



Inspector's Reference Guide
For Inverted Profile
Thermoplastic Markings

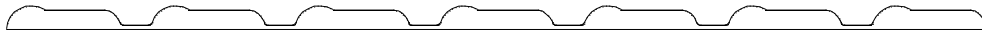
ONE: INTRODUCTION AND OVERVIEW

This manual is intended to help the inspector know what points to look for when examining the application of “Inverted Profile” traffic markings. These markings are a little different from standard thermoplastic markings. Some of the information in this manual was obtained from the American Traffic Safety Services Association (ATSSA) Pavement Marking Inspection Course. This course covers all forms of road markings. If you would like further information about this course, call ATSSA at (877) 642-4637.

Inverted Profile Traffic Marking is an all weather traffic striping system that places inverted profiles into the traffic stripe. The tiny profiles form small ridges in the traffic stripe that will rapidly drain away rain water. This draining happens so quickly that the glass beads do not become covered with water. This allows the beads to continue to reflect light, making the traffic stripe visible during rain storms. An added benefit of the rough surface is an unsurpassed anti-skid surface.

The markings are comprised of a hot applied thermoplastic stripe that receives a double coating of glass beads. The glass beads are imprinted or embossed by a specially designed Profiling Wheel that is rolled over the thermoplastic and beads while they are still hot. This entire application process takes place within 1 second as the inverted profiles are hot formed and the glass beads are pressed to their ideal embedment. Once the stripe has cooled you are left with a traffic stripe that has an irregular surface. This will ensure that water is rapidly drained from the road surface in order to provide a brighter reflection as well as a reduced risk of vehicle hydroplaning.

CROSS SECTION OF IN-PLACE INVERTED PROFILE MARKINGS



TWO: PRE-STRIPING INSPECTION

SUPPLY CHECKLIST

- Measuring Tape or Ruler
- Magnifying Glass (optional)
- Wet Thickness Checker
- Micrometer Type Thickness Gauge (for measuring cold thickness)
- Infrared Heat Gun or Bi-Metal Thermometer
- Air Thermometer
- Yield Chart
- Mirolux 12 Retroreflectometer (optional)
- Contract Documents

SURFACE PREPARATION/CONDITION

Any marking material will fail if dirt, dust, oil, grease, or moisture prohibit bonding between the marking material and the pavement surface. Sweeping and air blasting are usually sufficient to clean relatively new asphalt pavement. Old asphalt pavements, new concrete pavements, and pavements already marked require more extensive surface preparation.

All pavement areas to be striped shall be thoroughly cleaned using equipment capable of cleaning without damaging the surface. This shall include but not be limited to all vegetation, loose soil, oils, and other debris. Striping shall follow as closely as practical after the surface has been cleaned. Make sure that the surface is not excessively scarred during marking removal.

All existing paints and pavement markings, other than a single thin coat of temporary paint, shall be removed before applying Inverted Profile Thermoplastic Traffic Striping.

When striping over existing painted stripe, old bleached asphalt, on all Portland Cement Concrete pavement, and bridge decks or on all surfaces when the ambient temperatures are below 60 degrees F, a primer sealer shall be used and installed as recommended in writing by the thermoplastic material supplier.

ATMOSPHERIC/WEATHER CONDITIONS

For all installations, check the forecast and current weather conditions and make sure they meet or exceed the manufacturer's and/or specification recommendations. As a general rule, Inverted Profile Thermoplastic Traffic Striping should only be applied when the ambient and pavement temperatures exceed 60 degrees. The pavement should be completely dry.

The three ways to check the amount of moisture in the pavement are the plastic-wrap method, the aluminum foil method, and the roofing paper method.

Plastic-Wrap Method

Place a 12-inch by 12-inch section of clear plastic-wrap on the pavement in a sunny spot. Seal the edges of the plastic with tape. Examine the plastic after 15 minutes. If you see any moisture on the inside of the plastic, the surface moisture is too high to apply the marking material.

Aluminum Foil Method

Place a 12-inch by 12-inch section of aluminum foil on the pavement. Seal the edges of the aluminum foil with tape, then heat the top with a torch. Examine the inside of the aluminum foil. If you see moisture, then surface moisture is too high to apply the marking material.

Roofing Paper Method

Place an 18-inch by 18-inch section of roofing paper on the pavement. Next, have the contractor apply heated thermoplastic (420 degrees is recommended) to the paper. After waiting two minutes, check the underside of the paper. If you see any moisture, the humidity is too high for installing thermoplastic.

LOCATING MARKINGS

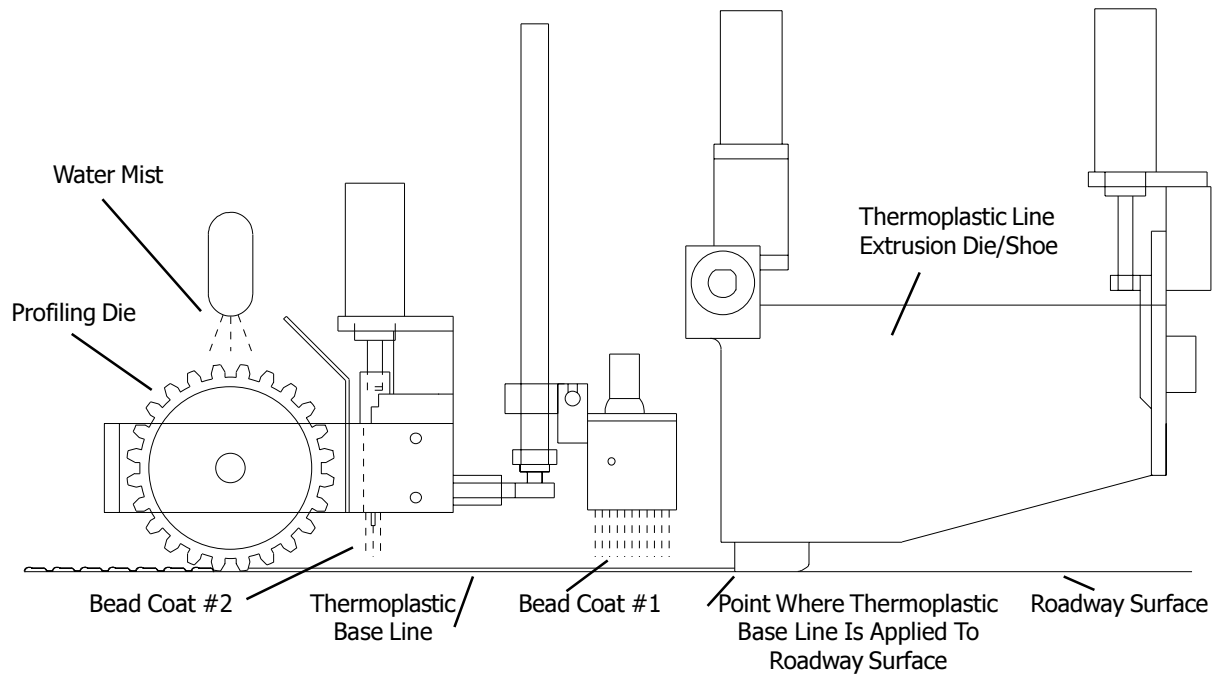
Examine the actual pavement width, etc. as compared to what is shown on the plans. If you find a conflict between the plans and the field conditions, resolve it before proceeding. Actual marking layout should follow standard procedures.

EQUIPMENT

For the most part, the equipment used and maintaining it are the contractor's responsibility. However, on occasion you may have to make a judgement as to whether a piece of equipment is suitable. For example, a handliner may be adequate for some work, but would not be the best choice for twenty miles of solid line.

Inverted Profile Thermoplastic Traffic Marking requires some special equipment. The application equipment consists of a screed shoe die with a moveable gate or door which controls the flow of thermoplastic onto the pavement. The screed shoe die should lay down a base line at the specified line width. Two low pressure glass bead applicator guns shall be utilized. The first bead gun shall be located so that the beads fall no more than 6" behind the point where the thermoplastic material flows onto the pavement. The second glass bead gun shall be located just ahead of the Profiling

Wheel. A Profiling Wheel approximately 7” in diameter shall be located approximately 15-21” behind the thermoplastic applicator. This Profiling Wheel shall be mounted on the same carriage as the extrusion shoe and glass bead guns, and shall be free to move up and down over pavement undulations. All thermoplastic tanks, lines, manifolds and the extrusion shoe itself, should be surrounded by a heated jacket in order to maintain proper application temperature.



MATERIAL ACCEPTANCE

All pavement markings should be approved by the State’s Materials Testing Laboratory before being applied. Some things you should do when on the job-site.

- Record information from each batch of material, including type of material, batch/lot number, color, and weight/quantity.
- Phone in to the testing laboratory for for verification of approval.

Also, test that the beads to be used in the first drop-on coat have the appropriate AC 07 adhesion or equivalent silane coating. This can be tested by dropping some water on a handful of beads. If the beads absorb the water, then the coating is likely to be correct.

The beads for the second drop-on coat standard state specification and should have a moisture-proof coating. Again, this can be tested by dropping some water on a handful of beads. For the moisture-proof coating, the water should bead up and not soak into the beads.

THREE: IN-PROGRESS INSPECTION

The In-Progress Inspection ensures that the contractor is following proper procedure as he applies the markings.

THICKNESS/QUANTITY/YIELD

The proper amount of material is necessary to achieve the specified thickness and width. You should have a yield chart exhibiting the approximate tonnage necessary for a specified length of line. Remember that this yield may vary according to the road surface, so more material should be allotted for rougher or open-graded roads.

A wet thickness checker can be used approximately 50 feet behind the applicator to do a quick check of the thickness. This checker should be dragged along the line in the same direction as the applicator. If the tips extend into the material, then the line is thick enough. It is important to remember that line may settle and/or beads may give a false impression of thickness, so you should perform the cold thickness check after the line dries.

The thickness of the material should be verified at least every 1/4 mile. Areas where the thickness is less than 95% of the required thickness should be reworked. A consistent, uncorrected underrun of less than 100% of the required thickness should not be accepted. The Contractor should adjust the application procedure to achieve a consistent minimum placement of 100% of the required thickness. Lines should be removed before being reworked. Double thickness of Inverted Profile striping should be avoided.

TEMPERATURE

The temperature of the hot molten thermoplastic, as measured with the infrared heat gun or bimetal thermometer, shall be in the range of 400 degrees to 430 degrees Fahrenheit (204-221C). This temperature should be measured after the material comes out of the kettle. Do not rely on thermometers posted on the outside of heating kettles. These thermometers do not always give accurate readings for the entire kettle.

STRAIGHTNESS AND ALIGNMENT

Check the alignment of the marking visually throughout the day. Straight lines should always look straight; curved lines should always look smoothly curved.

WIDTH

Measure the line width across the stripe at the bottom of the Inverted Profile.

If the specified line width is 4", the line width should be between 3 7/8" to 4 1/4"
6", the line width should be between 5 7/8" to 6 1/4"
8", the line width should be between 7 7/8" to 8 1/4"

BEAD EMBEDMENT

50% of the glass beads should be embedded to approximately 60% of their diameter to insure proper adherence to the thermoplastic marking material and provide maximum initial retroreflectivity. Shallow embedment allows the beads to debond, and deeper embedment reduces retroreflectivity. After sweeping the line clean of excess beads use a magnifying glass to view bead embedment.

WORKMANSHIP/APPEARANCE

While this relies much on personal judgement, there are several areas that you can objectively require corrections to.

- Make sure that the colors are consistent. When the Contractor changes from one color to another, make sure the applicator is cleaned out and the new material is the proper color before allowing him to begin.
- There should not be smooth places in the line. The Inverted Profile should be consistent.
- There should not be excessive drips or tracking, especially between skip lines.

COMMON PROBLEMS

- Smooth places in the line – There are two primary causes for this problem. The first thing to look for is rocks or debris left on the road. When the applicator runs over these, it causes the Profiling Wheel to jump into the air, leaving a section of the stripe unprofiled. The second area to examine is the speed of the applicator. If it is going too fast for the road surface, it may cause the Profiling Wheel to bump up and down, leaving smooth places.
- Material sinking into the road way – Check the material temperature. Often, when thermoplastic material is overheated it will become less viscous and run down into small cracks. When Inverted Profile material is at the proper temperature, it should be a little stiff and not run except under pressure.
- Line is a sort of caramel color – Make sure the tanks and application equipment are thoroughly cleaned when the Contractor changes colors from yellow to white.
- Excessive dripping – Check the material temperature. It is probably overheated.
- Material is not bonding properly – Check the material temperature. It is probably too cool. If the material is not heated to the proper temperature (usually 400 degrees), then it may not bond completely with the asphalt.
- Gas bubbles in the line – Often moisture or a solvent (such as undried sealer) is trapped underneath the line, or the material may be overheated.
- Cars are making tracks in the line – The Contractor is not keeping traffic off the new stripe long enough. The last vehicle in the caravan may need to stay further back, to give the stripe at least five minutes to cure before traffic crosses it.

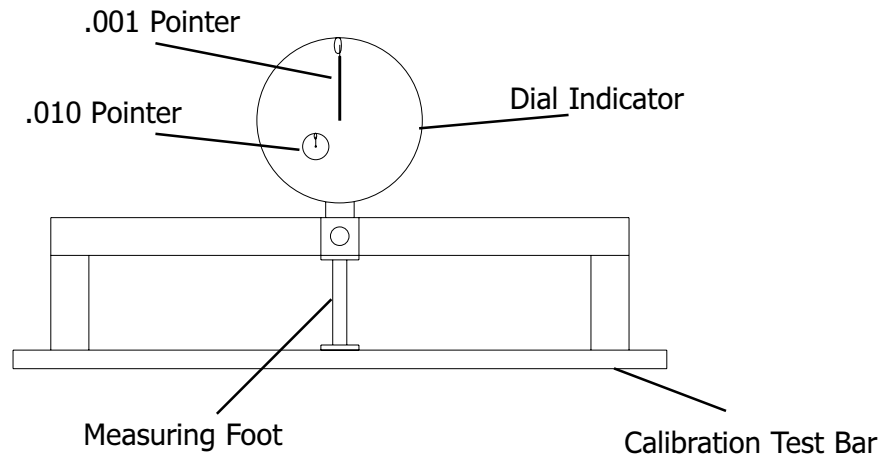
FOUR: POST-STRIPING INSPECTION

LINE SELECTION PROCEDURE

Throughout the project you should select periodic random inspection stations. Measurements of line thickness, width, apparent bond strength and retroreflectivity should be taken. In a given 3 foot section, several reflectance and thickness readings should be taken and averaged to yield net readings.

COLD THICKNESS CHECK

Once the in-place line has had time to cure (approximately 5 minutes) and been swept free of excess beads, line thickness can be checked with a micrometer type thickness gauge. First, zero the gauge by placing on a perfectly flat surface (this does not include the hood of a car). Twist the knob on top of the dial indicator until it shows zero. Lock into place by tightening the knob on the side. To measure the line, place the gauge over the stripe so that the two base points rest on flat road surface on either side of the stripe. The measuring foot of the micrometer should rest on the highest point of the stripe. The line thickness can then be read on the dial indicator. Two to three readings should be taken and averaged to ensure accuracy.



BONDING

On asphalt, bond can be checked with a knife or screwdriver while the material is still pliable. If the material is properly bonded it should bring up some asphalt with it.

On concrete, pavements, strike the material with a glancing blow with a hammer. If part of the thermoplastic remains bonded to the pavement, the bonding strength is good. The thermoplastic will shatter if the bonding strength is unacceptable.

REFLECTIVITY (optional)

The initial reflectance for the in-place marking shall have the minimum reflectance values shown as follows, as obtained with a Mirolux 12 Retroreflectometer.

Dry Night	White—450 mcd/lux/m ^s	Yellow—300 mcd/lux/m ^s
Wet Night	White—200 mcd/lux/m ^s	Yellow—175 mcd/lux/m ^s

Wet Night Test Procedure— Mark or delineate a three foot long section of pavement marking to be tested. Utilizing a pump type garden sprayer, wet the test section for 5 seconds with water so that the pavement marking is thoroughly wet. Wait 30 seconds after wetting the stripe and place the Mirolux 12 Retroreflectometer on the previously wet test section.