Groove Depth
Binders < 30 mils (0.8 mm) thick, including 3M™ Stamark™ Liquid Pavement Markings Series 5000 and 3M™ All Weather Paint	Minimum: 80 mils (2.03 mm) Maximum: 100 mils (2.54 mm) for improved retained reflectivity
Binders > 30 mils (0.8 mm) thick, including 3M™ All Weather Thermo-plastic	Minimum: 40 mils + binder thickness (1.27 mm + binder thickness) Maximum: 50 mils + binder thickness (1.27 mm + binder thickness) for improved retained reflectivity

Note: Deeper grooves, not exceeding the maximum groove depths identified in Table 2, help protect markings from more aggressive traffic and harsher climates. Local agencies may require grooves deeper than the maximum groove depths indicated above, however, grooving too deeply can hinder pavement marking retroreflective performance due to excessive water pooling within grooves.

3.3 Groove Width - Longitudinal Markings

As shown in Figure 1, grooves must be one to two inches (2.5–5 cm) wider than pavement markings. Wider grooves, up to two inches (5 cm) wider than markings, facilitate well-aligned tape installations and facilitate access to the tape edges to help ensure the full width of the tape is well tamped. Narrower grooves, no less than one inch (2.5 cm) wider than markings, may provide markings with additional protection, but require more precise alignment of pavement markings.

3.4 Groove Placement

Grooves must be positioned at least two inches (5 cm) from the edges of any concrete joints or asphalt seams.

3.5 Grooved and Recessed Intersection Markings

Intersection markings, such as crosswalks and stop bars, can be grooved into pavement surfaces and recessed by making multiple side-by-side passes with the same grooving equipment used for long line pavement markings.

When cutting grooves using multiple passes, keep the gang-stacked diamond cutting head parallel to the plane of the surface being grooved. Cutting grooves with multiple passes can result in ridges between passes. Such ridges are due to the grooving head stops on either side of the gang-stacked diamond cutting head resting on different levels of the pavement surface. The first grooving pass is completed with both stops resting on an even surface, as shown in Figure 2.

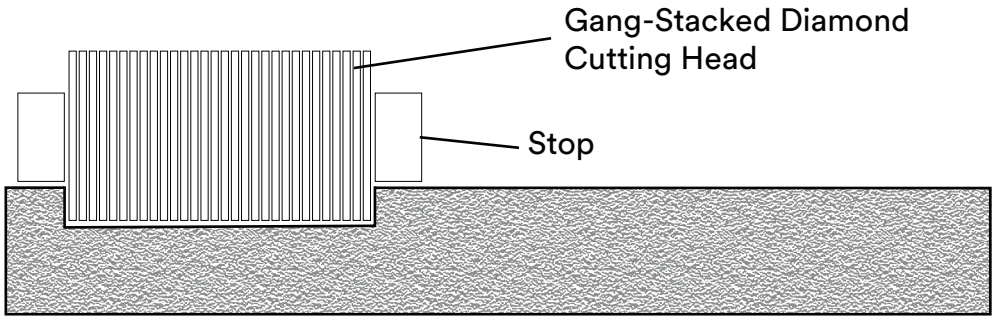

Figure 2. Position of gang-stacked diamond cutting head during initial pass of a multiple-pass intersection groove cut.

After the first pass, if one stop sits on the old pavement surface while the other sits lower, in the newly cut groove, unacceptable ridges result, as illustrated in Figure 3.

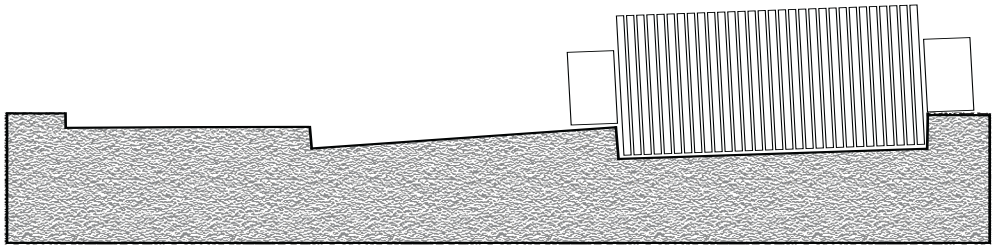

Figure 3. Position of gang-stacked diamond cutting head during subsequent passes that results in ridges at the cutting head edges.

To prevent ridges, adjust the stops on either side of the gang-stacked diamond cutting head after the first pass or grind ridges off prior to placing the pavement marking in the groove. One can also use a metal plate, with a thickness equal to the depth of the groove, to support the stop that sits on the freshly grooved surface and move the plate over for each new pass.

Legends and symbols can be grooved-in and recessed by grooving large squares or rectangles that fit the pavement markings. Refer to 3M Information Folder 5.8 for more information.

Use wider gang-stacked diamond cutting heads (place more gang-stacked diamond blades on the saw auger) to reduce the number of passes needed to make wide grooves and the number of potential ridges.

Curbs and median obstacles may not allow grooves to be cut across the entire width of an intersection marking using large, truck-mounted equipment. In such instances, use smaller equipment near obstacles to produce the required grooves.

4 Cutting Equipment and Surface Recommendations

Several different cutting head configurations are available from different equipment manufacturers that specialize in cutting and grooving equipment. The use of groove-cutting equipment with free-floating, independent heads is recommended. Such configurations allow the cutting head to follow irregularities in pavement surfaces and produce grooves of consistent depth. Different cutting heads and grooving equipment produce different groove surfaces and textures.

Gang-stacked diamond cutting heads produce strong groove surfaces with minimal surface and subsurface micro-fracturing. The use of gang-stacked diamond cutting heads is strongly recommended when grooving asphalt and concrete pavement surfaces; this is especially true for older surfaces and surfaces that show visible signs of deterioration.

The use of gang-stacked diamond cutting heads is required for all grooved 3M Stamark pavement marking tape installations, regardless of pavement condition or composition.

4.1 Saw Blade Type Cutting Heads

A single, large diameter, 12–18 inch (30–46 cm) saw blades, cutting head with gang-stacked 1/16–1/4-inch (0.063–0.63 cm) wide diamond cutting blades (Figure 4) can be used in place of purpose-built grooving equipment. When doing so, use spacers between the diamond cutting blades to maintain separation at the cutting tips and help protect the blades from damaging one another.

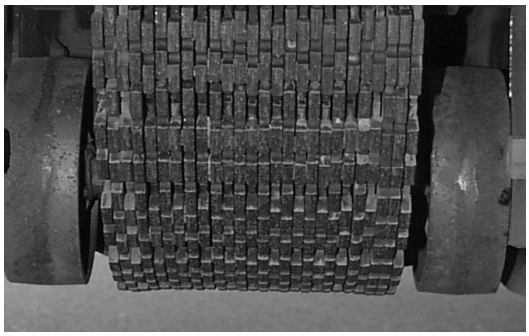

Figure 4. Gang-stacked diamond cutting head.

Wide blade spacings may result in heavily “ribbed” (also referred to as “ridged” or “corduroy”) patterns, shown in Figure 5, that are not recommended for pavement marking applications.

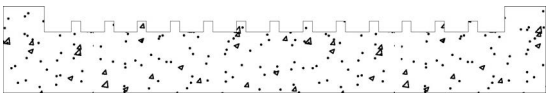

Figure 5. Cross sectional illustration of a coarse-tooth ribbed pattern produced by widely spaced or worn blades. Replace blades and/or change spacing to avoid such groove pattens.

Ribbed patterns must not be irregular or large enough to prevent tape from conforming to the shapes of their lowest areas. If tape bridges across the low areas of a pavement surface pattern instead of contacting the entire pavement surface, moisture will penetrate underneath the tape and result in poor adhesion.

Using the correct size spacers helps avoid producing ribbed grooves, as illustrated in Figure 5.Using Gang-stacked diamond blades with properly spaced blades helps produce grooves with smooth surfaces, as illustrated in Figures 6, 7, and 8. Groove ridges should rise no more than 10 mils above the base of the groove.

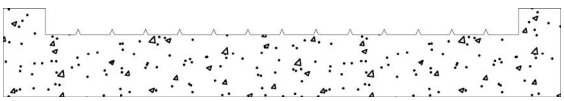

Figure 6. Cross sectional illustration of a smooth groove made with thin spacers and new blades.

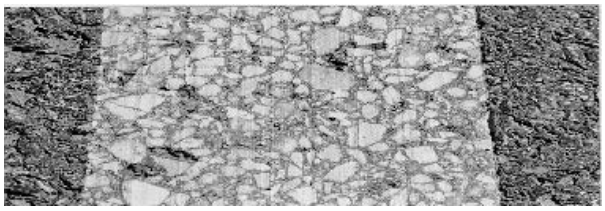

Figure 7. Photo of an asphalt cement concrete groove with a light corduroy pattern, made with properly spaced, gang-stacked diamond cutting blades.

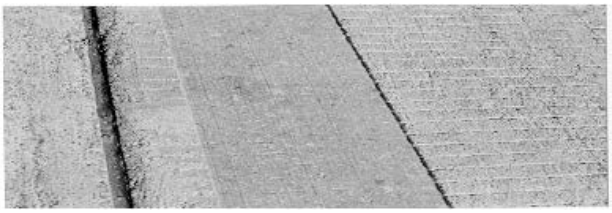

Figure 8. Portland cement concrete groove with a light corduroy pattern, made with properly spaced gang-stacked diamond cutting blades.

4.2 Multi-Box or Multi-Pass Grinding/Grooving Procedures for Stamark Tapes

Grinding and grooving may be completed using a multi-box, or multi-pass, approach. Multi-pass grooving still requires the use of gang-stacked diamond cutting blades to prepare the pavement for 3M Stamark pavement marking tape installation. If the installer is unable to use gang-stacked diamond cutting blades for all grind boxes or passes, the following procedure may be used.

The first grind box or pass may be performed using cutting or grinding heads with polycrystalline diamond coatings (commonly known as “PCD heads”). PCD head designs vary widely, as do the surfaces they produce, making them unsuitable for finishing pavement surfaces for 3M Stamark pavement marking tape installations. When removing previous markings for surface-applied Stamark tape installations, no more than 50% of the previous marking may be removed using the polycrystalline diamond head. For grooved Stamark tape installations, no more than 50% of the total groove depth may be cut using the polycrystalline diamond head.

The second (and third, if applicable) grind box or pass must be performed with a gang-stacked diamond cutting head. When removing previous markings for surface-applied Stamark tape installations, the remaining 50% or more of the previous marking must be removed using a gang-stacked diamond cutting head. For grooved installations, the remaining 50% or more of the total groove depth must be cut using a gang-stacked diamond cutting head. Regardless of the number heads or passes used, all grinding and grooving operations must produce surfaces that conform to the specifications presented in Section 3. Figure 9 illustrates the multi-box and multi-pass grinding procedure.

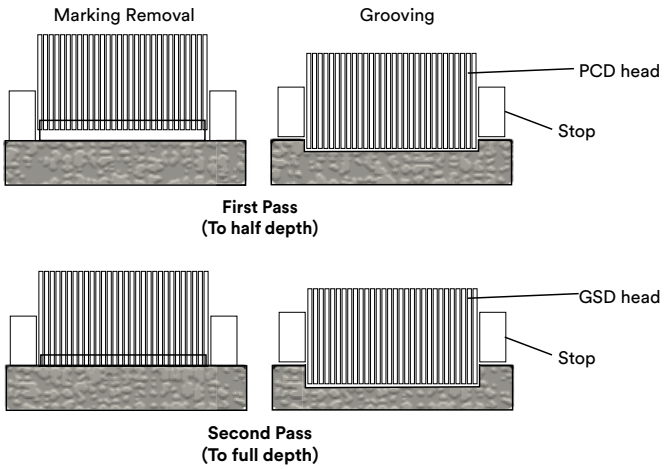

Figure 9. Illustration of the multi-box/multi-pass procedure.

Finishing the groove with a gang-stacked diamond cutting head helps to produce a suitably textured groove and helps minimize the risk of micro-fractures in the resultant pavement surface.

Note: Flail-head surface grinders are not suitable for preparing roadway surfaces for 3M Stamark pavement marking tape installations, even as first pass grinders.

4.3 Grinding Cutting Heads for Use with Liquid Binders

A flail-head grinder-type cutting head, illustrated in Figure 10, can be used to groove ONLY newer Portland cement pavement surfaces in good repair and ONLY for liquid markings.

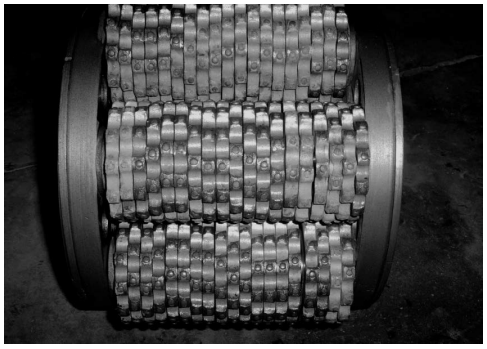

Figure 10. Flail-head grinder-type cutting head.

Flail-head grinder-heads like the one shown in Figure 10 produce grooves with irregular surface textures, as illustrated in Figures 11 and 12. Such surface textures are often superior for liquid pavement marking installations.

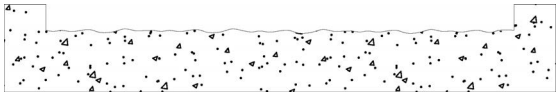

Figure 11. Cross sectional illustration of the texture of a groove made with a flail-head grinder-type cutting head.

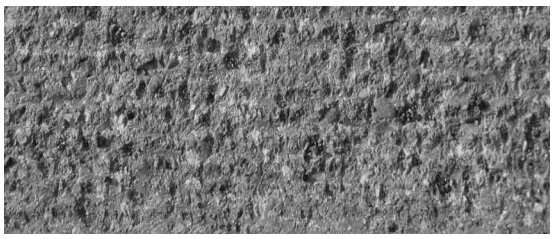

Figure 12. Photo of the surface texture of a groove made with a flail-head grinder-type cutting head.

4.4 Achieving Textured Surfaces with Gang-Stacked Diamond Cutting Heads

The bottom surface of a groove is defined as a “textured groove surface” if it has an irregular pattern and does not show the ribbed patterns common to grooves that have been recently cut using saw blades.

A textured groove surface can be achieved on ribbed grooves that have been cut with gang-stacked diamond cutting heads, (see Figure 5) by using a slow moving shot blaster, grinder, or sand blaster to knock down the ridges and add texture to the initial groove surface. Hydroblasting can also be used to remove ridges and texture the surface, but the groove must be allowed to dry following hydroblasting for at least 24 hours prior to pavement marking installation.

New concrete surfaces may contain more fine cement dust after cutting. This dust and all other cement residues must be removed and blown clean from grooves prior to pavement marking installation.

4.5 Asphalt Cement Concrete (ACC) Surfaces

Although other types of cutting heads can be used to produce acceptable grooves for liquid markings, gang-stacked diamond cutting heads can produce optimal groove surfaces. Gang-stacked diamond cutting heads are strongly recommended for all marking materials when grooving asphalt pavement surfaces.

The use of gang-stacked diamond cutting heads is required for all grooved 3M Stamark pavement marking tape installations, regardless of pavement material.

Existing asphalt surfaces should possess the strength necessary to withstand groove cutting. Inspect surfaces for obvious signs of distress before cutting grooves. Refer to the 3M Road Surface Guide for more details. Always inspect grooves for signs of channel or groove wall weakness at start-up. Lightly scratching a channel or groove wall with a pointed object can help determine the integrity of a cut.

Groove cutting older asphalt surfaces can sometimes weaken the aggregate/asphalt bond near the pavement surface. The structural integrity of a groove bottom should be checked after grooving and prior to pavement marking installation.

Newly paved asphalt surfaces must be given time to harden and cure before they can be grooved. In general, this means that newly paved asphalt surfaces should not be grooved within 10 days of placement of the final course of pavement. Newly laid asphalt surfaces may be too soft to support grooving operations, especially during periods of hot weather. It is, therefore, recommended that new asphalt surfaces be opened to traffic for at least 10 days prior to performing grooving or pavement marking operations. Consult with your asphalt manufacturer before reducing this wait-time recommendation.

In addition, some asphalt mixes require as much as 30 days to achieve sufficient strength to support grooving operations. Contact the asphalt manufacturer for wait-time requirements and traffic recommendations prior to grooving any new or unfamiliar asphalt mixes.

Inlay techniques (rolling tape into fresh hot asphalt) may be utilized when installing Stamark pavement marking tapes on new asphalt. See 3M Information Folder 5.7 for additional information regarding inlay techniques.

4.6 Vacuum system

Ensure grooving equipment is fitted with a vacuum system that is in good working order. A high-performance vacuum system will facilitate final cleaning and reduce airborne dusts. See Section 10 for further guidance regarding respirable crystalline silica.

4.7 Groove Cleaning

For some applications and equipment, it may be necessary to cool the gang-stacked diamond cutting head with water. In general, long continuous groove cuts for edge line installations are more likely to require water cooling of blades. Cutting grooves for skips, dashes, or other intermittent markings allows blades to cool between cutting operations and may not require water cooling. If water cooling is required, flush grooves with a high-pressure power washer immediately after cutting to remove any cement dust/water slurry build-up. Grooves must also be flushed with a high-pressure power washer when dry grooving during rainfall. If slurry is not removed from a freshly cut groove, the slurry may harden in the groove, which may result in the groove not meeting the required specifications.

Note: If water is present during groove cutting for any reason, allow grooves to dry for, at minimum, 24 hours before installing pavement markings. Grooves must be clean and dry for proper pavement marking installation.

Clean grooves completely using an air compressor with an air flow of at least 185 CFM and an air pressure of at least 120 PSI, prior to installing pavement markings. A street sweeper or pick-up broom may effectively remove some debris, but at least one pass with an air compressor is required to completely clean the bottoms of grooves.

Note: Open grooves may be left open over night if they have been blown out or flushed out at the time of grooving. However, the grooves must be cleaned again with compressed air as described above prior to pavement marking installation on the day of installation.

5 Stamark Tape Application Guidelines

The following are specific guidelines for installing Stamark tapes in grooves. They should be followed in conjunction with the detailed installation instructions presented in 3M Information Folder 5.7, “Pavement Surface Preparation and Application Techniques for 3M Stamark Tapes,” as well as the climate and weather recommendations made therein, to produce reliable, durable pavement markings.

5.1 Clean Ground Surface Prior to Application of Stamark Tape

Prior to installing pavement markings, clean grooves completely using an air compressor with at least 185 CFM of air flow and 120 PSI of air pressure. There should be no more than 50 feet (15 m) of ¾-inch (19 mm) (inside diameter) hose between the compressor and the air nozzle, and the air nozzle should have an inside diameter of no less than ½-inch (13 mm). The compressor should be equipped with a moisture and oil trap. When cleaning the groove, it is recommended that the air nozzle be no more than two feet from the ground. A street sweeper or pick-up broom may also be used to clean effectively, but a pass with an air compressor is still required to completely clean the bottoms of grooves.

5.2 Apply the Tape

Apply Stamark tape in the groove according to the detailed instructions presented in 3M Information Folder 5.7 for “Overlay Applications.”

5.3 Tamp the Tape

When newly laid in the groove, tamp the tape thoroughly with a minimum of six (6) passes (three passes back and forth), using an RTC-2 Tamper Cart with a 200-pound (90 kg) load.

Tamping the edges of the tape is very important. Tamping the edges of tape installed in a groove requires tamping with a tamper cart roller that fits within, and reaches the bottom of, the groove. Use a modified tamper cart roller, as shown in Figure 13, if necessary. A typical modified roller is 4-inches (10 cm) wide and ¼-inch (6 mm) deep.

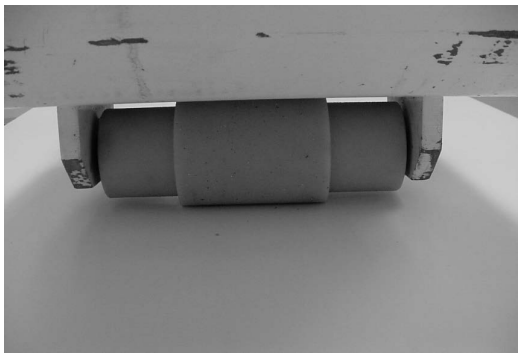

Figure 13. Tamper cart roller that has been modified for tamping in grooves.

Important Note: A vehicle tire can be used to tamp grooved-in long line pavement marking applications of patterned Stamark tapes (3M Stamark 380AW, 380I-ES, and 270ES). Refer to 3M Information Folder 5.7 for further information.

A vehicle tire may tamp the center of the tape without reaching the edges near the sides of the groove. Contact your 3M Application Engineer for further for information regarding tamping cart and roller procurement.

6 3M Liquid Pavement Marking Application Guidelines

Properly applying liquid pavement marking products into grooves increases durability and improves long-term retroreflective performance. Grooving-in liquid pavement markings is especially effective for extending the service lives of liquid pavement markings in northern climates where snow removal equipment is used.

Refer to 3M Information Folder 5.28 (Liquid Pavement Markings), 3M Information Folder 5.22 (All Weather Paint), and 3M Information Folder 5.24 (All Weather Thermoplastic) for proper surface preparation methods and application requirements.

Liquid pavement markings must be fully contained within grooves to be considered successfully applied and to receive the full benefit of the groove. A wider groove, up to 2 inches (5 cm) wider than the marking, may be needed to allow for the proper placement of the liquid marking material into the groove.

7 Surface Testing

Micro-fractures are very small cracks that form at or near a pavement surface and result in a thin, weak surface layer of pavement. Micro-fractures can result from improper grooving or grinding and certain types of grooving/ grinding technologies. As with the presence of old existing markings or surface contamination, micro-fractures can lead to adhesion failures of newly applied pavement markings. As noted in Section 4.2 above, using gang-stacked diamond cutting heads helps minimize the risk of micro-fracturing and, thus, adhesion failure.

This section describes two methods that can be used to help identify the presence of a potential weak surface layer following grooving or grinding. It is good practice to maintain records of such tests.

7.1 Pavement Surface Strength Peel Test Method

The pavement surface strength peel test (“**Peel Test**”) probes pavement surface strength by pulling a small piece of well adhered Stamark tape up from the pavement with sufficient force to remove it. Pavement surface strength is then assessed by rating the quantity and type of material present on the adhesive.

7.1.1 Apparatus

Testing Equipment and Materials:

- New Stamark tape with adhesive
- Vehicle for tamping tape to test surface
- Cutting tool (utility knife or other)
- Wide-bladed scraper to assist with starting the tape removal

7.1.2 Procedure

1. Place a piece of Stamark tape, adhesive side down, on the pavement test area.
   - Tape should be about 4 to 6 inches wide and 18 to 24 inches long for convenience, although the dimensions are not critical.
2. Tamp tape repeatedly and thoroughly with vehicle tire.
   - Drive very slowly over the tape, taking at least 2 to 3 seconds to drive over the 18 to 24 inch long piece of tape. Roll straight over the tape - do not turn the tire while tamping (turning the tire can twist, deform, and tear the tape).
   - Make sure that the vehicle tire tamps the full width of the tape; either have a partner watch the tamping process to ensure proper tamping or find another way to visually confirm that the tire passes fully over the tape. Do not guess about alignment - ensure visual confirmation.
   - Perform at least 6 tamping passes, 3 forward and 3 reverse.
   - **Tamping is the most important step of this test**. The goal is to maximize adhesion to the pavement surface in order to remove as much weak surface material as possible during the peeling step.

3. Immediately after final tamping pass, prepare one end of the tape for peeling
   - The tape should now be strongly bonded to the pavement and a knife or scraper tool is very useful for separating a corner or end of it from the pavement.
   - Remove enough tape from the pavement that the loose end can be folded and rolled to create a tab or handle that can be gripped by hand (at least 4 to 6 inches).
   - Fold and roll the tape with the adhesive side in to facilitate handling.
4. Standing and straddling the tape, as shown in Figure 14, grip the prepared end firmly with both hands.

Figure 14. Grip tape firmly with both hands while standing astride the marking.

5. Pull straight up, pulling hard and fast, until the piece of tape is completely removed from the pavement.
   - **Note:** Peel force is higher when tape is peeled quickly. A larger peel force removes more weak surface material and provides a more accurate evaluation of the pavement surface.
   - The tape can also be peeled using a force gauge equipped with a gripping clamp. The use of a force gauge allows one to record the average, minimum, and maximum peel force values, adding further detail to the evaluation. While useful, peel force measurements are not necessary for this test method.
6. Examine the adhesive side of the removed tape under good light and carefully observe the contamination present on the adhesive.
   - At night, vehicle high beam headlights can provide helpful illumination.
7. Carefully examine the pavement surface from which the tape was peeled for further evidence of the nature and extent of a weak surface layer.

7.1.3 Surface Strength Peel Test Ratings

Closely examine the adhesive surface of the peeled tape for contamination, and rate and record particle size and coverage area. Generally, a strong pavement surface has low coverage and small contaminants.

Fraction of Area Covered with Contaminants

Perform a close visual inspection of the tape sample and feel it with your fingertips. Rate the percentage of the area that is contaminated with foreign material, such as dust, dirt, sand, gravel, or other debris, and is not sticky. [Less contamination is better]

(5 = 0–20% contaminated)

(4 = 20–40% contaminated)

(3 = 40–60% contaminated)

(2 = 60–80% contaminated)

(1 = 80–100% contaminated)

Size of Contaminants

Examine the peeled tape sample and assess the average or typical size of the contaminants covering the adhesive, if any. Smaller average contaminant size is better, however, its presence is an indication that further cleaning of the surface is required.

(5 = Dust)

(4 = Sand)

(3 = Small Gravel, ~ 1/16")

(2 = Gravel, ~ 1/8")

(1 = Small Aggregate, greater than 1/8")

7.2 ASTM Test Method

The near-surface tensile strength of a substrate can be tested using ASTM method C1583, "Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-Off Method)." Results of this test indicate a surface's suitability for overlay application of pavement marking materials, with stronger surfaces being better suited to pavement marking applications. Refer to ASTM C1583 for full a full description of the test method.

8 Measuring Uniform Groove Depth

A micrometer or depth gage can be used to verify the depth uniformities of new grooves. Another method for testing groove depth is through the use of depth plates (see Appendix A).

Grooves should be checked frequently following groove cutter alignment changes to verify that proper and stable adjustments have been made and to avoid improper grooving. For example, check groove depths at 10-foot intervals for 50 feet immediately following any groove cutter adjustments. Depending on the pavement marking for which the groove is being cut, each measurement should fall within the range indicated in Table 1 or 2. Calculate the average of the five depths measured—the average should also fall within the depth range indicated in Table 1 or 2. If the average does not fall within the range indicated in Table 1 or 2, adjust the cutting equipment and check groove depth for the next 50 feet in the same way. Continue to adjust groove cutting equipment until a groove with an appropriate average depth is achieved.

9 Surface Wetting Test

Measure the wettability of the grooved surface. Use an eye dropper to apply a drop of water to the surface. The water drop should wet out on the groove surface. If not, the groove needs to be cleaned out, ground, or shot blasted.

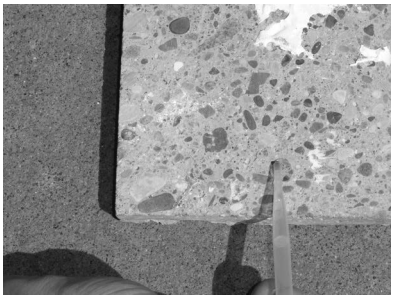

Figure 15. Place a drop of clean drinking or distilled water on the pavement surface.

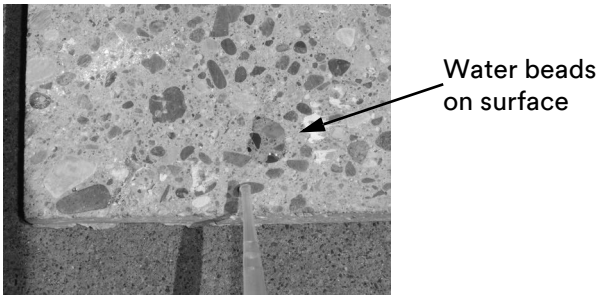

Figure 16. Image of a groove surface that water does not wet. Rather, the water beads on the groove surface.

If the drop of water does not spread (if it beads on the surface instead), the surface may be contaminated and requires additional surface preparation or re-cleaning with high pressure air.

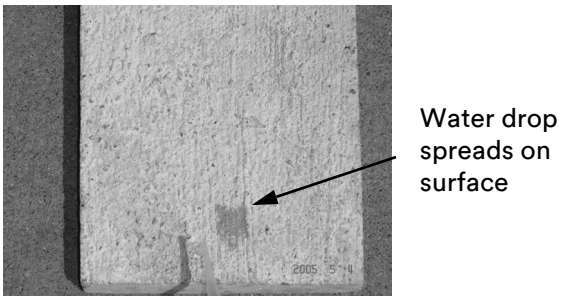

Figure 17. Image of a groove surface that water does wet. Water spreads out across surface.

If the water drop spreads (wets), the surface is ready for pavement marking application.

10 Health and Safety Information

Dry pavement preparation techniques, dry grooving methods, and dry groove cleaning methods are recommended because they optimize pavement marking tape adhesive performance and facilitate immediate pavement marking application without the need for a 24-hour drying period.

Always follow applicable temporary traffic control procedures and safe work zone practices. For example, eye, ear, respiratory, or other protection may be appropriate during grooving, surface preparation, or removal of existing pavement markings. For respiratory protection requirements, please refer to the OSHA Respirable Crystalline Silica Standard and the Small Entity Compliance Guide for Respirable Crystalline Silica Standard for Construction, which can be found at www.osha.gov. If wet grinding or grooving procedures are used, including those listed in Table 1 of the referenced OSHA standards, grooves must be cleaned immediately with high pressure water spray to prevent the resulting cement dust/water slurry from hardening in the groove. Cleaning with water must be followed by a 24 hour drying period prior to pavement marking installation.

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets (SDS), Article Information Sheets, and products labels of any materials for important health, safety, and environmental information prior to handling or use. Also refer to SDSs for information regarding the volatile organic compound (VOC) contents of chemical products. Consult local regulations and authorities for possible restrictions on product VOC contents and/or VOC emissions.To obtain SDSs and Article Information Sheets for 3M products, go to 3M.com/SDS, contact 3M by mail, or for urgent requests call 1-800-364-3577.

11 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's Website at http://www.3M.com/roadsafety.

12 Literature Reference

For additional information on 3M Stamark Pavement Marking Tapes, application recommendations, or 3M application equipment, refer to the following publications:

3M IF 3.2	3M™ Stamark™ Removable Tapes Pavement Surface Preparation and Application Procedures
3M IF 5.7	Pavement Surface Preparation and Application Techniques for 3M™ Stamark™ Tapes
3M IF 5.8	Instructions for Precut Symbols and Legends
3M IF 5.20	Application Guidelines for Liquid Pavement Markings
3M IF 5.22	3M™ All Weather Paint Application Guidelines
3M IF 5.23	3M™ Connected Roads All Weather Elements Application Guidelines for 3M Connected Roads All Weather Elements
3M IF 5.24	3M All Weather Thermoplastic application guidelines
3M IF 5.28	Liquid Pavement Marking Application Guidelines Series 5000
3M PB 270 ES	3M™ Stamark™ Pavement Marking Tape Series 270 ES
3M PB 380I-ES	3M™ Stamark™ High Performance Tape Series 380I-ES
3M PB 380I-5ES	3M™ Stamark™ High Performance Contrast Marking Tape Series 380I-5ES
3M PB 380AW	3M™ Stamark™ High Performance All Weather Tape Series 380AW
3M PB 380AW-5	3M™ Stamark™ High Performance All Weather Contrast Marking Tape Series 380AW-5
3M PB 385AW	3M™ Stamark™ High Performance All Weather Masking Tape 385AW
3M PB A385-ES	3M™ Stamark™ High Performance Masking Tape A385-ES
3M PB AWT	All Weather Thermoplastic
3M PB CR AWE	3M™ Connected Roads All Weather Elements
3M PSD	Personal Safety Division’s Tips for New OSHA Silica Regulations
3M Road Surface Guide	3M™ Road Surface Guide for 3M™ Stamark™ Pavement Marking Tapes

Appendix A:

Measuring Groove Depth with a Depth Plate

Use a depth plate of thickness equal to the desired groove depth.

Drop depth plate into groove.

Use a strait edge to check if depth plate fits into groove.

Put straight edge across the groove, over the top of depth plate.

Slide the depth plate back and forth to see if groove depth is correct.

For Information or Assistance
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In Canada Call:
1-800-3M HELPS (1-800-364-3577)

Internet:

http://www.3M.com/roadsafety

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Important Notice

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable at the time of this publication, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss, or damage, direct, indirect, special, or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.

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