



Stamark™ Tapes Pavement Surface Preparation and Application Techniques

Information Folder 5.7

November 2009

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Introduction

This information folder contains pavement surface preparation requirements and application procedures for 3M™ Stamark™ Pavement Marking Tapes. It is important that users be completely knowledgeable of all application requirements and procedures prior to product application. Instructions contained in this folder must be followed for material replacement provisions to be considered valid. Material replacement provisions are described in the appropriate product bulletins.

It is the responsibility of the installer to contact the 3M sales representative or 3M technical service representative whenever there is a question regarding application procedures or conditions.

3M™ Stamark™ Tape General Product Summary

Stamark tapes are durable, reflective pavement marking tapes used to mark asphalt and concrete surfaces. Stamark high performance tape is available in white or yellow, standard widths and roll sizes, and A series (unlined), L series (lined) or N series (no liner and no adhesive). It is also available in legend and symbol patterns. Below is a summary of each series of Stamark tape along with recommendations for appropriate uses.*

3M™ Stamark™ High Performance Wet Reflective Tape Series 380WR ES, 380WR-5ES, 380AW, and 380AW-5

Stamark high performance wet reflective tape is a durable pavement marking tape, highly retroreflective under both wet and dry conditions. Stamark Series 380WR ES and 380AW tape utilizes specially designed optics to provide wet and dry performance. Stamark Series 380AW tape can be used as an inlay marking on new asphalt or as an overlay marking on most asphalt and concrete pavement surfaces in good condition. Series 380WR-5 ES and 380AW-5 consists of standard white pavement marking tape with a 1-1/2 inch wide black edge to provide contrast on light colored asphalt or portland cement concrete surfaces.

3M™ Stamark™ High Performance Tape Series 390, 390-5, 380IES and 380I-5 ES

Stamark high performance tape is a durable, conformable pavement marking providing a high degree of retroreflectivity and durability. This pavement marking tape is manufactured with a patterned surface that presents a near vertical profile to the motorist to maximize retroreflectance and a pliant polymer conformance layer for long term durability. Recommended for a wide variety of uses including long line, gore areas, and intersections (low to medium shear, light truck traffic only) for inlay, grooved and overlay applications. Series 390-5 and 380I-5 ES consists of standard white pavement marking tape with a 1-1/2 inch wide black edge to provide contrast on light colored asphalt or portland cement concrete surfaces.

3M™ Stamark™ Pavement Marking Tape Series 270 ES

Stamark pavement marking tape is manufactured with a polymer conformance layer for durability and a patterned surface for reflectivity. Recommended for a wide variety of uses including intersection and longitudinal markings.

* See Information Folder 3.2 for information on 3M™ Stamark™ Removable Pavement Marking Tapes.

3M™ Stamark™ Pavement Marking Tape Series 310

Stamark pavement marking tape combines 3M's technology in beads, topcoats and adhesives which results in a pavement marking solution with good durability, retroreflectivity and appearance. Recommended for lane and edge lines on roads with medium to low traffic volumes, and is available in symbols and legends.

Overlay Product Application Requirements

The following general requirements apply to all Stamark tape applications:

- Temperatures
Air and surface Temperature: Minimum 40°F (4°C) and rising.
Overnight Air Temperature: Minimum 40°F (4°C) the night before tape application is recommended. If the temperature falls below 40° F, inspect the pavement surface for visible signs of moisture (dew, frost, etc.).
- Overlay applications must be completed within the seasonal start and end dates for a particular region as indicated in the 3M Climate Guide for 3M™ Stamark™ Pavement Marking Tapes.

3M Climate Guide Season	Surface Preparation Adhesive P-50 (or E-44T) Required?
<i>Within</i> Seasonal Start and End Dates	<i>IS NOT</i> Required
<i>Outside</i> Seasonal Start and End Dates	<i>IS</i> Required

(Note: Regions not covered in the Climate Guide must follow minimum temperature requirements.)

- **The pavement surface must be clean and dry. No rainfall within 24 hours prior to application. Other visible signs of moisture (dew or frost) cannot be present.**
- Butt splices must be used; do not overlap tape ends.
- Traffic must be kept off of pavement surfaces coated with a surface preparation adhesive prior to tape application.

Adhesive Series of Stamark Tapes

“A” Series: Tapes with pressure sensitive adhesive.

“A” Series tapes are shipped on a roll with a release agent top coating on the pavement marking surface. The adhesive on the back of the tape is ready for placement on the road surface once the tape is peeled from the roll.

“L” Series: Tapes with liner and pressure sensitive adhesive.

“L” Series tapes are available in both long line pavement markings as well as all symbols and legends. “L” Series tapes are shipped with a liner on the adhesive backing of the tape to allow for ease of handling prior to placement on the road surface. The liner is removed just before placement on the pavement.

“N” Series: Tapes with no liner and no pressure sensitive adhesive.

“N” Series tapes are manufactured with no adhesive backing on the tape. Application of “N” series tapes must be made using 3M™ Stamark™ Contact Cement E-44T with a three-coat system, including one coat of E-44T on the tape back surface and two coats on the pavement.

(See Appendix B for more information.)

A 3M Traffic Safety Systems Division technical service representative can be contacted at 1-800-553-1380 in the U.S. or at 1-800-265-1840 in Canada; when prompted, select technical service and then select pavement marking products.

Product Application

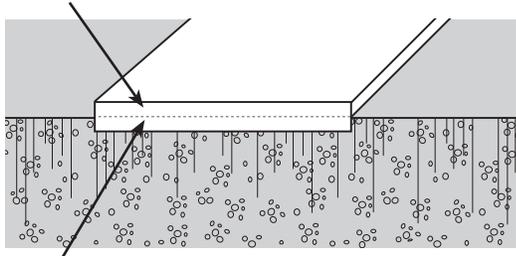
3M™ Stamark™ tapes can be applied by an inlay application (embedding pavement marking tape into fresh asphalt) or by an overlay application (applying tape on existing surface). The tapes can also be overlaid on a grooved surface. Refer to IF 5.18 for more information about a grooved application

Inlay Application of Long Lines

Including edge, lane and channelizing lines

Stamark tapes with pressure sensitive adhesive (A Series) can be applied on fresh asphalt before the finishing roller passes over the surface. Inlaying is the process of embedding pavement marking tape into the road surface. This is done by rolling over the applied tape with a steel-drum finishing roller while the asphalt is still warm. (See Figure 1.)

Tape above road surface (Approximately 40-50%)



Partially Embedded Tape (Approximately 50-60%)

Cross Section of the Road

Figure 1.

PROCEDURE

1. Pave a lane.

Lanes should be paved so that the tape will not be placed on the asphalt seams between lanes. Generally, the width of the first lane should be approximately 12 inches (30.5 cm) short of center (for example, a 12-foot [3.7 m] wide lane should be paved at 11 feet [3.3 m] wide). The second pass will then be paved 13 feet (4.0 m) wide, for a total road width of 24 feet (7.3 m). Center line markings will then be applied on a fresh, warm mat during paving of the adjacent lane, at least 4 inches (10 cm) from the asphalt seam.

2. Compact the fresh asphalt.

3. Premark the road.

Use 200-250 feet (60-70 m) of sash, chain or thin wire cable as a guide for long line applications or snap chalk lines on the asphalt. For skip line application, mark the skip sequence on a sash chain or with chalk or paint to be followed by the pointer on a tape applicator. (See Figure 2.)

Example: A sash chain marked to the proper skip sequence with 1-inch (2.5 cm) spiral key rings.

4. Test the asphalt surface.

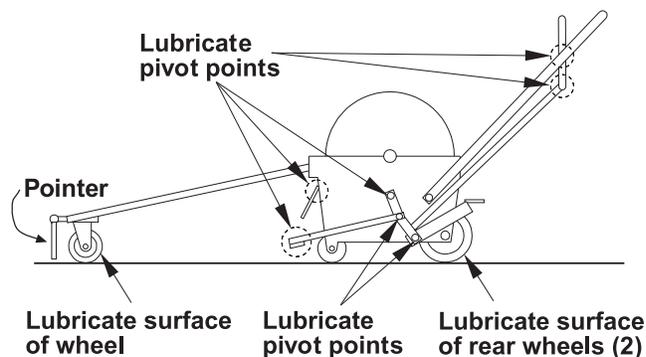
The pavement surface must be soft enough to allow the marking to be inlaid by the steel-drum finishing roller (a ten-ton finishing roller is recommended).

Generally, the desired surface temperature will be between 130°F (54°C) and 160°F (71°C). Using a surface thermometer, test the temperature of the asphalt surface. There is no minimum air temperature requirement for an inlay tape application; however, be advised that cooler air temperatures will result in faster cooling of the asphalt reducing the application window.

Note: If you are using a stiffer mix, rubber-based mix (rubberized asphalt), Superpave, OGFC (Open Grade Friction Course) or SMA (Stone Matrix Asphalt), you may need to increase the temperature at which the tape is recessed with a finishing roller to reach the desired amount of embedment into the surface. Inlay the tape with the finishing roller while the surface temperature is warm enough to get approximately 50 to 60 percent of the tape's thickness below the asphalt surface. Do not exceed 180°F (83°C).

5. Lubricate the tape applicator.

Prepare the Manual Highway Tape Applicator for use. Spray the rear rubber wheels, front wheel, and pivot points of the tape applicator with 3M™ 5-way Penetrant, WD-40™ or equivalent light oil spray. The rear wheels and pointer wheel should be sprayed regularly to avoid asphalt build-up. *Note: Wheels may also be wrapped with duct tape. Replace regularly to avoid buildup.* (See Figure 2.)



Manual Highway Tape Applicator

Figure 2.

Inlay Application of Long Lines (continued)

6. Procedure for Threading Tape If Using the Manual Highway Tape Applicator.

Load the tape and thread over the 2-inch (5.08 cm) diameter roll, adhesive side up. (Figure 3) Feed the tape in between the side frame connecting rod and the 2 inch aluminum roller, then through the CLAMP to the CUTTER PLATE. Adjust the GUIDE BARS at the sides of the tape rolls to hold them securely in position.

DO NOT thread tape over the 1/2 inch diameter side frame connecting rod. This will create excessive unwind tension and stretching of the tape.

Caution: Do not activate the cutting knife with the foot pedal while threading tape!

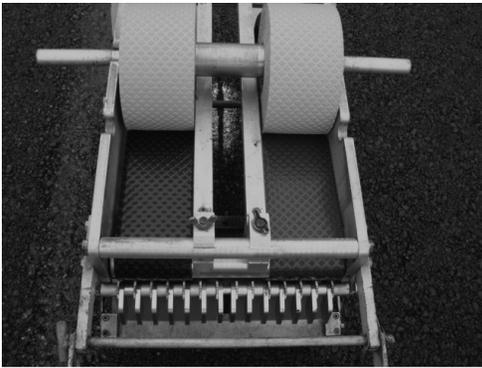


Figure 3

7. Apply the tape.

Apply the tape using the Manual Highway Tape Applicator (MHTA). Make sure you do not apply the tape any closer than 4 inches (10.16 cm) from the asphalt seam. (See Figure 4.)

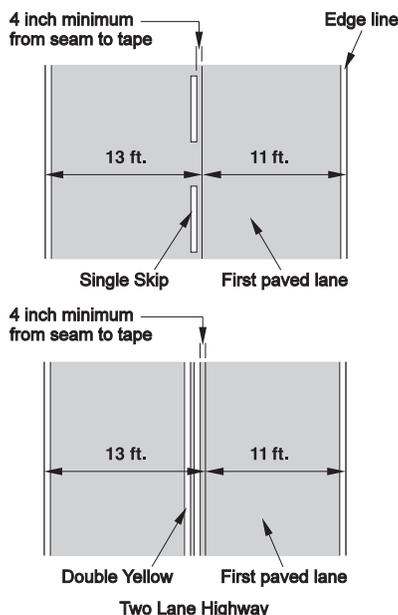


Figure 4.

If pavement markings are applied using the manual highway tape applicator, the weight of the tape applicator roller will be adequate to cause the adhesive to tack with the fresh asphalt prior to rolling with the steel-drum roller. If pavement markings are placed by hand (i.e., shorter, individual skip marks), walk on the tape first to tack the adhesive on the asphalt and then roll the tape using one pass with a Roller Tamper Cart RTC-2 with 50-100 lb. (45 kg) prior to rolling with a steel-drum finishing roller.

8. Press the tape into the pavement.

Using a tandem steel-drum finishing roller (no vibration), slowly roll over the tape to press (inlay) it into the warm pavement surface. The tape should always be rolled (first pass) in the same direction it was applied. The speed of the finishing roller should be kept to a minimum (between 2 and 3 mph [3 and 5 kmh]) when rolling over the tape during the first pass. Use a minimum amount of water to clean and lubricate the steel drums during the inlay operation. (See Figure 5.)

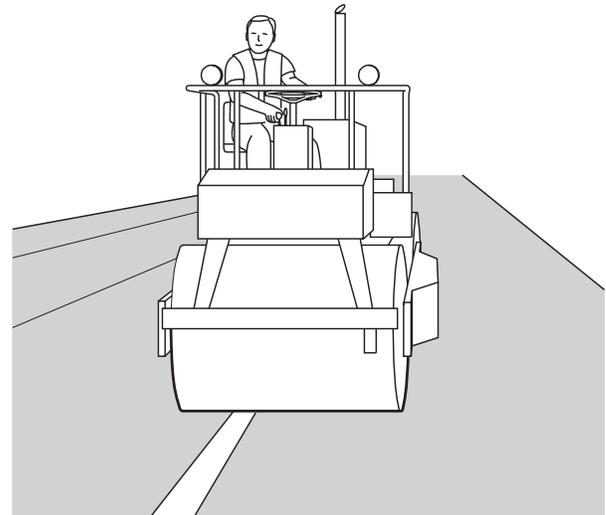


Figure 5.

Note: For best inlay results the weight of the steel-drum roller should be greater than 110 PLI (Pounds per Lineal Inch) of drum width.

$$PLI = \frac{\text{Total weight of roller (pounds)}}{\text{Total length of drums (inches)}}$$

Typically, a 3-5 ton 42 inch wide roller will apply over 140 PLI.

Inlay Application of Long Lines *(continued)*

Under normal conditions, two passes of the finishing roller is required to inlay the tape. Some stiffer asphalt mixes may need three passes with the finishing roller while the asphalt is still warm in order to inlay the tape properly. An inlay is considered successful when approximately 50 to 60 percent of the tape's thickness is below the asphalt surface. *(See Figure 1 on page 4.)*

Note: If the tape wrinkles or distorts severely in front of the roller, the mat temperature may be too hot or the roller speed may be too fast. Allow the surface to cool slightly and retry.

Do not remove the inlaid tape since removal of the tape will remove the asphalt.

9. Repeat Steps 1-8 until the road is fully marked.

10. Open the road to traffic.

As soon as the inlay operations are complete and the asphalt has cooled to temperatures that support vehicles without surface damage, the road may be opened to traffic.

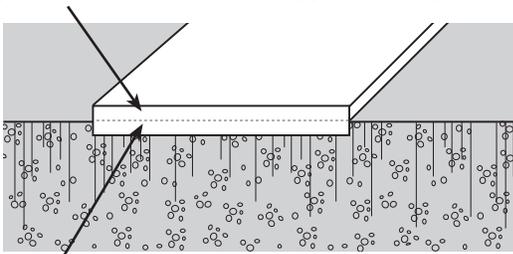
Note: Tape pattern is important for visibility performance. An improper inlay may cause tape pattern flattening. A measured increase of applied tape width greater than 1/8 inch (3mm) may be an indication that pattern flattening has occurred.

Inlay Application of Transverse Markings

Including crosswalks, stopbars, gore markings, symbols and legends

3M™ Stamark™ Pavement Marking Tapes with pressure sensitive adhesive (A Series [no liner] and L Series [with liner; also includes precut symbols and legends known as SMS-L Series]) can be applied on fresh asphalt before the finishing roller has passed over the surface. Inlaying is the process of embedding the pavement marking tape into the road surface. This is done by rolling over the applied tape with a finishing roller while the asphalt is still warm. *(See Figure 6.)*

Tape above road surface (Approximately 40-50%)



Partially Embedded Tape (Approximately 50-60%)

Cross Section of the Road

Figure 6.

PROCEDURE

- 1. Pave a lane.** *(See Step 1 on Page 4.)*
- 2. Compact the fresh asphalt.**
- 3. Premark the road.** Using chalk or keel, outline the area where the marking will be applied.
- 4. Test the asphalt surface.**
The pavement surface must be soft enough to

allow the marking to be inlaid by the steel-drum finishing roller.

Generally, the desired surface temperature will be between 130°F (54°C) and 160°F (71°C). Using a surface thermometer, test the temperature of the asphalt surface. There is no minimum air temperature requirement for an inlay tape application; however, be advised that cooler air temperatures will result in faster cooling of the asphalt reducing the application window.

Note: If you are using a stiffer mix, rubber-based mix (rubberized asphalt), Superpave, OGFC (Open Grade Friction Course) or SMA (Stone Matrix Asphalt), you may need to increase the temperature at which the tape is recessed with a finishing roller to reach the desired amount of embedment into the surface. Inlay the tape with the finishing roller while the surface temperature is warm enough to get approximately 50 to 60 percent of the tape's thickness below the asphalt surface. Do not exceed 180°F (83°C).

5. Apply the tape.

Apply the tape by hand.

Cut the tape approximately 12 inches (30.5 cm) short of the asphalt seam or edge. Once the adjacent lane is paved, the tape should meet the end of the tape placed in the first paved lane. Do not overlap the material. Use butt splices. *(See Figure 7.)*

After the next length of tape is placed and butt-spliced with the tape placed during paving of the first lane, the tape will not be inlaid through the 12-inch wide area between the seam and butt splice. To prevent tape loss in snowplow regions from this small area of tape overlay, use a utility

Inlay Application of Transverse Markings (continued)

knife to score a relief cut across the width of the tape just outside the seam and into the inlay area. (See Figure 7.)

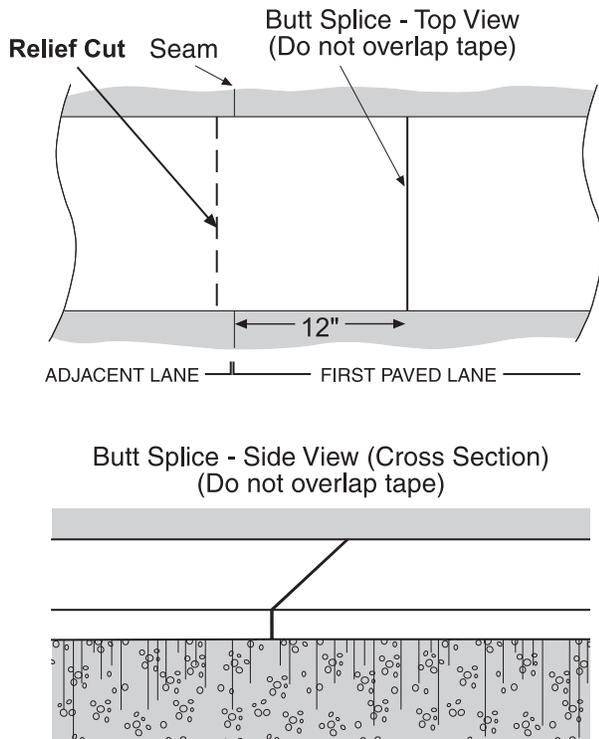


Figure 7.

For material with liner (L Series), including legends and symbols:

Position the marking and peel back the liner. Refer to IF 5.8 for Liner removal techniques. Press the exposed tape down. Slowly remove the rest of the liner as the tape is carefully guided into place.

6. Tamp the tape.

Use a Roller Tamper Cart RTC-2 loaded with **100 pounds (45 kg)** (two standard 50-pound weights) to get initial tack of the tape to the asphalt. This tamping of the tape should always be done in the same direction as the marking was applied (lengthwise, not crosswise). **Start in the center of the marking**, then work toward the edges of the tape to remove trapped air. Make sure all the edges of the tape are thoroughly tamped. Do not twist or turn the tamper cart on the tape. One pass over each area is sufficient. (See Figure 8.)

If the tape folds or distorts in front of tamper center, remove one 50 lb weight and continue tamping.

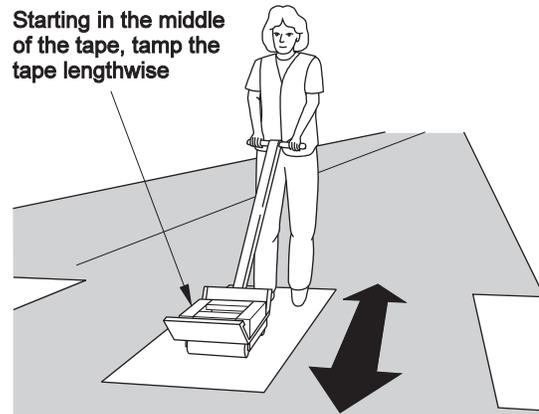


Figure 8.

7. Press the tape into the pavement.

Using a tandem steel-drum finishing roller with no vibration, slowly roll over the tape to press (inlay) it into the warm pavement surface. Roll back and forth in a straight line over the same section of tape before moving over to the next section. The speed of the finishing roller should be kept to a minimum (between 2 and 3 mph [3 and 5 kph]) when rolling over the tape. Use a minimum amount of water to clean and lubricate the steel drums during the inlay operation. (See Figure 9.)

Note: For best inlay results the weight of the steel-drum finishing roller should be greater than 110 (Pounds per Lineal Inch) PLI of drum width.

$$PLI = \frac{\text{Total weight of roller (pounds)}}{\text{Total length of drums (inches)}}$$

Use a smaller roller (3-5 ton) for intersection markings if one is available. Smaller rollers are generally more maneuverable and allow the markings to be inlaid more efficiently. It may be possible to inlay intersection markings in a longitudinal direction to the markings if the roller is small and the operator is experienced.

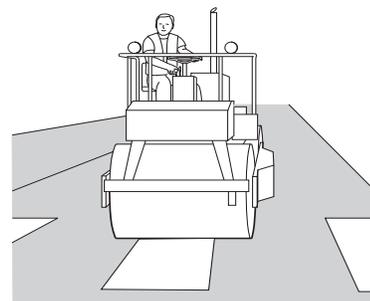


Figure 9.

Inlay Application of Transverse Markings *(continued)*

Under normal conditions, two passes back and forth of the finishing roller are required to inlay the tape. Some stiffer asphalt mixes may need three passes with the finishing roller while the asphalt is still warm in order to inlay the tape properly. An inlay is considered successful when approximately 50 to 60 percent of the tape's thickness is below the asphalt surface.

Note: *If the tape wrinkles or distorts severely in front of the roller, the mat temperature may be too hot or the roller speed may be too fast. Allow the surface to cool slightly and retry. Do not remove the inlaid tape since removal of the tape will remove the asphalt.*

8. Repeat Steps 1-7 until the road is fully marked.

9. Open the road to traffic.

As soon as the inlay operations are complete and the asphalt has cooled to temperatures that support vehicles without surface damage, the road may be opened to traffic.

Note: Tape pattern is important for visibility performance. An improper inlay may cause tape pattern flattening. A measured increase of applied tape width greater than 1/8 inch (3mm) may be an indication that pattern flattening has occurred.

Overlay Application of Long Lines

Including edge, lane and channelizing lines

PROCEDURE

This procedure explains how to apply tape to a concrete or asphalt surface in the form of edge, lane, and channelizing lines. Before you begin, make sure your environment meets all the product application requirements on page 3.

3M™ Stamark™ Surface Preparation Adhesive P-50 is generally the recommended surface preparation adhesive for long line pavement marking tape application, except in a few specific applications.

Use this chart to determine the proper tape and type of surface preparation adhesive to use.

(See Appendix B for application coverage guidelines)

Long line application	Recommended Tape Series	Asphalt 0-3 days old	Asphalt 4-10 days old	Asphalt >10 days old	Concrete (b)
Edge Line	A	None	P-50	P-50	P-50
Center or Lane Line	A	None	P-50	P-50	P-50
Channelization Line	A	None	P-50	P-50	P-50
Edge Line at High Vehicle Crossover Location (a)	A or N	None	None	P-50 (c)	P-50 (c)

Notes:

- Examples could include edge lines across high volume road access points or high volume crossover traffic through a median area with edge lines.
- New concrete surfaces open to traffic less than 90 days must have the curing compound removed prior to application of surface preparation adhesive and pavement markings.
- P-50 is the only Surface Preparation Adhesive recommended for use with Series 380AW, 390, 380WR ES, 380I ES, 310 or 270 ES tapes on long line applications.

Overlay Application of Long Lines (continued)

1. Determine road surface conditions.

- If surface is new concrete open to traffic less than 90 days, remove curing compound by sandblasting, shotblasting, light grinding, or hydroblasting.
- If markings exist on the roadway, remove markings from the surface by sandblasting or grinding. A minimum of 90 percent of the road surface under the existing markings must be exposed prior to tape application.
- Applying Stamark Tape over longitudinal joints is not recommended. Premature tape failure can occur as joints can shift and degrade over time. Concrete joints that are wider or deeper than normal can prevent the tape from conforming to the road surface. As joint maintenance is required, the markings can be damaged by maintenance equipment and joint fillers. If application over any joint is necessary, cut the tape 1 inch (2.54cm) away from the joint on both sides.

2. Clean the road.

Clean the surface of the road where the tape will be applied. Clean the surface using a high pressure, high velocity compressed air blower with minimum 185 cfm airflow and 120 psi at the air nozzle. There should be no more than 50 feet of 3/4-inch ID hose from the compressor to the air nozzle and the air nozzle should be no less than 1/2-inch ID. The compressor should also be equipped with a moisture and oil trap. It is recommended that the air nozzle be no more than 2 feet from the ground. A street sweeper or pick-up broom may also be effective to remove larger or adhered debris, but will require a final pass with the air compressor to completely clean the surface. The road surface must be dry.

3. Premark the road. (See Step 3 on Page 4.)

4. Determine if surface preparation adhesive (P-50) is required. Refer to product bulletin for tape to be applied.

- If no adhesive is required, go to Step 7.
- If adhesive is required, go to Step 5.

Note: If you have any questions, contact 3M Technical Services at 1-800-553-1380. Follow the automatic prompt to reach technical service to determine if surface preparation adhesive is needed.

5. Apply the adhesive (P-50 only).

Using a Spray Applicator PS-14, apply a thin, uniform coat of P-50 adhesive to the pavement. The adhesive should extend at least 1 inch (2.5 cm) beyond the premarked area where the edges of the

tape will be applied. (See Figure 10.) The PS-14 applicator is designed to spray a 6-inch (15.2 cm) wide pattern for application of 4-inch (10.2 cm) wide tape. The typical wet thickness is 6-7 mil.

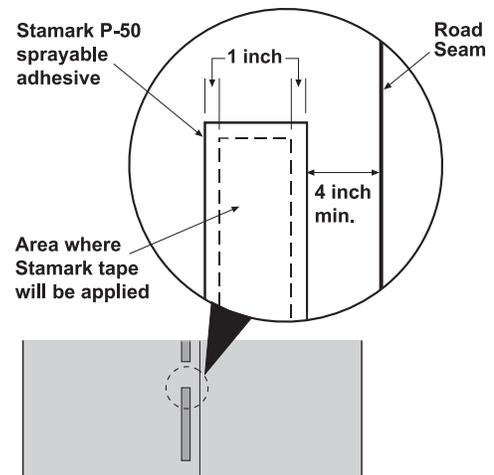


Figure 10.

Adjust the arm of the PS-14 applicator up or down so that the spray pattern is 6 inches (15.2 cm) wide. (See Figure 11.)

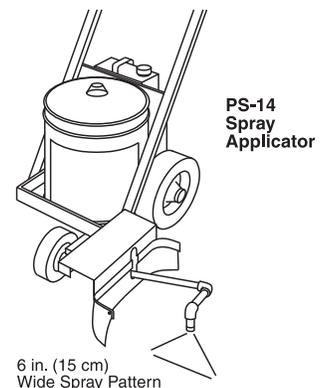


Figure 11.

Note: If you are using tape wider than 4 inches, spray multiple passes, overlapping the previous pattern by 1-2". Allow additional time for overlapped areas to set. See Appendix B to determine the amount of adhesive that is needed to cover a specific area.

6. Allow the adhesive to set.

Allow the P-50 to set. P-50 is set when it feels tacky but is no longer in liquid form and has a matte finish rather than a glossy wet appearance. P-50 dries quickly (to a set state) under most circumstances. Typical time for P-50 to set is 2 to 3 minutes under optimal conditions of 70°F (21°C) and medium to low humidity levels.

Overlay Application of Long Lines (continued)

7. Procedure for Threading Tape If Using the Manual Highway Tape Applicator.

Load the tape and thread over the 2-inch (5.08 cm) diameter roll, adhesive side up. (Figure 12) Feed the tape in between the side frame connecting rod and the 2 inch aluminum roller, then through the CLAMP to the CUTTER PLATE. Adjust the GUIDE BARS at the sides of the tape rolls to hold them securely in position.

DO NOT thread tape over the 1/2 inch diameter side frame connecting rod. This will create excessive unwind tension and stretching of the tape.

Caution: Do not activate the cutting knife with the foot pedal while threading tape!

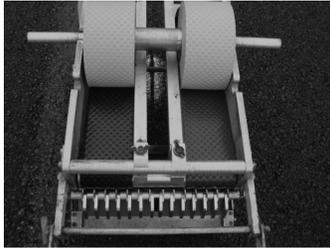


Figure 12

8. Apply the tape.

Note: This list is not inclusive and other tape application equipment has been used successfully to apply 3M Stamark tapes. Please contact 3M Technical Service if there are questions about equipment not specifically listed above.

If there is a crack in the pavement or if the tape is to be applied over a bridge expansion joint, lay the tape over the crack or joint, then cut the tape one inch away from the crack or joint on each side.

(See Figure 13.)

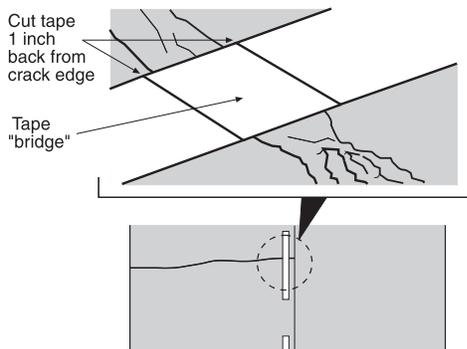


Figure 13.

9. Tamp the tape. VERY IMPORTANT!

Tamp the tape thoroughly with the RTC-2 tamper cart with a minimum **200-pound (90-kg)** load, or slowly drive over the tape a minimum of three times with a vehicle. The vehicle must be equipped with a pointing device to aid in keeping the vehicle on the tape, making three passes forward over the tape.

Use a vehicle tire on long line markings only.

TAMPING IS MOST IMPORTANT! When using the RTC-2 tamper cart (*See Figure 8, Page 7*):

- Do not twist or turn the tamper cart on the tape.
- Make a minimum of six passes (three passes back and forth) over each part of the tape.
- Make sure all edges are firmly adhered.

10. Open the road to traffic.

Overlay Application of Transverse Markings

Including crosswalks, stopbars, gore markings, symbols and legends

PROCEDURE

This procedure explains how to apply tape to a concrete or asphalt surface in the form of crosswalks, stopbars, gore markings, symbols and legends. Before you begin, make sure your environment meets all the product application requirements on page 3.

Use this chart to determine the proper tape and type of surface preparation adhesive to use.
(See Appendix B for application coverage guidelines)

Notes: High shear exposures may require the use of E-44T contact cement. Refer to appendix C for guidelines.

Transverse Marking Application	Recommended Tape Series	Asphalt 0-3 days old	Asphalt 4-10 days old	Asphalt >10 days old	Concrete (a)
Crosswalks	A, L or N	None	None	E-44T (b) or P-50 (f)	E-44T (b) or P-50 (f)
Stop Bars	A, L or N	None	None	E-44T (b) or P-50 (f)	E-44T (b) or P-50 (f)
Symbols & Legends	L or N	None	P-50	E-44T (b) or P-50 (f)	E-44T (b) or P-50 (f)
Gore Markings in Minimal Traffic Area (c)	A or N	None	P-50 (e)	P-50 (f)	P-50 (f)
Gore Markings in Heavy Traffic Area (d)	A or N	None	None	E-44T (b) or P-50 (f)	E-44T (b) or P-50 (f)

- a. New concrete surfaces open to traffic less than 90 days must have the curing compound removed prior to application of surface preparation adhesive and pavement markings.
- b. Three-coat E-44T method required for N-series tape application (roller applied).
- c. Gore markings in minimal traffic areas include gores at highway on-ramps and off-ramps where minimal traffic crosses over the pavement markings.
- d. Gore markings in heavy traffic areas include hatched median areas along urban roadways where high levels of traffic cross over the pavement marking.
- e. P-50 may be used for gore areas with minimal to no cross-over traffic..
- f. P-50 and E-44T are the only Surface Preparation Adhesives (roller applied) recommended for use with Series 380AW, 390, 380WR ES, 380I ES, 310 and 270 ES tapes for transverse marking application.

See Appendix C for guidance on the use of E-44T based on road type.

Overlay Application of Transverse Markings *(continued)*

1. Determine road surface conditions.

- a. If surface is new concrete open to traffic less than 90 days, remove curing compound by light grinding, sandblasting, shotblasting or hydroblasting.*
- b. If markings exist on the roadway, remove markings from the surface by hydroblasting, sandblasting or grinding. A minimum of 90 percent of the road surface under the existing markings must be exposed prior to tape application.

*Note: Hydroblasting requires a 24 hour waiting period before tape application

2. Clean the road.

Clean the surface of the road where the tape will be applied. Clean the surface using high velocity, high pressure compressed air blower with minimum 185 cfm airflow and 120 psi at the air nozzle (recommended). The road surface must be dry.

3. Premark the road. Layout the area where the marking will be applied.

4. Determine if surface preparation adhesive is required. (See table on page 3.) For additional information on application refer to the product bulletin and information folder for the tape being applied.

- a. If no adhesive is required, go to Step 11.
- b. If adhesive is required, go to Step 5.

5. Stir the adhesive. (E-44T only.)

Stir and thoroughly mix the E-44T adhesive with a wide wooden paint paddle or air driven paint mixer. Make sure any sediment on the bottom of the 5-gallon container is completely stirred into a consistent solution. (See Figure 14.)

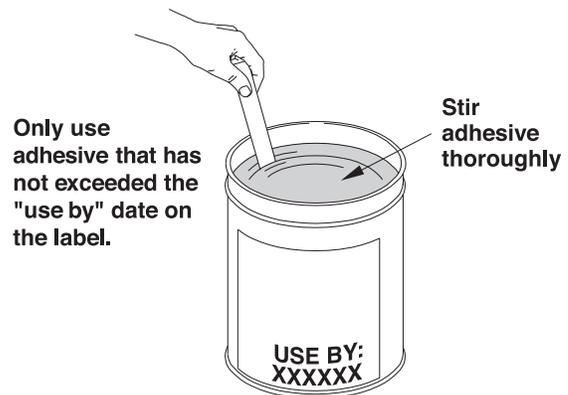


Figure 14.

6. Apply the adhesive.

- a. If using P-50 adhesive on asphalt 4-10 days old, see Step 5 on Page 9.
- b. If using P-50 or E-44T for an intersection or and transverse making - including legends and symbols - evenly apply one coat of adhesive to the road surface using a solvent-resistant roller with a minimum 3/8-inch (2.0 cm) nap. The coating on the pavement must extend at least 1 inch (2.5 cm) beyond the premarked area. (See Figure 15.)

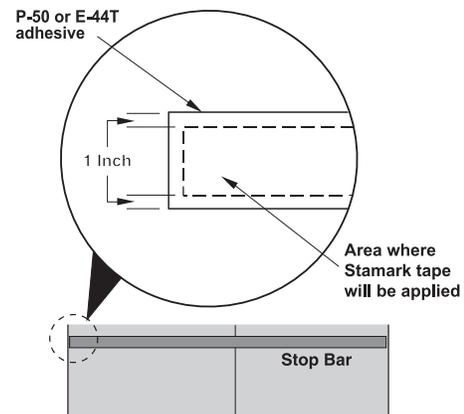


Figure 15.

Overlay Application of Transverse Markings (continued)

7. Allow the adhesive to set.

It is very important that the surface preparation adhesive is set to prevent the tape from sliding after application. If the surface preparation adhesive is not allowed to set, it will not bond properly to the adhesive on the tape and adhesion failure will likely occur. Surface preparation adhesive is set (see Figure 16) when it feels tacky but will not lift or string when touched with fingertips protected with gloves. The time needed for the E-44T to set is approximately 5 minutes under optimal conditions of 70°F (21°C) and medium to low humidity. Set time will change depending on climate conditions. Typical time for P-50 to set is 2 to 3 minutes under optimal conditions of 70°F (21°C) and medium to low humidity levels. (See Figure 16.)

Note: If E-44T dries to a tack free state, apply a second coat.

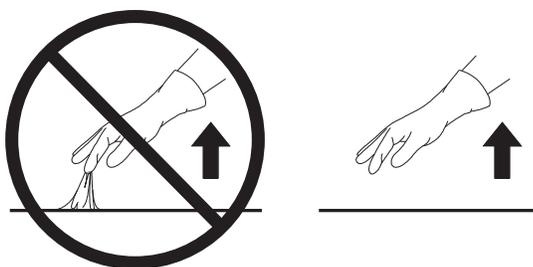


Figure 16.

8. Remark the road (if needed).

9. Determine next step, based on tape series being used.

- If tape is Series A (with adhesive), go to Step 11.
- If tape is Series L (with adhesive and a liner), then go to Step 11.
- If tape is Series N (no adhesive and no liner), go to Step 10.

10. Apply a second coat of adhesive to the road surface and a single coat to the back side of the tape. (N Series [tape with no adhesive or liner] only).

Allow adhesive to “set”. It is very important that the adhesive is set to prevent the tape from sliding after application. The adhesive is set when it will not lift or string but does feel tacky when touched with fingertips protected with gloves. The time needed for the E-44T to set is approximately 5 minutes under optimal conditions of 70°F (21°C) and medium to low humidity. Set time will change depending on climate conditions. (See Figure 16.)

Important Note: a. E-44T forms a skin as it dries so a firm pressing to the E-44T surface is needed to determine if it is set. No blisters or strings of adhesive should come away with the finger as it is removed.

b. Always check in different areas and especially depressions in the road surface where more E-44T may be present and slower to dry.

11. Apply the tape by hand.

Apply the tape by hand. When splicing is required, do not overlap the material. Use butt splices. (See Figure 17.)

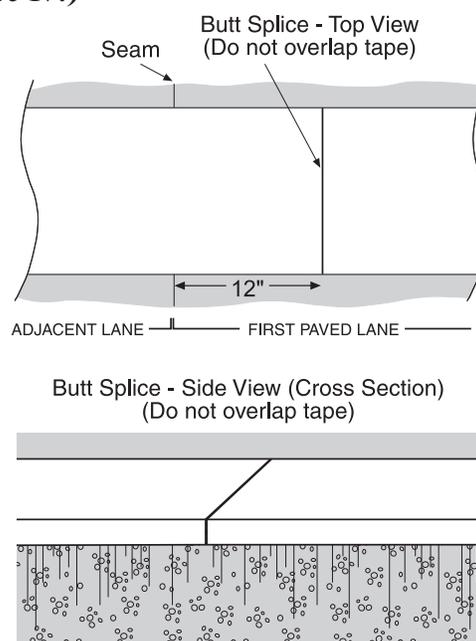


Figure 17.

Note: If there is a crack in the road that causes the tape to bridge, lay the tape over the crack, tamp the tape, and then cut the tape one inch from each side of the crack. (See Figure 18.)

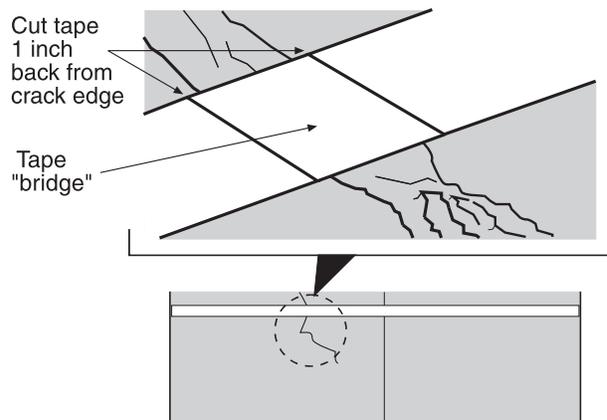


Figure 18.

Overlay Application of Transverse Markings *(continued)*

Use this same technique on concrete when the transverse marking is applied over a joint: Cut the tape 1 inch back from each side of the joint.

For material with liner (L Series): Refer to IF 5.8 for liner removal techniques

Position the marking and peel back the liner. Press the exposed tape down. Slowly remove the rest of the liner as the tape is carefully guided into place. Refer to IF 5.8 for liner removal.

12. Tamp the tape.

Tamp the tape thoroughly with the RTC-2 tamper cart with a minimum **200-lb. (90-kg)** load. (*See Figure 19.*)

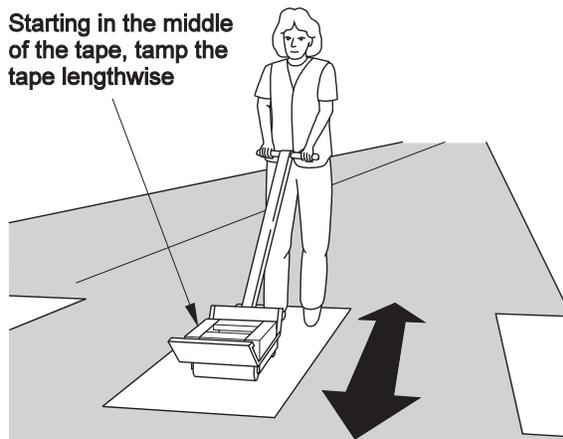


Figure 19.

- Start in the center of the marking.
- Do not twist or turn the tamper cart on the tape.
- Make six passes (three passes back and forth) over each part of the tape.
- Make sure all edges are firmly adhered.
Note: Do not use a vehicle tire to tamp transverse markings!

13. Open the road to traffic.

Additional Information

STORAGE

3M™ Stamark™ Tapes, Stamark™ Surface Preparation Adhesive P-50 and Stamark™ Contact Cement E-44T must be stored in a cool, dry area indoors. A storage temperature of 40-100°F (4-38°C) is recommended. Use all tape products within one year of receipt. Unopened containers of P-50 must be used within two years of receipt. Check label for expiration date of receipt.

REMOVAL

Stamark tapes are designed for permanent, non-removal applications. Contact your 3M representative for guidance concerning removal of Stamark tapes.

HEALTH AND SAFETY

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. 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 emission.

Personal protective equipment may be appropriate for safely installing these products in a work zone environment. For example, eye, ear, and respiratory protection may be appropriate during grooving, surface preparation, or for the removal of existing pavement markings. Always follow safe work zone practices.

CAUTION

- Gloves should be worn when using any Stamark tapes to prevent injury to hands.
- Do not use a flame or torch to remove Stamark tapes. Burning may violate local, state or federal air quality regulations. Also, exposing the tape to very high temperatures with the use of a flame or torch could generate emissions that may be harmful to skin, eyes and respiratory system.

Appendix A. Pavement Surface Types

The pavement surface type and age determine which application procedures for 3M™ Stamark™ Pavement Marking Tapes should be used. For pavement types not covered, contact your 3M representative.

ASPHALTIC CEMENT CONCRETE (ACC)

Standard Mix Asphalt

A standard mix contains both fine (sand) and large (1/4-inch [6-mm]) aggregate with an asphalt cement binder. Stamark tapes can be inlaid or overlaid on this surface.

Open Grade Friction Course

An open grade friction course mix consists of only large aggregate, up to 3/4 inches (19 mm), with an asphalt cement binder. Stamark tapes can be inlaid or overlaid on this surface. Refer to the inlay application section of this folder for further explanation, beginning on page 4.

Chip Seal

A chip seal is achieved by spraying a hot asphalt emulsion onto an existing surface and then covering it with a 1/4-inch (6.4-mm) aggregate. Excess aggregate is removed after several days of exposure to traffic. Stamark tapes can be overlaid on this surface after the loose aggregate is removed and the surface has cured.

Slurry Seal

A slurry seal is a hot asphalt emulsion that is sprayed onto an existing surface, as a top coat dressing only. No aggregate is added. Stamark tape can be overlaid on this surface after the road has been open to traffic for three days.

Recycled Asphalt

This road surface consists of an existing asphalt that is removed through milling or grinding, reprocessed and then reapplied. Stamark tape can be inlaid or overlaid on this surface.

Rubberized Asphalt

Rubberized asphalt mixes contain additives designed to increase durability. The mix can be either a “standard mix” or an “open grade friction course” mix. Stamark tape can be applied as noted under the appropriate headings in this information folder.

PORTLAND CEMENT CONCRETE (PCC)

New Concrete

During construction, the new surface is often brushed or grooved (tined). Concrete that has been open to traffic less than 90 days must have the curing compound removed before applying Stamark tapes or surface preparation adhesive. Sandblasting is the method commonly used to remove curing compound from new concrete. Other methods, such as shot-blasting or hydro-blasting, can also be used. In the case of hydro-blasting, the pavement must be allowed to dry before the surface preparation adhesive and tape are applied.

Old Concrete

Old concrete is a PCC surface that has been open to traffic for more than one year and is showing signs of wear. Often this surface is smooth with large amounts of exposed, polished aggregate. Stamark tape can be overlaid using a surface preparation adhesive. The old concrete surface may require texturing prior to surface preparation adhesive and tape application. Contact a technical service representative at 1-800-553-1380 for additional information.

Appendix B. Surface Preparation Adhesives

Two surface preparation adhesives are commonly available for application of Stamark pavement marking tapes: Stamark E-44T contact cement and Stamark surface preparation adhesive P-50.

A. E-44T Contact Cement

E-44T contact cement is used with the roller applied 3-Coat Method to apply all N-Series (no adhesive) intersection markings including stop bars, crosswalks, symbols, channelizing lines and gore markings. It is applied using a long-handled, thick (3/4 -inch [2-cm]) nap paint roller with a solvent-resistant core. Refer to the section, "Overlay Application of Transverse Markings," for complete surface preparation and adhesive application procedure, beginning on page 11.

Note: E-44T is recommended for ES tapes in high shear exposures. Refer to Appendix C for more detail.

Stamark Tapes Non-Adhesive Coated (N Series only)

A three-coat system is used: One uniform coat of E-44T contact cement is roller applied first to the road surface and allowed to set. A second coat is then applied to the road surface and a single coat is applied to the nonreflective (bottom) side of the tape and allowed to set. Traffic must be kept off the coated surface prior to tape installation.

Note: E-44T Contact Cement can be applied to all road surfaces except for new, 0 to 10 day old asphalt. When applying to new concrete (PCC) opened to traffic for less than 3 months, the curing compound must be removed by sandblasting light grinding, hydroblasting, or shotblasting.

B. Surface Preparation Adhesive P-50

P-50 sprayable adhesive is applied using the PS-14 spray applicator or an airless or a compressed air sprayer as found on a highway striping paint truck.

For a compressed air sprayer, adjust as needed to achieve target application rate as listed in chart #3. It is designed to be used as a surface preparation adhesive for long-line applications.

It is also applied using a long-handled, thick (3/8 inch [0.95cm]) nap paint roller with a solvent-resistant core.

C. Coverage for E-44T and P-50 Adhesives

See Chart 3 below to determine how much adhesive you need to cover a specific area.

Chart 3

Adhesive Type	One Coat	Three Coats
E-44T Contact Cement Roller Application	75 sq. ft./gallon (1.8 sq. m/liter) (3/4 inch Nap) metric	25 sq. ft./gallon (0.6 sq. m/liter)
P-50 Surface Preparation Adhesive Spray Application	One coat sprayed at a 6-inch (15-cm) width for a 4-inch (10-cm) line covers approximately 450 lineal ft./gallon (35 lineal meters/liter) or 225 sq. ft./gallon (5.3 sq. m/liter)	N/A
P-50 Roll Application	75 sq. ft./gallon (1.8 sq. m/liter) (3/8 inch Nap) metric	N/A

Appendix C. Road Type Surface Preparation Adhesive Application Recommendations

Road lanes are typically exposed to different levels of traffic shear exposure. Road lanes that are exposed to a high frequency of high shear turning; especially by trucks and other large vehicles require use of E-44T Contact Cement for application of Stamark pavement marking tapes. The following table summarizes the product and surface preparation adhesive application recommendations by shear condition:

Important Note: Refer to Overlay Application of Transverse Markings sections starting on page 11.

Contact 3M Technical Service at 1-800-553-1380 for questions on E-44T applications.

Shear Level	Product and Adhesive Recommendation
↑ Very High Shear	Stamark Tape "N" Series Use 3 Coats of E-44T
High Shear	Stamark Tape "A" and "L" Series Use One Coat of E-44T
Moderate Shear	Stamark Tape "A" and "L" Series Use P50
Low Shear	Stamark Tape "A" and "L" Series
Within the Climate Guide Recommendations	

Literature Reference

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

- Product Bulletin 310 3M™ Stamark™ Pavement Marking Tape Series 310
- Product Bulletin 380AW 3M™ Stamark™ High Performance All Weather Tape Series 380AW
- Product Bulletin 380I ES 3M™ Stamark™ High Performance Tape Series 380IES
- Product Bulletin 380I-5ES 3M™ Stamark™ High Performance Tape Series 380I-5ES
- Product Bulletin 380WR ES 3M™ Stamark™ High Performance Wet Reflective Tape Series 380WR ES
- Product Bulletin 380WR-5ES 3M™ Stamark™ High Performance Wet Reflective Contrast Masking Tape Series 380WR-5ES
- Product Bulletin 270 ES 3M™ Stamark™ Pavement Marking Tape 270ES
- Product Bulletin 390 3M™ Stamark™ High Performance Tape Series 390
- Product Bulletin 390-5 3M™ Stamark™ High Performance Contrast Marking Tape
- Information Folder 5.2 Highway Tape Applicator (HTA)
- Information Folder 5.8 Application of 3M™ Stamark™ Precut Symbols and Legends
- Information Folder 5.13 3M™ Stamark™ Contact Cement E-44T
- Information Folder 5.17 3M™ Stamark™ Surface Preparation Adhesive P-50
- Information Folder 5.18 Guidelines for Pavement Marking Applications in Grooved Pavement Surfaces
- 3M Climate Guide Climate Guide for 3M™ Stamark™ Pavement Marking Tapes
- 3M Road Surface Guide Road Surface Guide for 3M™ Stamark™ Pavement Marking Tapes.

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Stamark™ Pavement Marking Tape and Liquid Pavement Markings

Application Guidelines for Pavement Markings in Grooved Pavement Surfaces

Information Folder 5.18 Grooving Applications

May, 2011

Replaces IF 5.18 Dated August, 2009

Description

Grooving the pavement surface of a road or highway provides an alternative method for installation of 3M™ Stamark™ Pavement Marking Tape and 3M™ Liquid Pavement Markings (LPM, All Weather Paint and All Weather Thermoplastic). The benefits of grooving include enhanced protection of the pavement marking and retroreflective beads from snowplow damage in northern climates. Grooving extends the service life of the pavement markings.

This information folder lists the recommended procedures and application guidelines for completing a grooving application for products mentioned above.

The following sections can be found in this information folder:

- I. Groove Specifications
- II. Equipment Alternatives and Surface Texture Recommendations
- III. Application Guidelines
- IV. Measuring Groove Depths
- V. Surface Wetting Test

Follow the detailed application instructions for "Overlay Applications" in 3M Information Folder 5.7 Pavement Surface Preparation and Application Techniques for Stamark tapes when applying pavement marking tapes in a groove.

All weather and climate conditions for the specific pavement marking product (liquid or tape) must be met before application into the groove.

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

I. Groove Specifications

Figure 1 shows a typical section of a pavement marking in a groove with the required groove width and depth indicated for both liquid and tape pavement markings.

(1000 mil = 1 inch)

Note: See Tables A and B for specific pavement marking type recommendations.

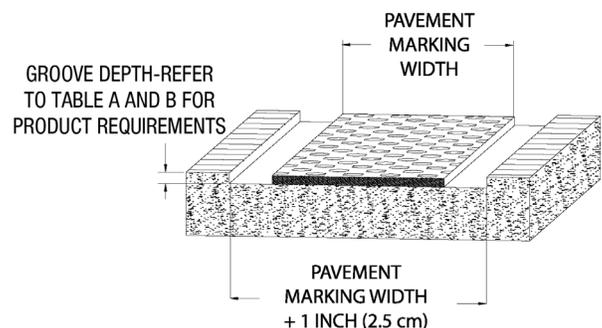


Figure 1 – Groove and Pavement Marking – Typical Section

Groove Depth

As shown on Figure 1, the groove depth should be cut according to the values recommended shown in Tables A and B below.

Table A UNIFORM GROOVE DEPTH

Pavement Marking Material	Required Groove Depth	
	Minimum	Maximum
3M™ Stamark™ Pavement Marking Tapes (Series 380 IES, 390, 270 ES, 310)	100 mils (2.54 mm)	200 mils (5.08 mm)
3M™ Stamark™ Pavement Marking Tapes Series 380AW	110 mils (2.79 mm)	200 mils (5.08 mm)

Table B UNIFORM GROOVE DEPTH

Pavement Marking Material	Required Groove Depth
3M™ Stamark™ Liquid Pavement Markings Series 1000 w/AASHTO M247 beads	40mils (1.02 mm) Minimum
3M™ All Weather Paint with All Weather Elements	60 mils min. (1.52 mm) 80 mils (2.03 mm) for max retained reflectivity
3M™ Stamark™ Liquid Pavement Markings Series 1000 w/large beads AND Series 1400 Polyurea or Epoxy binder with All Weather Elements	60 mils min. (1.52 mm) 80 mils (2.03 mm) for max retained reflectivity
3M™ All Weather Thermoplastic or MMA with All Weather Elements	Minimum 30 mils in addition to binder thickness (0.76 mm + binder thickness) For maximum retained reflectivity - 40 mils in addition to the binder thickness specification. (1.02 mm + binder thickness)

Note: More aggressive traffic or climate environments may require deeper grooves.

Groove Width – Longitudinal Markings

As shown in Figure 1, the typical groove width shall be one inch (2.5 cm) plus the width of the pavement marking. A groove two inches (5 cm) wider than the pavement marking width is sometimes preferred to allow for ease of straight tape application within the groove. The extra width also allows for improved tamping of the edges of the tape. Narrower grooves may provide additional protection to the pavement marking, but extra care must be taken to cut straight grooves that will allow for a straight alignment of the pavement marking installed in the groove.

Groove Position

The recommended position of the groove edge is a minimum of 2 inches (5 cm) from the edge of concrete joints or asphalt seams along edge or centerlines.

Groove Cutting Speed

The speed of groove cutting equipment will vary with the width of the groove, the size of the application, the pavement surface (new or old asphalt or concrete) and the equipment and blades used for cutting. The speed must be set in accordance with other factors to ensure the required groove depth specifications are met.

Groove Cleaning

Cooling the cutting head with water may be necessary for some applications and equipment. In general, long continuous groove cuts for edge lines may require water to keep blades cool. Groove cutting for skip dash or other intermittent markings allows the blades to cool between cutting operations, so cooling water may not be necessary. If cooling water is necessary, flush the groove immediately with a high pressure power washer to remove any build-up of cement dust/water slurry. If this is not done, the slurry may harden in the groove.

Note: This process must also be used when dry grooving during a rainfall period.

Allow the groove to dry a minimum of 24 hours after groove cleaning, removal of excess water, and prior to pavement marking application if water is used in the grooving process. The groove must be clean and dry for proper application of the pavement marking.

Clean the groove completely prior to pavement marking application using an air compressor with at least 185 CFM air flow and 120 PSI air pressure. A street sweeper or pick-up broom may also be effective, but will require a pass with the air compressor to completely clean the bottom of the groove. **Note:** An open groove may be left open over night if it has been blown out or flushed out at the time of grooving. It is recommended to blow out the groove again before application of a pavement marking.

Grooved and Recessed Intersection

Markings

Intersection markings such as crosswalks and stop bars can be grooved into the pavement and recessed by making multiple side-by-side passes with grooving equipment typically used for long line pavement markings. Multiple passes are made to allow for placement of the wider intersection markings in a groove.

Cutting grooves with multiple passes can result in a ridge between each pass due to the stops on each side of the cutting head resting on different levels of pavement surfaces. The first pass with the grooving equipment is completed with the stops resting on an even surface (Figure 2).

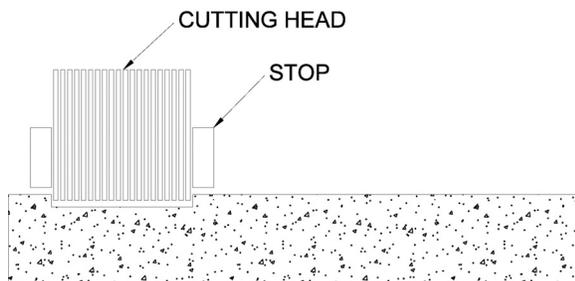


Figure 2 - Initial Pass, Intersection Groove Cut

After the first pass, one stop will sit on the old pavement surface and the other stop will sit in the newly cut groove (Figure 3). This produces ridges which are unacceptable.

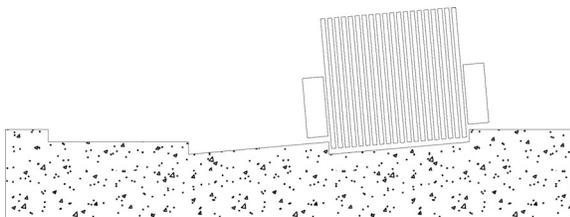


Figure 3 - Additional Passes with Ridge along Cutter Head Edge

Adjust the stops after the first pass to prevent this problem or grind off the ridges between the passes prior to placing the pavement marking in the recessed groove.

You can also use a metal plate the depth of the groove and move over for each cut across the groove face.

Legends and symbols can be grooved and recessed by grooving a large square or rectangular shaped area that will fit the pavement marking. Refer to IF 5.8 for more information.

Use wider cutting heads and more blades gang stacked on the saw auger to reduce the number of ridges formed by multiple passes with the cutting head.

Curb and median obstacles may not allow for cutting the groove using large truck-mounted equipment across the full width of the intersection marking. Use smaller equipment in areas near obstacles to achieve a groove at the recommended depth.

II. Equipment Alternatives and Surface Texture Recommendations

Several different cutting head configurations are available from different equipment manufacturers that specialize in saw cutting and grooving equipment. Different grooves will result from the use of different cutting heads and grooving equipment.

Groove equipment with a free-floating, independent head is recommended. This type of configuration allows the cutting head to follow irregularities in the pavement surface and provides a more consistent groove depth.

Important Note: The use of gang stacked cutting blades is required for asphalt pavement surfaces. The use of gang stacked cutting blades is strongly recommended for concrete pavement surfaces; especially for older surfaces or surfaces that show visible signs of deterioration.

Special note: Diamond cutting blades produce an optimal groove surface.

Saw Blade Cutting Heads

One alternative for grooving equipment consists of a single large diameter (12 -18 inch saw blades) cutting head, with gang-stacked, 1/8-inch (0.30 cm) to 1/4-inch (0.63 cm) wide carbide or diamond tipped cutting blades (Figure 4). Spacers are placed between the blades to provide a gap for the wider cutting head tips and to decrease the number of blades required for the cutting head.



Figure 4 – Saw Blade Cutting Head

Wider spacing of the blades may result in a heavily "ribbed" or "ridged" pattern that is not recommended for pavement marking applications (Figure 5). The ribbed pattern or corduroy effect must not be irregular or large enough to prevent tape conformance into the lower areas of the pattern. If the tape bridges these lower areas and does not make contact with the pavement surface, poor adhesion will occur due to moisture penetration.

Use of gang-stacked diamond tipped cutting blades creates a corduroy or ribbed pattern as shown in Figure 5.



Figure 5 – Cross Section Coarse Tooth Pattern Widely Spaced or Worn Blades

Replace blades and/or change spacing to correct this appearance.

Thinner spacers may be used between the blades to prevent an irregular raised pattern in the groove. This will result in a groove with a smoother surface (Figure 6, 7 and 8). The height of the ridges should be no greater than 15 mil. above the base of the groove.

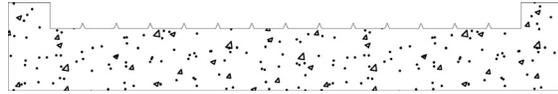


Figure 6 – Cross Section Smooth Groove Thin Spacers and New Blades.

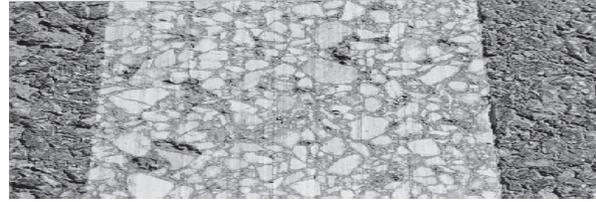


Figure 7 – ACC Light Corduroy or ribbed pattern made with properly spaced, gang stacked cutting blades.



Figure 8 – PCC Light Corduroy or ribbed pattern made with properly spaced, gang stacked cutting blades.

Grinder Cutting Heads

Another alternative for grooving ONLY newer PCC pavement surfaces in good repair is the use of a grinder-type cutting head (Figure 9).

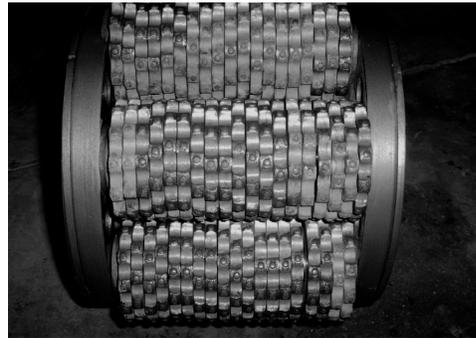


Figure 9 – Grinder Cutting Head

Use of the grinder head shown in Figure 9 results in a groove with an irregular surface texture shown in Figure 10 and 11. This surface texture is often the superior surface for application of liquid pavement markings.



Figure 10- Cross Section Textured Groove Cut with Grinder Head

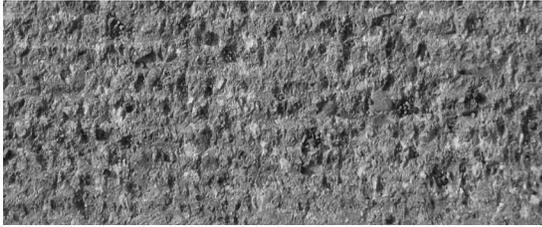


Figure 11 – Textured Groove Surface

Achieving a Textured Surface with Saw Blades

A textured groove surface is a groove bottom surface that has an irregular pattern and does not show the typical ribbed or corduroy pattern common to new grooves cut with saw blades.

Besides using a grinder cutting head as shown in Figure 9, a textured groove surface can also be achieved with the saw blade configuration shown in Figure 4 using the following procedure. The textured surface is achieved by using a slow moving shot blaster, grinder, or sand blaster to knock down the ridges and create the textured surface after cutting the initial groove with the saw blade cutting head. Hydroblasting can also be used, but the groove must be allowed to dry (24-hour minimum) prior to application of the pavement markings.

New concrete surfaces may contain more fine cement dust after cutting. This dust and any cement residue must be removed and blown clean from the groove prior to application of the pavement marking.

Asphalt Cement Concrete (ACC) Surfaces

As with concrete, grooving asphalt surfaces provides some of the same benefits for pavement markings such as reducing the profile to help prevent snow plow damage and providing a "new" exposed surface for adhesion.

Important Note: The use of gang stacked cutting blades is required for asphalt pavement surfaces.

Special Note: Diamond cutting blades produce an optimum groove surface

Existing asphalt surfaces should possess the strength necessary to support the cutting of a groove. Inspect the surface for obvious signs of distress before cutting a groove. Refer to the 3M Road Surface Guide for guidance. Always inspect the groove at start-up for signs of weakness in the channel or at the groove wall. Light scratching in the channel or at the groove wall, light scratching with a pointed object can help to determine the integrity of the cut.

Groove cutting some older asphalt surfaces may result in weak aggregate/asphalt bonds near the surface. The structural integrity of the groove bottom should be checked after grooving and prior to application of pavement markings.

In general, new asphalt shall not be grooved within a minimum 10 days of the placement of the final course of pavement. The asphalt surface must be open to traffic during this period. Asphalt may be too soft within 10 days of placement to support grooving operations, especially during periods of hot weather.

Some asphalt mixes may require as long as 30 days to achieve enough strength to support grooving operations. Perform a field test at a small localized area on new asphalt mixes to verify that proper surface strength has been achieved.

Inlay techniques (rolling tape into fresh hot asphalt) for Stamark tape should be utilized for new asphalt surfaces whenever possible. See 3M Information Folder 5.7 for additional information on inlay techniques.

III. Application Guidelines

The following are specific application guidelines for Stamark tapes in a groove. Review the detailed application instructions in 3M Information Folder 5.7, Pavement Surface Preparation and Application Techniques for 3M™ Stamark™ Tapes, as well as climate and weather recommendations for proper installation and application.

Clean the Groove

Clean the groove completely prior to pavement marking application using an air compressor with at least 185 CFM air flow and 120 PSI air pressure. There should be no more than 50 feet of 3/4-inch ID hose from the compressor to the air nozzle and the air nozzle should be no less than 1/2-inch ID. The compressor should also be equipped with a moisture and oil trap. When cleaning the groove it is recommended that the air nozzle be more than two feet from the ground. A street sweeper or pick-up broom may also be effective, but will require a pass with air compressor to completely clean the bottom of the groove.

Apply the Tape

Apply Stamark tape in the groove following the detailed instructions for "Overlay Applications" in 3M Information Folder 5.7, Pavement Surface Preparation and Application Techniques for 3M™ Stamark™ Tapes.

Tamp the Tape

Tamp the tape thoroughly with a minimum of six (6) passes minimum (three passes back and forth) over the surface of the new tape in the groove. Use a RTC-2 Tamper Cart (contact Century Tool at 763-428-2168) with a 200-pound (90 kg) load.

Tape application in a groove will require tamping with a tamper cart roller cut to fit in the groove. Tamping the edges of the tape is very important. A vehicle tire may tamp the center of the tape but not the tape edges near the edge of the groove. Use a modified tamper cart roller if necessary. (See Figure 11) Modified rollers can be purchased from Century Tool, 763-428-2168. A typical modified roller will have a 4-inch width and a 1/4-inch depth. **Important Note:** Use of a vehicle tire to tamp a long line application of pavement marking tape in a groove is acceptable for waffle pattern tapes (380IES, 270ES, 310, 390, and 380AW). Refer to IF 5.7 for further information.

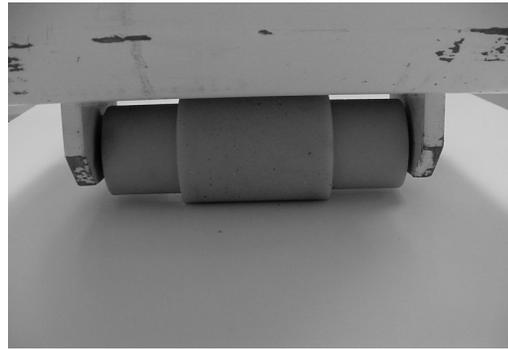


Figure 11 – Tamper cart roller cut for groove tamping

3M Liquid Pavement Markings

Applying Liquid Pavement Markings products properly in a groove provides increased durability and improved long-term retroreflective performance. This method is especially effective to extend the service life of the pavement marking in northern climates where snow removal equipment is used.

Refer to Information Folder 5.20 (Liquid Pavement Markings), 5.22 (All Weather Paint), and 5.24 (All Weather Thermoplastic) for proper surface preparation and application requirements.

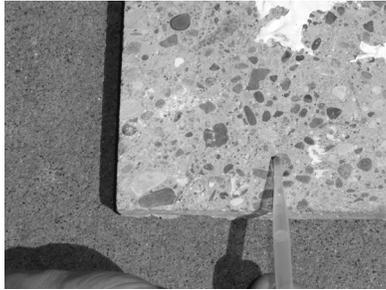
The liquid pavement marking must be placed fully within the groove for successful application and to achieve the full benefit of the groove. A wider groove (up to two inches greater than the marking width) may be needed to allow for the proper placement of the liquid pavement marking into the groove.

IV. Measuring Uniform Groove Depths

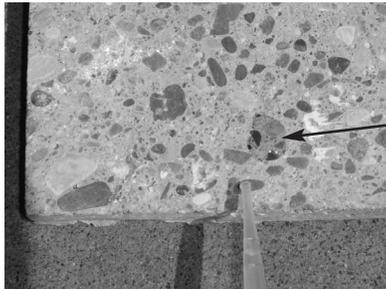
A micrometer or depth gage can be used to verify the uniform depth of new grooves. Another method is the use of depth plate (see Appendix A). Grooves should be checked frequently as a new alignment is cut to make adjustments early in the process. As an example, on a new groove cutting application, check the groove depths at 10-foot intervals for the first 50 feet. Each measurement should be within the tolerance shown in Table A. Calculate an average of the five depths measured – the average should equal the appropriate depth shown in Table A. If the average does not equal the values in the table, make adjustments to the cutting equipment and check the next 50 feet using a similar method. Continue to adjust the equipment until the depth shown in Table A is the average calculated groove depth.

V. Surface Wetting Test

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

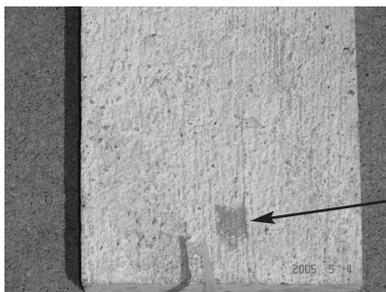


Place a drop of clean drinking or distilled water on the pavement surface.



Water beads on surface

If the drop of water does not spread (but instead forms a bead on surface), the surface may be contaminated, need additional surface preparation or need to be re-cleaned with high pressure air.



Water drop spreads on surface

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

Appendix A

Depth plate 100 mil or the agency's specifications



Drop plate into groove



Check to see if plate fits into groove



Put straight edge across groove over the top of depth plate



Slide plate back and forth to see if groove is at the right depth

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. 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 MSDS search.

FOR INFORMATION OR ASSISTANCE

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Literature References

- PB 270 ES 3M™ Stamark™ Pavement Marking Tape Series 270 ES
- PB 380I ES 3M™ Stamark™ High Performance Tape Series 380I ES
- PB 1000 3M™ Stamark™ Liquid Pavement Marking Series 1000
- PB 1400 All Weather Liquid Pavement Marking Series 1400
- PB 380AW 3M™ Stamark™ High Performance All Weather Tape Series 380AW
- PB 310 3M™ Stamark™ Pavement Marking Tape Series 310
- PB 390 3M™ Stamark™ High Performance Pavement Marking Tape Series 390
- IF 5.7 Pavement Surface Preparation and Application Techniques for 3M™ Stamark™ Tapes
- IF 5.8 Instructions for Precut Symbols and Legends
- IF 5.20 Application Guidelines for Liquid Pavement Markings
- IF 5.22 3M™ All Weather Paint Application Guidelines
- IF 5.24 3M All Weather Thermoplastic application guidelines
- PB AWT All Weather Thermoplastic
- PB AW Dry All Weather Dry Elements
- PB AWE All Weather Elements

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