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**DIVISION 12
PAVEMENT MARKINGS, MARKERS, AND DELINEATION**

**SECTION 1205
PAVEMENT MARKING GENERAL REQUIREMENTS**

1205-2 MATERIALS

Furnish the following pavement marking material certifications in accordance with Article 106-3:

Glass Beads (for paint)	Type 3 Material Certification
Glass Beads (for thermoplastic and polyurea)	Type 3 and Type 4 Material Certification
Paint	Type 3 Material Certification
Removable Tape	Type 3 Material Certification
Thermoplastic	Type 3 and Type 4 Material Certification
Polyurea	Type 3 Material Certification
Cold Applied Plastic	Type 2 and Type 3 Material Certification

(C) PERFORMANCE

Any questions concerning the historical performance and approval status of a pavement marking material should be directed to Signing and Delineation at (919) 773-2800.

1205-3 CONSTRUCTION METHODS

Definitions:

Premarking (could also be referred to as layout by some Contractors):

Small paint spots used by striping Contractors to establish locations of pavement markings (i.e., lane widths, stop bar locations, arrow locations, etc.) are also used to guide the striping equipment for alignment. This is not a pay item, but is a requirement for proper installation of all pavement markings. Premarking must be inspected and approved prior to the installation of pavement markings.

Interim paint:

A thin layer of pavement marking paint applied at the striping Contractor's option, in lieu of durable pavement markings to comply with time limitations for placement of pavement markings or to prevent exposure of durable markings to ongoing construction traffic (i.e., tack trucks and tack from dump trucks). The width of the interim marking shall be no more than 1/4" less than the specified line width. Interim marking should be overlaid with the durable marking within 30 days. However, if interim marking is placed on concrete, remove 100% of the paint prior to placing polyurea. When interim paint marking is placed on concrete, such as diamond grinding projects, a pay item should be included for the paint marking.

Pavement marking lines, paint:

- A. Temporary paint markings - Used on construction projects for detours, lane shifts, and lifts of asphalt other than the final pavement surface. Used on resurfacing projects on milled surfaces and lifts of asphalt other than the final pavement surface. When placing two applications, pay for each application.
- B. Permanent paint markings - Used on construction projects and resurfacing projects when durable markings are not used. (Generally on -Y-lines and secondary roads.) When placing two applications, pay for each application.

(A) TESTING PROCEDURES

Any questions regarding Inspection Procedure PM-1.0 shall be directed to the Signing and Delineation Unit, Garner, North Carolina at (919)-773-2800. (See inspection procedure at the end of this section.)

(B) APPLICATION EQUIPMENT

(1) Testing Procedures

Refer to the pavement marking inspection procedure herein for a troubleshooting guide for all types of pavement markings.

(2) Glass Bead Dispensing Equipment

Placing Drop-On beads on long-line pavement marking **shall not** be done by gravitational methods or dropping by hand. Bead dispensing by gravitational methods or dropping by hand is **acceptable** on pavement marking **messages, word symbols**, and when using hand-liners.

Bead dispensing by a straight mechanical feed may result in lower retro-reflectivity readings than if a pressurized mechanical feed system is used. Bead installation inspection should be performed as the beads are being placed.

(C) WEATHER LIMITATIONS AND SEASONAL LIMITATIONS FOR ALL MARKINGS

All pavement marking materials can be affected by adverse climatic conditions. As favorable weather conditions deteriorate be prepared to stop pavement marking operations. You might consider using temporary raised markers with an epoxy adhesive in lieu of paint or tape when you are trying to place markings near the seasonal limitations. Contact the Signing and Delineation Unit for guidance with acceptable alternatives.

(D) TIME LIMITATIONS FOR PLACEMENT AND REPLACEMENT

For any critical paving operation, such as a tie-in, adequate time should be provided during each work period for the placement of pavement markings. Place temporary paint to achieve time limitations when the final pavement markings cannot be placed.

(E) PREMARKING / INTERIM / TEMPORARY MARKINGS

A good resource for assistance with pavement marking or premarking is the Traffic Services Supervisor or the Paint Crew Leader, especially for passing and no passing zones on two-lane roadways.

If the pavement marking design does not match the field conditions, contact the Division Traffic Engineer and the Signing and Delineation Unit.

The Contractor shall reference the existing markings prior to the markings being obliterated and make that information available to the Engineer. Special attention should be placed on retracing operations when dealing with multi-lane roads or roads with widening on one or both sides. A videotape of the area is a good way to record the existing pavement markings.

Every line should be premarked to establish proper lane widths and locations.

(F) SURFACE PREPARATION AND CURING COMPOUND REMOVAL

Clean all surfaces in accordance with the Specifications. Any type of curing compound needs to be removed two inches wider than the line that is to be placed. Acceptable methods of curing compound removal include grinding and high-pressure water blasting.

Curing compound should be removed when installing temporary paint for patterns that will be in place more than 90 days.

Curing compound is not typically used on bridge decks. However, the bridge deck will have surface laitance and residue that will need to be removed prior to placing the final markings. This is especially important for polyurea. If the surface residue or laitance is not removed, the pavement marking, especially polyurea, will pull the surface laitance from the bridge deck and the marking will debond. Many bridge decks are mechanically grooved, which may require water blasting to ensure all essential surface laitance is removed for the markings to properly bond. This is incidental to the cost of the markings and should not be paid for with the curing compound removal pay item.

The Department does not typically use thermoplastic on concrete. However, there are occasions on short bridge projects thermoplastic is striped across the concrete bridge deck. If this situation occurs, ensure primer sealer is placed prior to installing the thermoplastic markings.

(H) OBSERVATION PERIOD

It is extremely important the Contractor and Inspector perform in-place inspection as the marking is being applied instead of waiting until all of the marking has been placed. Ideally, the inspection should be done in the first few hundred feet and routinely throughout the operation of each day's placement to detect any problems early. This inspection will greatly reduce problems that arise after improper placement of pavement markings. The mil thickness of liquid materials such as polyurea, epoxy and paint can affect the retro-reflectivity and can be challenging to inspect. This must be inspected while the material is wet and as the material is sprayed, but prior to the installation of beads. A flat piece of metal should be placed between the material and bead guns and quickly removed after the material gun passes over it. Then, using a wet film thickness gauge, check the mil thickness. If the material is too thin, it could still meet the 30-day retro-reflectivity, but will fall fast and not provide the expected life-cycle since there is not enough binder material to hold the beads. On the other hand, if the liquid material is too thick, it could have below minimum retro-reflectivity but will increase over time and be the better line. It is always better to have the material too thick than too thin.

If you are having problems with compliance of the initial readings, thickness and/or retro-reflectivity, contact the Signing and Delineation Unit. **Night inspections should be made during the 30 day application review to note any problems.**

Most markings, especially thermoplastic, reflectivity readings will increase within a few weeks. On the day of application, take reflectivity measurements after the marking has completely cured and the thermoplastic has completely cooled. As the thermoplastic cools the color will change and the readings will increase.

Historical data tells us if there is going to be a problem with retro-reflectivity, it will typically occur within 30 days of placement. Checking the retro-reflectivity and bond during this time allows us to make sure the product will provide good service life. The retro-reflectivity may be checked for trouble shooting the same day the line is installed. However, the optimum time to check this requirement is between 15 and 30 days of final marking placement. If it is not possible to check the retro-reflectivity using an approved hand held device, contact the Signing and Delineation Unit for the mobile retro-reflectivity device. The Signing and Delineation Unit should be contacted at least thirty days prior to the marking being placed.

INSPECTION

When checking the retro-reflectivity, there may be a section(s) of a line that does not meet the minimum retro-reflectivity requirements. A section of line is defined as 1000' of marking. If using a hand held device, take six readings within a 10' area every 500' and average the numbers to get the 500' retro-reflectivity average. Go another 500' and repeat the process. Once you have taken readings in the 1000' section, average those readings together and that is your average for the 1000' section.

If a mobile retro-reflectivity device is used, the readings will come from the Signing and Delineation Unit. These readings are automatically averaged every tenth of a mile. However, the same inspection applies to the mobile readings as described above.

If it is determined the marking has attained the minimum 30-day retro-reflectometer readings, the material has bonded correctly and workmanship is satisfactory, go ahead and pay full payment. However, continue to watch for debonding and discoloration within the 12 month observation period.

ASSESSING DAMAGES

Section 105-3 applies to all pavement marking, but use the guide below to make the determination of acceptable damages and for statewide consistency. If any section of a line has not attained the minimum 30-day retroreflectometer readings within 30 days of acceptance see the following:

NOTE: The pavement marking contractors are not responsible for situations such as snowplows and tracking of asphalt on the markings that could result in debonding or lowering the retro-reflectivity.

- **Level 1: Retroreflectivity is between 375 and 350 for white and 250 and 225 for yellow**, you may contact the Area Roadway Construction Engineer for assistance in determining if the marking may have future retroreflectivity and debonding issues. If no problem is identified, you may go ahead and pay full payment. Evaluate the marking again prior to the end of the 12 month observation period for debonding and discoloration.
- **Level 2: Retroreflectivity is between 349 and 325 for white and 224 and 200 for yellow**, contact the Signing and Delineation Unit and Area Roadway Construction Engineer for assistance in determining if the marking may have future retro-reflectivity and debonding issues. If it is determined the marking can provide an adequate service life, take a 10% pay reduction for the failing section(s). Evaluate the marking prior to the end of the 12 month observation period for debonding and discoloration.
- **Level 3: Retroreflectivity is between 324 and 305 for white and 199 and 180 for yellow**, contact the Signing and Delineation Unit and Area Roadway Construction Engineer for assistance in determining the cause of the low retro-reflectivity and determining if the marking may have future retro-reflectivity and debonding issues. If it is determined the marking can provide an adequate service life, take a 25% reduction for the failing section(s). However, if it is determined the line cannot provide any acceptable service life, it may be required to remove and replace the section(s) of marking. This will be a collective decision between the Division, Signing and Delineation Unit and the Construction Unit (Area Roadway Construction Engineer.)

Workmanship or visual quality of a line may also justify a price reduction in addition to poor retroreflectivity. This could be due to lateral deviation of the long-line, messy work, removing markings that are not in the correct location and damaging the roadway, etc. Determining the quality of the workmanship is more subjective than retro-reflectivity or bonding issues. Typically, a price reduction of 5% to 10% is taken due to poor workmanship for a segment(s) of line or characters/symbols. All workmanship reductions/removals should be discussed collectively by the Division, Signing and Delineation Unit and Construction Unit (Area Roadway Construction Engineer.) The Area Roadway Engineer will communicate the Department's final decision to the Resident Engineer by letter.

HIGHLY REFLECTIVE MARKING

The same process, evaluation and price reductions apply to markings with highly reflective elements as to marking that is applied with standard beads as described above. The following retro-reflectivity ranges will be used in determining price reductions as in the three levels described above.

Level 1: White 800 to 750 Yellow 500 to 450

Level 2: White 749 to 700 Yellow 449 to 400

Level 3: White 699 to 650 Yellow 399 to 350

(I) REMOVAL OF PAVEMENT MARKINGS

Pavement markings must be removed by acceptable methods that will not materially or structurally damage the surface of the pavement. General industry practices for removal of marking includes mechanical grinding, high pressure water blasting, and recoverable shot blasting. All these methods will practically have some effect on the pavement. The goal of line removal is an adequate removal with minimal surface affect. For asphalt pavements, any of these methods may be acceptable. However, high pressure water blasting on asphalt, especially new asphalt, will remove the surface AC content and fines in the final layer of surface course. When removing markings where the new markings will be placed in the same location, shot blasting or grinding may be the better option. Recoverable shot blasting creates the least amount of debris and possibly the least amount of damage to the pavement, but is more difficult to remove durable markings.

When temporary pavement marking lines are to be removed from concrete pavement, water blasting or grinding is the preferred method. Mechanical grinding is not an acceptable method of pavement marking removal on concrete pavements when the marking to be removed is not in the final location. This usually happens during construction containing temporary traffic shifts. When this occurs, high pressure water blasting is the only acceptable method.

ALL DEBRIS CREATED BY LINE REMOVAL MUST BE VACUUMED AND REMOVED FOR PROPER DISPOSAL. There is a possibility that the material removed may be hazardous to the environment if it is not properly removed (as of 10/1/08 yellow thermo is the material which could pose an environmental hazard.) When determining the method of line removal, consider the time required for cleanup (drying, sweeping, vacuuming) if traffic must be maintained.

When removing temporary or existing lines, reference 1205-3 (G) of the 2006 Standard Specifications for guidance.

Remove 100% of existing marking prior to placing polyurea for restriping projects. If polyurea is to be placed on existing polyurea, ensure the existing material is properly bonded and there are no areas that contain loose material. Many times temporary paint or premarking must be installed before the polyurea on new projects. When temporary marking is installed on concrete, 100% of the temporary marking must be removed before placing polyurea. When temporary paint is installed on asphalt, polyurea can be placed without removing the temporary paint line as long as no more than 5 to 8 mils of paint with 1 to 3 pounds of beads per gallon of paint are installed.

Cold Applied Tapes have the same marking removal and surface preparation requirements as polyurea described above.

Grinding on any pavement scars the pavement surface such that another line is created which may be visible at night and can be confusing to traffic. Take special care not to excessively scar the pavement when removing pavement markings. If a portion of the marking remains after removal on asphalt pavement surfaces and it is enough to mislead traffic, you can use flat black paint to cover it. Refer to Article 1205-3(I) of the Specifications for more details. Contact the Signing and Delineation Unit if you have any questions concerning removal of pavement markings.

Removal of temporary tape is incidental to the pay item.

Methods for removal of pavement marking lines should be addressed in the contract and discussed at the preconstruction conference.

In many purchase order pavement marking contracts, removal of lines is incidental to various pavement marking pay items in the contract. However, it is still important the means of removal is identified in the contract.

(J) PAVEMENT MARKING INSTALLER QUALIFICATIONS

Ask for a NC Pavement Marking Certification from at least one person working on the truck of each crew. If you have questions about contractors and/or the certified personnel in their company, contact the Signing and Delineation Unit or go to our website at:

<http://www.ncdot.org/doh/preconstruct/wztc/>

1205-4 THERMOPLASTIC (Alkyd/Maleic)

(A) APPLICATION EQUIPMENT

In cool weather, the temperature of the material when it hits the pavement is critical. The temperature measurement for thermoplastic should be taken at the “shoe” or right after it has hit the ground and not in the melting kettle. It is hard to maintain the temperature in secondary kettles, such as pushcarts, particularly in colder weather.

When extrusion equipment is used, the extrusion “shoe” should be checked regularly for wear. The more worn the shoe, the thinner the casters which results in a thinner line extruded.

(B) WEATHER LIMITATIONS AND SEASONAL LIMITATIONS

There are seasonal limitations for the placement of thermoplastic based on regions of the state. Do not waive these restrictions without consulting the Signing and Delineation Unit.

(C) APPLICATION

The Contractor has the option to place a thin layer (approximately 5 to 8 mils) of interim pavement marking paint with glass beads (approximately 1 to 3 pounds per gallon of paint) prior to applying the thermoplastic markings. If the Contractor elects to do this, they will **not** be compensated. The Contractor must cover the thin layer of pavement marking with Thermoplastic Pavement Marking within 30 days.

1205-5 POLYUREA

(A) WEATHER LIMITATIONS

Apply polyurea pavement marking only when the ambient air and pavement surface temperatures are 40°F or above.

(B) APPLICATION

The equipment shall be certified by the manufacturer as suitable for the application of polyurea and reflective media. The striping equipment shall bear a decal identifying it as manufacturer certified. Application equipment is a mobile, truck mounted and self-contained pavement marking machine specifically designed to apply multi-component liquid material and reflective elements. The guns can deliver approximately 1.5 to 3 gallons per minute to accommodate application speeds of 6 to 8 miles per hour.

Wait a minimum of 15 days before applying polyurea on new asphalt. The reason for the waiting period is the new asphalt's oils may seep through the polyurea causing it to become darker and discolored. If traffic must be maintained on the roadway during the 15 day waiting period, place a thin layer of paint. There is no compensation for this paint. The rate of application for the paint should not exceed 8 gal./mile (5-8 mils) for a continuous 4" line. Use beads at a rate of 2 lbs/mile (1-3 lbs/gal of paint) for reflectivity. Place polyurea pavement markings within 30 days.

When placing polyurea on new concrete pavement, all curing compound and surface laitance **MUST** be removed. Polyurea pavement marking lines shall have a minimum dry thickness of 20 mils (25 mils wet) when placed on concrete or asphalt pavements.

1205-6 COLD APPLIED PLASTIC

(A) APPLICATION EQUIPMENT

There are three basic types of equipment required to install cold applied plastic: the primer cart, the applicator cart, and the tamper cart.

Proper weight on the tamping machine is an important part of the adhesion process. The tamper cart should be used as the primary method of adhering tape to the roadway. The use of a truck tire for tamping is acceptable but only after the cold applied plastic has been properly tamped with the tamper cart. When vehicle tamping is used, do not turn the wheel of the vehicle when the tire is on the cold applied plastic.

(B) TYPES OF COLD APPLIED PLASTIC

Type 4 (Removable Tape) should last a minimum of 6 months. If temporary tape is used and comes up within 6 months, the Contractor shall replace the tape at their expense.

1205-7 HEATED-IN-PLACE THERMOPLASTIC

(A) APPLICATION EQUIPMENT

Proper heating temperatures, duration of heat application, and clean/dry surfaces are critical to obtaining proper bond of heated-in-place thermoplastic to the roadway.

1205-8 PAINT

(A) APPLICATION EQUIPMENT

The main determining factor of paint thickness is the speed of the paint truck. Generally, a speed of 10-12 miles per hour will result in a paint thickness of 15 to 18 mils wet film thickness (without beads). Speeds in excess of 12 miles per hour may not produce 15 mils wet film thickness.

(C) APPLICATION

Thickness is very important when placing paint. Paint should be a minimum of 15 to 18 mils thick wet per application for long term markings. Inspection of paint application is critical. Wet thickness gauges are available from the Materials and Tests Chemical Lab.

Final wearing surfaces need two applications of 15 to 18 mils wet thickness of paint. A good rule of thumb is 16 gallons of paint per mile for a 4" solid line. The second application is needed to compensate for paint that is absorbed into the pavement during the first application.

When applying paint for temporary traffic patterns, the line shall be full width and meet the reflectivity requirements in Section 1205-8 of the Standard Specifications. If the traffic will be left in a pattern for longer than six months, apply a second application of paint equal to the first. Repeat this procedure every six months. Each layer of paint shall meet the retro-reflectivity requirements of the Standard Specifications.

1205-9 MAINTENANCE

For existing and intermediate pavement markings, retro-reflectivity and the amount of material on the surface are the criteria for maintenance of pavement markings. If the retro-reflectivity readings are below 150 mcd/lux/m² or there is less than 75%+/- of the pavement marking left on the pavement in any one given area, the pavement needs to be remarked. The Contractor should be compensated for remarking the existing or intermediate pavement markings for maintenance reasons. As a general rule, temporary paint should last 6 to 9 months if placed according to Specifications. If you are not sure if marking **requires maintenance**, contact the Division Traffic Engineer, Area Traffic Engineer, and/or the Signing and Delineation Unit.

There are times when projects will extend into the winter season and the pavement marking contractor will not have an opportunity to place final markings. Winterize the project by placing an application of marking (typically paint) to last the entire winter season or until the final markings are installed and payment should be made to the contractor. However, no payment will be made to the contractor on resurfacing projects where paving is completed more than 30 days prior to the written notification by the Engineer that winterization is required.

**SECTION 1250
PAVEMENT MARKERS GENERAL REQUIREMENTS**

1250-2 MATERIALS

A Type 2 certification is required for all pavement markers.

1250-3 CONSTRUCTION METHODS

Most pavement marking plans do not show the location of permanent pavement markers. The marker placement is based on the pavement marking lines placed. Most pavement marking plans refer to the Roadway Standard Drawings for pavement markers because markers are easier to place after the lines have been placed.

(A) WEATHER LIMITATIONS

There is a test that can be performed on the pavement to determine if there is moisture present. Refer to the pavement marking inspection procedure located herein.

(C) REMOVAL OF EXISTING PAVEMENT MARKERS

While it is preferable to remove the entire marker, during a traffic shift when time is short and there is not sufficient time to properly remove the entire snowplowable marker, the lenses should be removed and the iron casting left in place.

Taping over lenses is not acceptable.

A pry bar can be used to pry the lens out of the iron casting.

A motorgrader blade can be used to remove stick-on and cast iron markers.

(D) INSTALLATION

(2) Color

For raised pavement markers the marker housing color should match the pavement marking it supplements.

(3) Appearance

There should be no adhesive on the reflective lens of the marker.

(4) Spacing

When replacing existing snowplowable markers with stick-on markers and the snowplowable markers are not removed (especially in purchase order contracts), the new stick-on markers should be placed directly in front of the existing snowplowable marker. Avoid joints and/or surface defects by adjusting marker spacing longitudinally up to one foot in either direction.

SECTION 1251 RAISED PAVEMENT MARKERS

1251-3 CONSTRUCTION METHODS

Raised pavement markers are measures used as positioning guides, pavement marking supplements, or substitutes for other types of marking. They may also be used to supplement solid lines, skips, mini-skips, edgelines, channelized islands, or approaches to an obstruction.

If the Signing and Delineation Unit has used raised markers to substitute for pavement markings, the design is based on the MUTCD and should be included in the Traffic Control Plan. If you think substituting raised markers for pavement markings will work on your project, and this is not shown in the traffic control plan, contact the Signing and Delineation Unit for guidance.

Adhere to all provisions of Articles 1250-3 and 1081-7. In order to ensure a proper waterproof seal, the bituminous adhesive should extend at least 1/2 inch beyond the reflective pavement marker with particular attention paid to each corner. However, if the adhesive pool is too large, the marker will be prematurely covered with the adhesive.

1251-4 MAINTENANCE

The raised markers that do not reflect at night should be replaced.

When any three consecutive markers out of seven are missing, crushed, or non-reflective in at least three sections of roadway, the reflective markers should be replaced. If 20% of all markers are missing, crushed, or non-reflective, the markers should be replaced.

If necessary, markers should be replaced throughout the life of the project. The Contractor should be paid for replacement of markers for maintenance purposes.

SECTION 1253 SNOWPLOWABLE PAVEMENT MARKERS

1253-3 CONSTRUCTION METHODS

(A) GENERAL

Be sure to observe the epoxy mixing process. If the epoxy is mixed by hand, never mix more epoxy than can be placed in 15 minutes or less because it will harden too fast. **Make sure to clean the pavement after cutting the slots.** After placing the epoxy, test the hardness with a sharp object. If after 30 minutes an indentation can be made in the adhesive, you may have a problem with the epoxy. Test the marker by prying up with a screwdriver or pry bar. Often the epoxy under the marker did not set. Use caution on super-elevated curves (0.06 and up) because the epoxy tends to run to the low side.

Snowplowable markers should not be placed on bridge decks. A general rule to follow is: If the bridge is less than 200 feet long, delete the markers, if the bridge is over 200 feet long, use permanent raised markers instead.

(B) REFLECTOR REPLACEMENT

If the new marker is damaged prior to final acceptance, the Contractor shall replace it at no cost to the Department.

If traffic is in an intermediate pattern and snowplowable markers are in conflict, the snowplowable marker must be removed. Taping or painting over the reflector lens is not acceptable. The snowplowable marker must be removed or the lenses must be removed. There is no direct payment for this work as it is considered incidental to the other pay items for marking the intermediate pattern (Article 1250-3(C)).

SECTION 1264 OBJECT MARKERS

1264-3 CONSTRUCTION METHODS

Any time a road is blocked with an earth berm, guardrail, etc., the end of road markers should be used. This should be done even if the end-of-road markers are not shown in the traffic control plan. If you are unsure about using end of road markers, contact the Division Traffic Engineer or the Signing and Delineation Unit.

SECTION 1266 TUBULAR MARKERS (FIXED)

1266-4 MAINTENANCE

It is important to replace tubular markers using the replacement parameters listed in the Specifications. Tubular markers that are still in place may need to be replaced if the sheeting is worn or damaged.

SECTION 1267 FLEXIBLE DELINEATORS

1267-3 CONSTRUCTION METHODS

Flexible delineators are only used at interchanges of multi-lane divided facilities. Refer to Standard Drawings 1267.02 and 1267.03 for spacing and location.

Contact the Signing and Delineation Unit for information about approved products for roadside delineation.

INSPECTION OF IN-PLACE PAVEMENT MARKING MATERIALS

OVERVIEW

The key to quality pavement markings lies in proper installation. To assure quality installation, proper inspection procedures are essential. Many variables exist which affect the installation process; some of these are elements which occur naturally such as pavement moisture, ambient and pavement temperature and wind. Others are materials-oriented, such as the size and shape of glass beads, the color of the striping material and installation equipment. However, being present at the time of installation is probably the most essential part of pavement marking quality control. This alone can prevent the Contractor from installing inferior material or using improper equipment to install the markings. In addition, planning ahead plays an important role because the type of facility as well as type of material will dictate the necessary traffic control measures needed to place the material.

DOCUMENTATION

Before any pavement marking activity begins, the Contractor shall provide the proper paperwork to the Resident Engineer. Most pavement marking materials require a Type 3 and Type 4 certification. A **Type 3** certification is a certified statement from the material manufacturer that the material arriving on the job has been inspected by the manufacturer during production. A **Type 4** certification is a certified test report from an independent testing laboratory on samples of the same material actually shipped to the project. These certifications shall be provided to the Resident by the Contractor **before** work begins. Before and during striping operations, the Technician should document all testing results and weather conditions, as well as problems with retro-reflectivity or low quality placement, etc., as directed by the initial pavement marking inspection report form.

PURPOSE

To provide NCDOT Personnel a procedure for insuring compliance with various items in the contract for in-place Alkyd/Maleic Thermoplastic, Polyurea, Cold Applied Plastic and Paint Pavement Marking as listed below.

Resident Engineers may obtain assistance in verifying deficiencies and determining compliance with the contract special provisions by contacting the Signing and Delineation Unit at (919) 773-2800.

PRE-INSTALLATION INSPECTION PROCEDURES

I. Check pavement for moisture

Asphalt or Concrete:

Using "Saran Wrap" or any other clear plastic wrap, place a 12" X 12" square of plastic wrap on the asphalt and, using duct tape, attach it to the surface of the pavement in a sunny spot. Let stand approximately 3 to 5 minutes and check for moisture bubbles on the inside surface of the plastic. If the moisture bubbles on the plastic are larger than the eraser end of

a #2 pencil, then the pavement contains too much excess water. Notify the Contractor of this condition and postpone all marking operations until the pavement is dry enough to prevent the large moisture bubbles from forming on the plastic.

Asphalt (Thermoplastic Applications Only):

Using roofing felt paper, place a 12" X 12" square of felt on the asphalt and install the thermoplastic material directly onto the felt paper. Let it sit for approximately 10 seconds to cool and then lift the paper to check for moisture on the backside. If moisture is present and is larger than the eraser end of a #2 pencil, then the pavement contains too much excess water. Notify the Contractor of this condition and postpone all marking operations until the pavement is dry enough to prevent the large moisture bubbles from forming on the back of the felt paper.

II. Office and Field Calibration of the LTL 2000 retro-reflectometer:

Office Calibration:

Switch the power on by pressing and holding the <ON> button. Two steps are required for a complete calibration, *zero* calibration and *reference* calibration. Both steps must be completed in the proper order for a successful calibration.

- (1) For zero calibration, mount the instrument in the base frame. Make sure that the base frame is clean particularly in the light trap. Make sure that there is no calibration block in the base frame. While pressing and holding down the <2'nd> button, press the <ZERO> button once, then release the <2'nd> button. Press the <ENTER> button. Zero calibration will take approximately 3 seconds.
- (2) For **reference calibration**, press the <CALIB> button. Press the <ENTER> button. Look at the RI value on the office block (black block) and remember what it is. With the white ceramic panel facing towards the built-in printer, place the office calibration block on the square marked *Calibration Position*. Close door. Press the <ENTER> button. The calibration will take approximately 3 seconds. If the RL normal value on the LCD and the RI value marked on the block are equal, then press <ENTER>. If the RI normal value on the LCD and the RI value on the block are different, use the <↑↓> buttons to change the RI normal value on the LCD to match the RI value marked on the office block, then press <ENTER> button. Remember, **never** take the office block to the field.

Office calibration of the LTL 2000 is now complete. Check the calibration before removing the block. This is done by pressing the <RL> button. The value measured should match the value marked on the block. If it does not, repeat the calibration and check again. Remove the office calibration block and store it properly. Take measurement again. The value should be zero (± 1). Insert the field block (orange block) and take an RI reading. Write the value on the back of the field block. This is the value to be used when calibrating the LTL in the field.

Field Calibration:

Repeat the steps for the office calibration but use the field block (red block) only.

INSTALLATION INSPECTION PROCEDURES

GENERAL PROCEDURE

At the beginning of the striping operation, once the color has been checked, instruct the Contractor to install approximately 10 to 15 feet of marking with the drop-on beads and stop. Make sure the marking is fully dried/cooled. Next, brush off all the excess glass beads and check the retro-reflectivity of this line by taking 6 readings along this portion of the line and average them together for a combined result. If this value meets the minimum requirements of 375 mcd/lux/m² for white or 250 mcd/lux/m² for yellow, then allow the Contractor to continue.

PROCEDURE-GENERAL

BEADS - Glass beads should be embedded to approximately 60% of their diameter to insure proper adherence to thermoplastic marking material and provide maximum initial retro-reflectivity. Epoxy material requires less embedment depth. Shallow embedment allows the beads to debond and deep embedment reduces retro-reflectivity. Use A-6 to view bead embedment.

BONDING - The thermoplastic material should be embedded into the asphalt pavement to be properly bonded. This 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. When completely cured it should be almost impossible to get a knife or screwdriver blade between the marking and the roadway.

LINE SELECTION PROCEDURE

B-1 For inspecting the pavement marking, at least three portions of the project should be inspected. The portions that should be inspected are the beginning, middle and end of the project. This should give a good representation of the retro-reflectivity, thickness, width and color for the project. Choose a section in the beginning, middle and end of each line of the project and take 6 measurements of retro-reflectivity. Average each section and complete the inspection form. If the readings are below the minimum retro-reflectivity, then take readings for each 1000-foot interval. Pick a random station and measure the retro-reflectivity in a 10 foot \pm area along the line.

THICKNESS MEASUREMENT PROCEDURE

B-2 Place the Taper Thickness Gauge on either side of the line to be measured and measure at 6 locations as described in B-1 above. Note: Epoxy, Polyurea and Paint pavement marking may also be measured by placing the material without beads on a metal plate and then measuring the thickness using a micrometer or wet film thickness gauge.

B-3 Place the Metal Rule perpendicular (transverse) to the length of the pavement marking being measured and slide the Taper Thickness Gauge underneath the Metal Rule until the gauge just touches the bottom of the rule and then read gauge. The Taper Gauge should be parallel to the marking line and as close as possible to the line.

B-4 Marking should touch or obstruct Metal Rule over the entire width of the line being measured.

B-5 Should more than 2 of the 6 locations not meet the thickness requirement, select 2 more random 10 foot \pm areas, 100 feet \pm from the original location. Measure the thickness as outlined in steps B-2 thru B-4. If either is deficient, contact the Resident Engineer.

The in-place thickness of various types of pavement marking material:

Minimum dry film thickness of paint	.013" (13 mils)
Minimum dry film thickness of Epoxy on concrete	.020" (20 mils)
Minimum dry film thickness of Epoxy on asphalt	.020" (20 mils)
Various thicknesses for Alkyd/Maleic Thermoplastic	.090 -.120" (90 - 120 mils)
Minimum dry film thickness of polyurea	.020" (20 mils)

WIDTH MEASUREMENT PROCEDURE

B-6 Measure the width at 3 locations as described in B-1 above at points where the line is the minimum thickness as described in A-1 above across the entire width being measured.

B-7 Should more than 1 of the 3 locations not meet the width requirement, select 2 more random 10 foot \pm areas, 100 feet \pm from the original location. Measure the width as outlined in step B-6. If either is deficient, contact the Resident Engineer.

COLOR MEASUREMENT PROCEDURE

To check the color, simply have the Contractor apply approximately a 10 foot section of marking *without the drop-on beads*. Compare the installed material to that of the Federal Standard 595A Color Chips. If the color is either cloudy or milky or some other color that is not reasonably close to the color chips, then do not use this material. Notify the Contractor of this condition so appropriate action can be taken.

B-8 Have the Contractor place several feet of marking material without drop-on beads or scrape the surface beads from the pavement marking with the Metal Rule.

B-9 Place Color Chip of appropriate color lengthwise on top of or beside line to be evaluated at 3 locations as described in B-1 above.

B-10 Should more than 1 of the 3 locations not be in reasonable conformity with the requirement, select 2 more random 10 foot \pm areas, 100 feet \pm from the original location. Evaluate the color as outlined in steps B-8 and B-9. If either is deficient, contact the Resident Engineer.

RETRO-REFLECTIVITY MEASUREMENT PROCEDURE

B-11 Using a LTL 2000 or LTL-X Retro-reflectometer, measure the retro-reflectivity at the beginning, middle and end of the project as described in B-1 above. See the operation manual distributed with this device for detailed instructions on how to use it.

Note - The Resident Engineer may obtain assistance in measuring retro-reflectivity by contacting the Signing and Delineation Unit.

CRACK MEASUREMENT PROCEDURE

B-12 Acceptable pavement marking lines and symbols shall not have more than the following maximum number of cracks completely **through the pavement marking material** to the pavement surface:

Pavement marking symbols & letters - 2 cracks

Word Messages - If 2 or more letters fail as above, the whole word fails

Stop Bars - 1 transverse crack per foot

Skip lines - 2 transverse cracks per linear foot of line

Long line - 2 transverse cracks per linear foot of line

RESULTS

The marking shall meet the required minimum thickness, width, color, and cracking over the entire width and length of the line being measured as required in the contract special provisions after initial placement and at the end of the observation period. The test results of above procedures shall be documented in the Diary on a daily basis. Any visible defects in the pavement marking such as chipping should also be noted in the Diary. For pavement marking with a 180 day Observation Period, the marking should be visually inspected for cracking, chipping, fading, or any other defects at 1 month, 3 months, and 5 months after placement. Any defects found during these inspections should be noted in the Diary. If the material is believed **not** to be in reasonable conformity with the specification, then the Contractor should be stopped from placing the pavement marking material until the situation can be corrected. Assistance in determining causes of problems can be obtained from the Signing and Delineation Unit at (919) 773-2800.

PAVEMENT MARKING TRIPS & TIPS

TRIPS AND TIPS FOR PAINT APPLICATIONS	
TRIPS	TIPS
Thick centers	Decrease paint tank pressure
	Close control screw slightly
	Increase atomizing pressure
	Reduce pump pressure
	Increase temperature of material
Thin centers	Decrease atomizing air pressure/Clean paint screens
	Increase paint tank pressure
	Decrease temperature of material
Marking is thick on one side and thin on the other	Replace tips or clean them out
Marking is too wide	Lower application gun
	Select proper tip size
	Adjust tip angle
Marking is too narrow	Raise application gun
	Select proper tip size
	Adjust tip angle
	Clean spray nozzle
Marking is too thin	Open the control screw slightly
	Increase the pump pressure
	Increase the air pressure
	Decrease the application vehicle speed
Marking is too thick	Close the control screw slightly
	Decrease the pump pressure
	Decrease the air pressure
	Increase the application vehicle speed
Discoloration of paint on new asphalt roadway	Apply a second coat of paint

TRIPS AND TIPS FOR THERMOPLASTIC APPLICATIONS

TRIPS	TIPS
Bulge forms at beginning of marking	Decrease pressure/slow pump speed
	Decrease material temperature
	Decrease application vehicle speed
	Clean road surface
	Wait to apply when pavement is warmer
Rough, pitted	Remove foreign objects in line
	Decrease temperature of material
	Remove foreign objects from die/Clean Strainer
Air bubbles	Moisture in pavement
	Decrease temperature of material
Uneven edges and gaps	Increase temperature of material
	Decrease application vehicle speed
	Increase material thickness
Marking is rounded, no defined edges	Decrease temperature of material
	Decrease pressure
	Increase application vehicle speed
Cracks in marking after application	Could be cracks in pavement
	Overheated material during application
	Material was applied too cold
	Material applied too thin
	Material manufactured too brittle for climate
Rough surface or Uneven edges	Increase material temperature
	Material has been overheated or scorched
	Moisture in pavement
Jagged marking ends or drips in marking gaps	Check for proper closure of die
	Remove foreign objects from die
Discoloration	Material has been heated for too long
	Tanks not properly cleaned before color change

TRIPS AND TIPS FOR POLYUREA APPLICATIONS	
TRIPS	TIPS
Thick centers	Replace tip
	Decrease tip size
	Increase pressure
Thin centers	Replace tip
	Increase tip size
Surging pattern	Leaks or restrictions in supply hose may be causing pulsating application
	Check Hydraulics
Marking is thick on one side and thin on the other	Replace tips or clean them out
Marking is too wide	Lower application gun
	Select proper tip size
	Adjust tip angle
Marking is too narrow	Raise application gun
	Select proper tip size
	Adjust tip angle
Marking is too thin	Increase tip size
	Slow down application vehicle
	Increase pressure
Marking is too thick	Decrease tip size
	Speed up application vehicle
	Decrease pressure
Dark marking	Decrease hardener amount
Marking takes too long to cure	Increase hardener amount
	Rebuild high pressure pumps
Some spots didn't cure properly	Clean or change check valves
	Check accumulator pressures
Railroad tracking	Increase temperature of material
	Replace tips
	Adjust material pressure

TRIPS AND TIPS FOR BEAD APPLICATIONS

TRIPS	TIPS
Concentration of beads on one side	Unclog bead gun
	Adjust alignment of bead gun
Concentration of beads in middle of line	Increase bead tank pressure
	Adjust bead gun control screw
	Adjust alignment of bead gun cap deflector
	Increase tip size
Using excessive amount of beads	Replace gun or repair gun parts
	Decrease bead tank pressure
Beads are buried in material	Adjust height of bead gun
	Adjust angle of bead gun
	Check material thickness
	Lower temperature of material
Beads are not imbedded sufficiently	Adjust alignment of bead gun
	Increase temperature of material
Surging pattern of beads	Raise bead tank pressure
	Replace applicator
Excessive amount of beads off the material and on the pavement	Move bead gun closer to material

TESTING APPARATUS REQUIRED

- A-1 6"x 1/2" Taper Thickness Gauge
- A-2 12" metal straight edge
- A-3 6' folding rule
- A-4 Federal Standard 595a Yellow and White Color Chips
- A-5 LTL 2000 or LTL-X Retro-reflectometer
- A-6 Magnifying glass

(Items A-1, A-2, A-4, A-6 are available from the Chemical Lab of the Materials & Tests Unit. Item A-5 is available through the Division Office)

APPARATUS SUPPLIERS

A-1 Starrett Taper Gage (No. 270)
L. S. Starrett Co.
121 Crescent St.
Athol, Ma. 01331
508-249-3551

A-6 Silsi Linen Tester
Young-Phillips Sales Co.
6399 Amp Dr.
Clemmons, NC 27012

LTL 2000 or LTL-X Retro-reflectometer
Flint Trading, Inc.
PO Box 1183
115 Todd Court
Thomasville, NC 27360
(336) 475-6600



North Carolina Department of Transportation

PAVEMENT MARKING TECHNICIAN CERTIFICATION APPLICATION

General Procedures

Individuals may attend the Rodeo Course without seeking certification. However, Rodeo attendees are expected to take a test at the end of the course. Certification is granted based on the following criteria:

- 1) Completion of the Rodeo course with a grade of 70 or better on the test,
- 2) Completion and submission of the application form within 30 calendar days of the Rodeo Pavement Marking test attesting to 2000 hours of installation/inspecting experience, and
- 3) Review of the application by the Review Board.

If the applicant fails the test on the day of the Rodeo course, the Review Board may grant another test to be taken no later than 30 calendar days from notification of initial test failure. If the applicant chooses not to take a second test within the 30-day period or they fail the second test they must complete the entire course again.

The applicant may attend the Rodeo and take the test while continuing to accumulate the required minimum 2000 hours of installation/inspecting experience. If the applicant is unable to complete the certification application within 1 year they will be required to begin the certification process again by attending another Rodeo as described above.

If the applicant is not currently installing or inspecting pavement marking materials and is seeking certification, the minimum hours experience required must come from past hours actually installing or inspecting pavement marking. Supervision of others installing or **inspecting pavement marking materials will not count towards the 2000-hour minimum.**

Certification is good for 3 years from the date the applicant attended the last Rodeo Course. Re-certification follows the same process as the Certification above.

Work performed below the level of competence demonstrated in the Rodeo Course may result in removal of certification.

Applications for certification will only be accepted by mail. Please mail application forms to:

North Carolina Department of Transportation
Signing and Delineation Unit
750N Greenfield Parkway
Garner, NC 27529



North Carolina Department of Transportation

APPLICATION FOR PAVEMENT MARKING CERTIFICATION						Date of Application
Please Print or Type						
All applications must be submitted by mail						
Social Security Number		Last Name		First Name		Middle Name
Address (Street Number and Name)				City		County
State	Zip Code	Phone (Home or where you can be reached) ()	Business Phone ()	Driver's License Number State		
Employer:			Address:			
Job Title:			Supervisor's name:		Length of Employment	
Telephone Number: ()		Fax Number: ()		Email:		
Previous Employer if you have been with current employer less than 3 years.						
Employer:			Address:			
Job Title:			Supervisor's name:		Length of Employment	
Telephone Number: ()		Fax Number: ()		Email:		
List the number of hours you have spent properly installing and/or inspecting the pavement marking materials listed below:						
Material	Installing Hours	Inspecting Hours	Calendar Year(s) Occurred In	State		
Paint						
Molten Thermo						
Heated-In-Place Thermo						
Epoxy						
Removable Tapes						
Permanent Tapes						
Markers – Stick-On						
Markers – Cast Iron						
TOTAL:						
Have you attended NCDOT Traffic Control Pavement Marking Rodeo? <input type="checkbox"/> YES <input type="checkbox"/> NO If so, when: _____ (MM/DD/YY)						
Have you previously received Pavement Marking Certification through North Carolina training? <input type="checkbox"/> YES <input type="checkbox"/> NO						
Certification Number:		Date Issued:		Expiration Date:		
<p>I certify that I have given true, accurate and complete information on this form to the best of my knowledge. In the event confirmation is needed in connection with my work, I authorize educational institutions, associations, registration and licensing boards, and others to furnish whatever detail is available concerning my qualifications. I authorize investigation of all statements made in this application and understand that false information or documentation, or a failure to disclose relevant information may be grounds for rejection of my application.</p>						
Signature of Applicant (unsigned applications will not be processed)					Date	
<p>I certify that the above-signed applicant has given true, accurate and complete information on this form to the best of my knowledge. I confirm this applicant is good standing with the company. In the event confirmation is needed in connection with the applicant's work, I have job order records, log book records, or personal knowledge that can verify the type of work and the quality of that work attested to in this application.</p>						
Signature of Authorized Company Official (unsigned applications will not be processed)					Date	
Official Use Only						
Rodeo Date Attended:		Test Date & Score / Graded By:		Cert. Approval Date / Initials:		Certification Number:

INITIAL PAVEMENT MARKING INSPECTION REPORT KEY

Key: For information asked on the Initial Pavement Marking Inspection Report.

Purpose: The purpose of these data sheets are for the collection of accurate pavement marking and marker data. It will be used to develop a database to determine pavement marking life cycle. This data is imperative for the evaluation of current and future pavement marking retroreflectivity and life cycle.

Heading:

PRINT TECHNICIAN'S NAME Enter name of NCDOT personnel responsible for performing inspection of project

DATE OF INSPECTION Enter date inspection was performed

PROJECT INFORMATION

<i>Project/TIP Number</i>	Enter either the Project Number or TIP number the marking was placed under.
<i>Division</i>	Enter division project is located
<i>County</i>	Enter county project is located
<i>Project Length</i>	Length of project, either in miles (English projects) or kilometers (Metric projects). Specify BOTH value and unit of measure. EX: 12.2 mile, 12.2 mi., 7 kilometers or 7 km
<i>Road Name/Number</i>	Name of primary road(s) that marking was placed. EX: SR1200, I-95, NC 50 or US 70
<i>Project Description/Location</i>	Description of project, including specifying limits of project and type of project. EX: Resurfacing of I-85 from Webb Rd. (Exit 70) to Jake Alexander Blvd (Exit 75)
Reason for applying new pavement markings	Circle reason for application of pavement markings. For projects where a new roadway was constructed, where none existed before or where major roadway realignment was made, circle <i>New Roadway</i> . For projects where an existing roadway has new pavement layers applied, circle <i>Resurfacing</i> . For projects where an existing roadway ONLY has new pavement marking applied, circle <i>Scheduled Restriping</i> .
Road surface material	Circle road surface material of the road marking was placed, either Concrete or Asphalt.
Roadway access control	Full control (interchanges) Partial Control (interchanges and –Y- lines) No Control –Y- lines with driveways
Number of Lanes (both directions)	Enter number of lanes of traffic when the project is complete. If the number of lanes change over the length of the project, enter the number of lanes that is most representative of the majority of the project.
Posted Speed Limit	Enter the posted speed limit of the project.
Marking Contractor	Contractor responsible for application of markings on project.
Marking Unit Cost	Cost of marking per linear foot.
Date pavement markings were applied	Enter date that pavement markings were applied. If pavement markings were applied over several days, enter start and ending dates.
Bead Type	If beads are inserted into pavement markings, circle type of beads used with the pavement markings.
<i>Bead Manufacturer</i>	Manufacturer of beads inserted into pavement markings.
Outside temperature when markings were applied	Circle temperature range of outside temperature when pavement markings were applied.

MARKER INFORMATION

INITIAL PAVEMENT MARKING INSPECTION REPORT

1. PRINT TECHNICIAN'S NAME: _____ 2. DATE OF INSPECTION: _____

PROJECT INFORMATION

3. Project/TIP Number: _____ 4. Division: _____ 5. County: _____
 6. Road Name/Number: _____ 7. Project Length: _____
 8. Project Description/Location (Include project limits) : _____

10. Road surface material : _____ 11. Total Number of Lanes _____
 Concrete
 Asphalt

12. Marking Contractor: _____

13. Date pavement markings were applied: _____

14. Bead Type: Regular Gradation Large Gradation Other _____

15. Bead Manufacturer: _____

16. Outside air temperature when markings were applied:
 40°F-59°F 60°F-69°F 70°F-79°F 80°F-89°F 90°F-99°F 100°F+

17. Temperature of pavement when markings were applied:
 40°F-59°F 60°F-69°F 70°F-79°F 80°F-89°F 90°F-99°F 100°F+

Line Type	Unit Cost per ft/meter installed
4" Wide (White)	
6" Wide (White)	
8" Wide (White)	
12" Wide (White)	
24" Wide (White)	
4" Wide (Yellow)	
6" Wide (Yellow)	
8" Wide (Yellow)	
Other	

Other
100°F+

MARKER INFORMATION

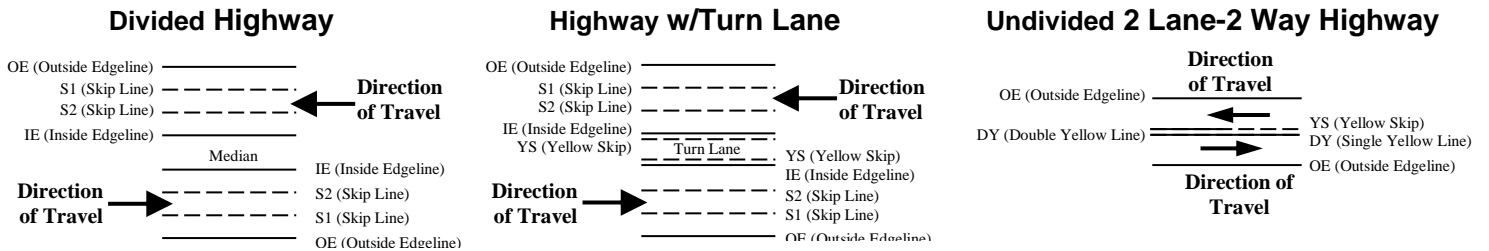
18. Marker type: Raised Pavement Marker (RPM) 19. Marker Unit Cost installed: _____
 Snowplowable Pavement Marker (SP)

20. Marker Model/Product Number: _____

21. Marker Manufacturer: _____

INDIVIDUAL LINE DATA SEE BACK FOR ENTERING ADDITIONAL LINE DATA

ROAD MARKING LEGEND



Note: If more than two Skip Lines are applied in one direction, number Skip Lines from outermost to innermost.

22. Color: White Yellow 23. Marking Type: OE IE DY S _____ YS Other _____
 (See Road Marking Legend) (Insert skip line#) (Goreline, Mini-Skip, Stop bar, etc.)

24. Material Type: Thermoplastic Paint Epoxy
 Cold Applied Plastic Other _____

25. Marking Thickness: _____ (mils)

26. Batch Number: _____

27. Manufacturer: _____

28. Travel Direction: N S E W

LINE #1

Locations	29. Retro-reflectivity Readings						AVG
	#1	#2	#3	#4	#5	#6	
Beg Proj							
End Proj							
Middle Proj							
Other							
Other							
Other							

LINE #2

22. Color: White Yellow 23. Marking Type: OE IE DY S _____ YS Other _____
(See Road Marking Legend) (Insert skip line#) (Goreline, Mini-Skip, Stop bar, etc.)

24. Material Type: Thermoplastic Paint Epoxy
Cold Applied Plastic Other _____

25. Marking Thickness: _____ (mils)

26. Batch Num: _____

27. Manufacturer: _____

28. Travel Direction: N S E W

Locations	29. Retro-reflectivity Readings						AVG
	#1	#2	#3	#4	#5	#6	
Beg Proj							
End Proj							
Middle Proj							
Other							
Other							
Other							

LINE #3

22. Color: White Yellow 23. Marking Type: OE IE DY S _____ YS Other _____
(See Road Marking Legend) (Insert skip line#) (Goreline, Mini-Skip, Stop bar, etc.)

24. Material Type: Thermoplastic Paint Epoxy
Cold Applied Plastic Other _____

25. Marking Thickness: _____ (mils)

26. Batch Num: _____

27. Manufacturer: _____

28. Travel Direction: N S E W

Locations	29. Retro-reflectivity Readings						AVG
	#1	#2	#3	#4	#5	#6	
Beg Proj							
End Proj							
Middle Proj							
Other							
Other							
Other							

LINE #4

22. Color: White Yellow 23. Marking Type: OE IE DY S _____ YS Other _____
(See Road Marking Legend) (Insert skip line#) (Goreline, Mini-Skip, Stop bar, etc.)

24. Material Type: Thermoplastic Paint Epoxy
Cold Applied Plastic Other _____

25. Marking Thickness: _____ (mils)

26. Batch Number: _____

27. Manufacturer: _____

28. Travel Direction: N S E W

Locations	29. Retro-reflectivity Readings						AVG
	#1	#2	#3	#4	#5	#6	
Beg Proj							
End Proj							
Middle Proj							
Other							
Other							
Other							

LINE #5

22. Color: White Yellow 23. Marking Type: OE IE DY S _____ YS Other _____
(See Road Marking Legend) (Insert skip line#) (Goreline, Mini-Skip, Stop bar, etc.)

24. Material Type: Thermoplastic Paint Epoxy
Cold Applied Plastic Other _____

25. Marking Thickness: _____ (mils)

26. Batch Number: _____

27. Manufacturer: _____

28. Travel Direction: N S E W

Locations	29. Retro-reflectivity Readings						AVG
	#1	#2	#3	#4	#5	#6	
Beg Proj							
End Proj							
Middle Proj							
Other							
Other							
Other							

LINE #6

22. Color: White Yellow 23. Marking Type: OE IE DY S _____ YS Other _____
(See Road Marking Legend) (Insert skip line#) (Goreline, Mini-Skip, Stop bar, etc.)

24. Material Type: Thermoplastic Paint Epoxy
Cold Applied Plastic Other _____

25. Marking Thickness: _____ (mils)

26. Batch Number: _____

27. Manufacturer: _____

28. Travel Direction: N S E W

Locations	29. Retro-reflectivity Readings						AVG
	#1	#2	#3	#4	#5	#6	
Beg Proj							
End Proj							
Middle Proj							
Other							
Other							
Other							

TECHNICIAN'S CHECKLIST
DIVISION 12
PAVEMENT MARKINGS, MARKERS, & DELINEATION

- 1) Study the plans, Standard Specifications and Roadway Standard Drawings.
- 2) Ensure that at least one member of the pavement marking crew is certified through the NCDOT Pavement Marking Technician Certification process.
- 3) Ensure that the pavement marking materials are on the Department's Approved Products List or are qualified by the Signing and Delineation Unit.
- 4) Test all pavement marking materials and placement in accordance with the pavement marking inspection procedure listed herein.
- 5) Clean the pavement surface and check for moisture prior to pavement marker installation.
- 6) Ensure that the marker color corresponds to the pavement marking that the marker supplements.
- 7) Remove all debris resulting from the saw cutting operation prior to installation of snowplowable pavement markers.
- 8) Ensure the snowplowable marker keel is completely embedded in the pavement surface.