6. Virginia designated Type E black tape may only be used on hydraulic cement concrete roadways.
   a) True
   b) False

7. One of the criteria in Virginia for using Type E black tape in lieu of eradication is that the traffic pattern will shift back to the original pattern within:
   a) 90 days.
   b) 1 month.
   c) 120 days.
   d) 6 months.
Appendix A

VDOT – SPECIFICATIONS (*)

SECTION 106.01 Control of Materials ................................................................. A-1
SECTION 234 Glass Beads for Reflectorizing Traffic Markings .......................... A-2
SECTION 512 Maintenance of Traffic ................................................................. A-3
SECTION 704 Pavement Markings & Markers ................................................... A-8

* Consult the current or applicable VDOT Road and Bridge Specification Book and Special Provisions for the most current specifications.

SECTION 106—CONTROL OF MATERIAL

106.01 Source of Supply and Quality Requirements

The materials used throughout the work shall conform to the requirements of the contract. The Contractor shall regulate his supplies so that there will be a sufficient quantity of tested material on hand at all times to prevent any delay of work. Except as otherwise specified, materials, equipment, and components that are to be incorporated into the finished work shall be new. Within 30 days after notification of award of the contract, but not later than 7 days prior to the beginning of construction operations under the contract, the Contractor shall file a statement of the known origin, composition and manufacture of all materials to be used in the work, including optional or alternate items. Material requirements not previously reported shall be submitted at least 60 days prior to their use on the project, but not less than two weeks prior to delivery. The Contractor’s statement shall be electronically submitted by use of Form C-25 and shall be identified by the complete project number, and all items or component materials shall be identified by the specific contract item number and the specification reference shown in the contract.

At the option of the Engineer, materials may be approved at the source of supply. If it is found during the life of the contract that previously approved sources of supply do not supply materials or equipment conforming to the requirements of the contract, do not furnish the valid test data required to document the quality of the material or equipment, or do not furnish documentation to validate quantities to document payment, the Contractor shall change the source of supply and furnish material or equipment from other approved sources. The Contractor shall notify the Department of this change, and provide the same identifying information noted in this section, at least 60 days prior to their use on the project, but less than two weeks prior to delivery.
SECTION 234—GLASS BEADS FOR REFLECTORIZING TRAFFIC MARKINGS

234.01—DESCRIPTION.

This specification covers glass beads for application on liquid traffic marking materials so as to produce a reflective surface.

234.02—DETAIL REQUIREMENTS.

Beads shall be manufactured from glass of a composition designed to be highly resistant to traffic wear and weather. Glass beads shall be spherical in shape and shall conform to AASHTO M247 Type 1, except that at least 80 percent of the beads shall be round when tested in accordance with the requirements of ASTM D 1155 Procedure B. Beads shall be essentially free of sharp angular particles, milkiness and surface scoring or scratching.
SECTION 512—MAINTAINING TRAFFIC

512.01—DESCRIPTION.
This work shall consist of maintaining and protecting traffic through areas of construction, maintaining public and private entrances and mailbox turnouts, constructing and obliterating detours, and protecting the traveling public within the limits of the project and over detours that are not a part of the state highway system in accordance with the contract documents.

512.02—MATERIALS.

(a) **Materials** salvaged from the roadway shall be used in the maintenance of traffic insofar as possible. Material shall conform to the requirements of the applicable specifications.

(b) **Signalization, barricades, channelizing devices, safety devices, and pavement markings** shall conform to the requirements of Division VII Traffic Control Devices of these specifications and the *Virginia Work Area Protection Manual* except where otherwise indicated. Retroreflective surfaces shall conform to the requirements of Sections 235, 247 and 702 as applicable.

(c) **Temporary pavement markers** shall conform to the requirements of Section 235.

(d) **Construction pavement markings** shall conform to the requirements of Section 246.

**PARTIAL SPEC. for 512.03**

512.03 Procedures

(i) **Construction Pavement Markings:** Construction pavement markings shall be installed at locations shown on the plans and in the *Virginia Work Area Protection Manual*, and at other locations as directed by the Engineer. Construction pavement markings shall be selected from the Department’s approved list of Construction Pavement Marking Materials. Construction pavement markings are classified as Types D, Classes I and II (removable tape), E (non-reflective black removable tape) and F, Classes I and II (temporary markings). Construction pavement markings shall be used as follows:

1. **Type D construction pavement markings** shall be used on final roadway surfaces or in areas where traffic patterns are subject to change before pavement is resurfaced unless the surface temperature of the pavement is below the pavement marking manufacturer’s recommended minimum application temperature. When the surface temperature of the pavement is below the manufacturer’s minimum application temperature, a Type F construction pavement marking on the approved list under the same class as the specified Type D construction pavement marking may be used except on final surfaces.
The Contractor shall select a Type F product known to perform the best under those temperature conditions. When a Type F construction pavement marking is utilized in lieu of a Type D due to the surface temperature being below the manufacturer’s minimum application temperature, the Contractor will be paid the price bid for Type D, which will include the Type F markings and any necessary eradication of existing pavement markings.

2. Type E construction pavement markings shall be used to cover existing markings in accordance with Section 512.03(j).

3. Type F construction pavement markings shall be used where the roadway is to be resurfaced prior to changes in the traffic pattern or where pavement is to be demolished and traffic patterns will not change before demolition.

Construction pavement markings shall be installed in accordance with the manufacturer’s recommendations. Application thickness and bead application shall be in accordance with the manufacturer’s recommendations except as follows. In the event the manufacturer’s recommendation for material thickness and quantity of beads is less than utilized when the material was tested by the National Transportation Product Evaluation Program (NTPEP), the minimum values used during product installation shall conform to the NTPEP test values which are indicated on the approved list for the specific marking. The Contractor shall furnish a copy of the manufacturer’s installation recommendations including the thickness, bead embedment and dispersement to the Engineer.

The Contractor shall maintain the construction pavement markings and shall correct any deficient markings by reapplying markings. Deficient construction pavement markings are considered to be any markings that do not provide adequate guidance to motorists due to inadequate retroreflectivity or color qualities, or due to problems with adherence to the pavement. The Engineer will make a visual nighttime inspection of all construction pavement markings to identify areas of markings that have inadequate retroreflectivity qualities.

**Those markings that have inadequate retroreflectivity qualities** as determined by the Engineer shall be replaced by the Contractor with the following exceptions:

a. Reapplication of skip line construction pavement markings is not required unless the inadequate retroreflectivity qualities are for at least two consecutive skip lines.

b. Reapplication of center, lane (except skip lines) or edge line construction pavement markings is not required unless the inadequate retroreflectivity qualities are for at least a continuous section of 70 feet.
c. Reapplication of transverse markings is not required unless the inadequate retroreflectivity qualities are for at least a continuous section exceeding 3 feet.

512.03

In lieu of replacement of construction pavement markings based on visual observations by the Engineer, the Contractor may have retroreflectivity readings made. These measurements shall be taken within 48 hours after the Contractor has been notified of the deficient markings except additional time will be granted due to inclement weather that prevents the adequate measurement of the markings. The Contractor shall brush any form of debris from the line before performing the measurements. Measurements shall be taken in the presence of the Engineer using Contractor furnished equipment conforming to the requirements of ASTM E1710. The Contractor shall operate the equipment in accordance with the manufacturer’s instructions and a copy of such instructions shall be provided to the Engineer. The photometric quantity to be measured is coefficient of retroreflected luminance ($R_v$) which shall be expressed as millicandela per square foot per foot-candle.

Measurements shall be accomplished at three random locations within each area of markings that have inadequate retroreflectivity qualities. When the length of the visually inadequate area is greater than one mile, measurements shall be accomplished at three locations per mile segment or portion thereof. Measurements for all lines shall be accomplished in the middle of the line horizontally. Measurements for skip lines shall be accomplished in the middle of its length. Measurements for transverse lines shall be taken outside of the wheel path locations. The Engineer will designate the locations along the line segments that the measurements shall be taken. The Contractor shall make a log of the measurements along with their locations and provide a copy to the Engineer. When the average of the three readings for an area is below 100 millicandelas per square foot per footcandle, the Contractor shall reapply the markings as indicated above.

Construction pavement markings that have become unadhered to the pavement shall be reapplied by the Contractor with the following exceptions:

1. Reapplication of skip line construction pavement markings is not required unless the unadherence is for at least two consecutive skip lines.
2. Reapplication of center, lane (except skip lines) or edge line construction pavement markings is not required unless the unadherence is for at least a continuous section of 70 feet.
3. Reapplication of transverse markings is not required unless unadherence is for at least a continuous section exceeding 3 feet.

However, all construction pavement markings that have become unadhered to the roadway that may cause guidance problems for the motorists shall be removed by the Contractor.

Removable construction pavement markings shall also be replaced on tined concrete and
high hit asphalt locations on time frames as recommended by the manufacturer of the
marking to prevent the need for eradication. The Contractor shall furnish a copy of the
manufacturer’s recommendations to the Engineer.

512.03

Those construction pavement markings found in need of reapplication in accordance with
the above requirements shall be reapplied by the Contractor at no additional cost to the
Department with the following exceptions:

a) Markings that have been under traffic for more than 90 days will be paid for at the
contract unit price when needing reapplication unless the manufacturer’s warranty
coverage is still in effect.

b) Markings damaged by the Department’s snow removal or other maintenance and
construction operations will be paid for at the contract unit price.

Construction pavement markings shall be replaced in accordance with the time requirements
of Section 704.

Eradication for reapplication of Type F construction pavement markings is not required if
allowed by the marking manufacturer provided the existing marking is well adhered and
the total thickness of both the existing and reapplied marking combined will not exceed
40 mils. If not well adhered, 90 percent of the existing markings shall be removed prior
to reinstallation of the markings. Temporary pavement markers shall be installed with
construction pavement markings in accordance with (k) herein.

(j) **Eradicating Pavement Markings:** Markings that may conflict with desired traffic
movement, as determined by the Engineer, shall be eradicated as soon as is practicable:
either immediately prior to the shifting of traffic or immediately thereafter and prior to the
conclusion of the workday during which the shift is made.

Eradication shall be performed by grinding, blasting, or a combination thereof. Grinding
shall be limited to removal of material above the pavement surface except when removing
thermoplastic and preformed tape markings, which may be removed by grinding alone.
Blasting shall be used on both asphalt concrete and hydraulic cement concrete pavements
to remove all other types of markings. Other methods may be submitted for approval by the
Engineer. The Contractor shall ensure that the least amount of damage as possible occurs to
the roadway surface when accomplishing the eradication.

When eradicating pavement markings, the Contractor shall ensure workers are protected
in conformance to the requirements of *Occupational Safety and Health Administration’s
(OSHA) standards* as detailed in 29 CFR 1910 or 1926, whichever is the most stringent at
the time. The Contractor shall collect the eradication residue during or immediately after the
eradication operation, except dust shall be collected during the entire operation. Eradication
residue from the removal of any pavement markings is considered to be a non-hazardous waste material and shall be disposed of in a properly permitted waste disposal facility in accordance with state and federal laws and regulations. Testing of the eradication residue for the eight RCRA metals will not be required.

512.03

When markings are removed for lane shifts/transitions, 100 percent of the marking shall be removed.

Non-reflective removable black construction pavement marking may be used to cover existing markings in lieu of eradication methods on asphalt concrete surfaces when its use will not be required for more than 120 days and when specified as a pay item. The Contractor shall use this material to cover markings as indicated in the plans or as directed by the Engineer. Non-reflective removable black construction pavement marking shall be applied in accordance with the manufacturer’s recommendations.

(k) **Temporary pavement markers** shall be installed with construction pavement markings, except non-reflective removable markings, in transition (lane drop) or lane shift areas of work zones which will encroach upon the traveled roadway for a period of more than three days and in other areas as required by the Engineer.

Temporary pavement markers shall be installed on twenty-foot centers in lane shift and transition areas. When temporary pavement markers are required in other areas, they shall be installed on forty-foot centers unless otherwise required by the Engineer. Temporary pavement markers shall be located between and in alignment with broken lines and beside solid line pavement markings. Where double line pavement markings separating traffic are installed, two-way markers shall be installed beside each line. The Contractor may install two one-way markers in lieu of each two-way marker at no additional cost to the Department.

Temporary pavement markers shall be installed with a hot applied bitumen adhesive except epoxy may be used on hydraulic cement concrete roadways and non-final surfaces of asphalt concrete roadways. Damage created in the pavement by removal of markers shall be repaired in kind by the Contractor at no additional cost to the Department.

Temporary pavement markers found in need of replacement shall be replaced by the Contractor at no additional cost to the Department except those markers damaged by the Department’s snow removal operations or other maintenance and construction operations will be paid for at the contract unit price.

512.03

(n) **Construction Pavement Message Markings:** Markings shall be installed at locations designated on the plans and as determined by the Engineer and shall consist of messages in accordance with the requirements of Section 704. Construction pavement message
marking material including maintenance of the markings shall be in accordance with the 
requirements for construction pavement markings.

Retroreflective measurements shall be taken out of the wheel path locations and each 
separate entity of a pavement message marking shall be replaced when the average of the 
three readings for that entity is below 100 millicandelas per square foot per footcandle.

512.03

Replacement and correction of ineffective work zone traffic control devices shall be 
accomplished in accordance with the American Traffic Safety Service Association’s (ATSSA) 
Quality Standards For Work Zone Traffic Control Devices publication with the following 
additions and exceptions:

1. Requirements herein for replacement and correction of construction pavement markings 
shall be used in lieu of the requirements contained in the section entitled Evaluation 
Guide Pavement Tape & Raised Pavement Markers.

SECTION 704—PAVEMENT MARKINGS AND MARKERS

704.01—Description.

This work shall consist of establishing the location of pavement markings and installing pavement 
markings, pavement markers, and reflectorized material on specified pavements in accordance 
with these specifications, the MUTCD and as directed by the Engineer.

704.02—Materials.

The Contractor shall use an approved inventory tracking system for all materials received from the 
manufacturer. Shipment of materials from such inventory shall be accompanied by the following 
certification:

Material shipped under this certification has been tested and approved by VDOT as indicated by 
laboratory test numbers listed hereon.

_________________________________________________________________

Signature and Title

_________________________________________________________________

Date

(a) Pavement markings shall conform to the requirements of Section 246.

(b) Glass beads shall conform to the requirements of Section 234.

(c) Pavement markers shall conform to the requirements of Section 235.
704.03—Procedures.

The Contractor shall have a certified Pavement Marking Technician present during pavement marking operations.

Pavement markings shall be installed on new roadways prior to opening the roadway to traffic. Pavement marking installation shall be completed within the time limits herein on roadways where the pavement markings have been removed or obscured and the roadway is open to traffic unless otherwise directed by the Engineer. Installation of Type B, Class VI pavement markings on asphalt roadways are not applicable to these requirements if they are inlaid with the last pass of the asphalt roller or directly after the asphalt roller utilizing a separate roller.

Installation of edge lines on roadways where the existing pavement markings have been removed or obscured are also required within these time limits unless otherwise indicated by the Engineer. Exceptions to the below time limits will be granted only for weather restrictions, and installation of epoxy resin pavement markings on new pavement shall not commence until after 24 hours of final surface placement.

Pavement marking installation on roads having traffic volumes of 10,000 ADT or more shall be completed within 24 hours after the end of the workday where the pavement markings were removed or obscured.

Pavement marking installation on roads having traffic volumes between 3,000 and 10,000 ADT shall be completed within 48 hours after the end of the workday where the pavement markings were removed or obscured.

Pavement marking installation on roads having traffic volumes of less than 3,000 ADT shall be completed within 72 hours after the end of the workday where the pavement markings were removed or obscured.

If the Contractor will not have pavement markings installed within the time limits set above, the Contractor shall install Type D construction pavement markings within the same time limits and maintain such until the final pavement markings can be installed. The cost of installing, maintaining and removing the Type D construction pavement markings shall be borne by the Contractor with no cost to the Department.

When establishing the location of pavement markings, the Contractor may mark the locations on the roadway by installing premarkings. Premarkings shall be accomplished using Type D (removable – any class) tape, chalk, or lumber crayons except special pavement markings such as stop lines, crosswalks, messages, hatching, etc. shall be accomplished using chalk or lumber crayons. All premarkings shall be of the same general color as the pavement markings being premarked. When tape is used as premarking, premarking shall consist of 4-inch x 4-inch maximum squares or 4-inch maximum diameter circles spaced at 100-foot minimum intervals in tangent sections and 50-foot minimum intervals in curved sections. At locations where the pavement marking will switch colors,
e.g. gore marking, the ends of the markings may be premarked regardless of the spacing. When chalk or lumber crayon are used as premarking, the entire length of the pavement marking may be premarked. All premarkings shall be installed whereby its installation shall not affect the adhesion of the pavement markings. When Type D tape is used as the premarking and the lateral location of such premarkings to the final pavement markings exceeds 6 inches, the premarkings shall be removed at no cost to the Department.

704.03

(a) **Pavement Markings:** Pavement markings shall be white or yellow markings as required by the MUTCD for the specific location or as specified by the Engineer and shall be installed in accordance with Table VII-1 unless otherwise recommended by the manufacturer and approved by the Engineer. The Contractor shall furnish a copy of the manufacturer’s installation recommendations to the Engineer.

The Contractor shall perform quality control testing for application thickness and glass bead rate in accordance with VTM-94 at the beginning of each workday and every 3 hours thereafter. The Contractor shall be responsible for providing the apparatus indicated in VTM-94 that are needed to perform the quality control testing. Testing shall be performed in the presence of the Engineer.

The Contractor shall maintain a daily log (Form C-85) for both temporary and permanent pavement markings and markers. Entries in the log shall be made in ink, shall be legible, and the log shall be signed by the Contractor and delivered to the Engineer or designee by the end of each workday.

Pavement line markings shall consist of stop lines, crosswalks, and solid or skip lines used for, but not limited to, dividing lanes, marking edges, channelizing, outlining and marking safety zones around objects, and forming islands and parking lot stalls.
### TABLE VII-1

#### PAVEMENT MARKINGS

<table>
<thead>
<tr>
<th>Type</th>
<th>Class</th>
<th>Name</th>
<th>Surface Temp. at Time of Application</th>
<th>Film Thickness (mils)</th>
<th>Pavement Surface</th>
<th>Application Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>Traffic Paint</td>
<td>50°F+</td>
<td>15 ± 1 when wet</td>
<td>AC HCC</td>
<td>May be applied directly after paving operations</td>
</tr>
<tr>
<td>I</td>
<td>I</td>
<td>Thermoplastic Alkyd</td>
<td>50°F+</td>
<td>90 ± 5 when set</td>
<td>AC</td>
<td>May be applied directly after paving operations</td>
</tr>
<tr>
<td>I</td>
<td>I</td>
<td>Thermoplastic Hydrocarbon</td>
<td>50°F+</td>
<td>90 ± 5 when set</td>
<td>AC</td>
<td>Do not apply less than 30 days after paving operations</td>
</tr>
<tr>
<td>B</td>
<td>II</td>
<td>Polyester resin</td>
<td>50°F+</td>
<td>15 ± 1 when wet</td>
<td>HCC</td>
<td>Needs to be coned</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>Epoxy resin</td>
<td>50°F+</td>
<td>20 ± 1 when wet</td>
<td>AC HCC</td>
<td>Manufacturer’s Recommendations</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>Plastic-backed preformed tape</td>
<td>Manufacturer’s Recommendation</td>
<td>60 - 90</td>
<td>AC HCC</td>
<td>Manufacturer’s Recommendations</td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td>Patterned preformed tape</td>
<td>Manufacturer’s Recommendation</td>
<td>20 * 65**</td>
<td>AC HCC</td>
<td>Manufacturer’s Recommendations</td>
</tr>
<tr>
<td>D</td>
<td>I &amp; II</td>
<td>Removable tape</td>
<td>Manufacturer’s*** Recommendation</td>
<td>AC HCC</td>
<td>Construction zone pavement marking</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-</td>
<td>Removable black tape (non-reflective)</td>
<td>Manufacturer’s *** Recommendation</td>
<td>AC</td>
<td>Construction zone pavement marking for covering existing markings</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>I &amp; II</td>
<td>Temporary markings</td>
<td>Manufacturer’s *** Recommendation (Film Thickness = 40 mils max)</td>
<td>AC HCC</td>
<td>Construction zone Pavement marking</td>
<td></td>
</tr>
</tbody>
</table>

* Thinnest portion of the tapes cross-section. This is the minimum required thickness.
** Thickest portion of the tapes cross-section. This is the minimum required thickness.
*** In the event the manufacturer’s recommendation for film thickness is less than utilized when the material was tested by the National Transportation Product Evaluation Program (NTPEP) or other Department approved test facility, the minimum values used during installation shall conform to the test values which are indicated on the approved list for the specific marking.
Section 704.03

**Crosswalks and stop lines** shall be installed using Type B, Class I or IV markings.

**Solid lines or skip lines** shall be installed using Type A or Type B markings as specified.

Pavement message markings shall be installed using Type B, Class I, IV or VI markings and shall include, but not be limited to, school zone markings, railroad crossing markings, disabled parking symbols, elongated arrows, word messages, etc. The word SCHOOL shall be formed with characters that are 10 feet in height where permitted by the normal roadway width. School zone markings shall extend transversely across both lanes of two-lane roadways and across two or more approach lanes of roadways of three or more lanes. Disabled parking symbols shall be 41 inches in height, 36 inches in width and shall use a 4-inch stroke width for the lines.

The Contractor shall protect the public from damage attributable to pavement marking operations. The Contractor shall be responsible for the complete preparation of the pavement surface, including, but not limited to, removing dust, dirt, loose particles, oily residues, curing compounds, concrete laitance, residues from eradication, and other foreign matter immediately prior to installing pavement markings. The pavement surface shall be dry at the time of installation when tested in accordance with VTM-94. The Contractor shall be responsible for providing the apparatus indicated in VTM-94 that are needed to perform the moisture test. Marking material shall not be applied within 24 hours following rain or other inclement weather.

Liquid markings shall be applied so as to prevent splattering and overspray and shall be protected from traffic until track free by the use of guarding or warning devices as necessary. If a vehicle crosses a marking and tracks it or if splattering or overspray occurs, the affected marking and resultant tracking shall be removed and new markings applied at the Contractor’s expense.

Equipment shall also be thoroughly cleaned between changes in colors of materials.

Pavement markings shall have clean and well-defined edges without running or deformation; shall be uniform, free of waviness; shall be straight on tangent alignment; and shall be on a true arc on curved alignment. The widths of pavement markings shall not deviate more than ¼ inch on tangent nor more than ½ inch on curves from the required width. The length of the gap and the length of the individual stripes that form skip lines shall not deviate more than two inches. The length of the gap and individual skip line shall be of such uniformity throughout the entire length of each that a normal striping machine will be able to repeat the pattern and superimpose additional striping upon the existing marking.
Section 704.03

Glass beads shall be applied at the rate specified herein and shall be evenly distributed over the entire surface of the marking. Beads shall be applied to the surface of liquid markings by a bead dispenser attached to the applicator that shall dispense beads simultaneously on and in the just-applied marking. The bead dispenser shall be equipped with a cut-off control synchronized with the cut-off of the applied marking material so that the beads are applied totally to the completed line. Beads shall be applied while the liquid marking is still fluid. Approximately 70 percent of beads shall be buried in the marking, and the remaining 30 percent shall be 50-60 percent embedded in the surface. Beads installed on crosswalks and stop lines on roadways with curbs only (no gutter) may be hand applied for two feet at the end of each line next to the curb with 100 percent of the beads embedded 50-60 percent in the surface.

Markings found to be unacceptable shall be removed, and new markings applied at the Contractor’s expense.

1. **Type A markings:** Paint may be applied to asphalt concrete and hydraulic cement concrete pavements. Paint shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed. Paint may be applied over existing paint markings.

Paint shall be applied with a line painting machine that is capable of hot spraying paint directly onto the pavement surface with a uniformity of feed through its nozzles for widths of 4 through 8 inches. The machine shall be capable of applying two pavement stripes, either solid or skip, at the same time when double line markings are required. Paint tanks on the equipment shall be equipped with a mechanical agitator and paint shall be thoroughly mixed and heated such that it will not track within 60 seconds after its application.

Non-truck mounted equipment shall be self-propelled and regulated to allow for calibration of the amount of material applied.

Glass beads shall be applied to the surface of the paint at the rate of 6 pounds per gallon of paint.

2. **Type B markings:**

Equipment shall be capable of providing mixing, heating and agitation of material. Material shall be uniformly heated throughout the system in accordance with the manufacturer’s recommendations. Thermoplastic material shall be maintained in the heating kettle and applied to the road surface at a minimum temperature of 400 degrees F. Heating kettles shall be equipped with an automatic thermostatic control device. The Contractor shall furnish a properly calibrated infrared instrument for the purpose of measuring the actual temperature of molten thermoplastic material. Multi-component material shall be applied using internally injected guns for the mixing of catalyst and hardener.
Section 704.03

Non-truck mounted equipment for application of thermoplastic material shall be of the screed extrude type with a screw drive or shall be self propelled and regulated to allow for calibration of the amount of material applied. Non-truck mounted equipment for application of polyester and epoxy resin material shall be self propelled and regulated to allow for calibration of the amount of material applied.

a. **Thermoplastic (Class I)** material shall only be applied on asphalt concrete pavements and shall be applied by screed extrude, ribbon gun or spray equipment. Alkyd thermoplastic may be applied directly after the paving operations, however hydrocarbon thermoplastic shall not be applied less than 30 days after the paving operations.

Alkyd and hydrocarbon materials shall not be mixed together. Equipment shall be thoroughly cleaned before types of material are changed.

Thermoplastic shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed. Thermoplastic may be applied over existing thermoplastic markings. For concrete bridge decks that occur in asphalt roadways, Type B, Class VI tape shall be used.

Primer/adhesive shall be applied to asphalt concrete surfaces more than two years old and shall be from the same manufacturer as the thermoplastic.

Glass beads shall be applied to the surface of the marking at the rate of 7 pounds per 100 square feet.

b. DELETED

c. **Epoxy resin (Class III)** material shall only be applied to asphalt concrete pavement more than one day old and hydraulic cement concrete pavement. Epoxy resin shall not be applied over existing pavement markings unless the existing marking is 90 percent removed.

Glass beads shall be applied by the gravity method to the surface at the rate of 25 pounds per gallon of material.

d. **Plastic-backed preformed tape** shall be installed in accordance with the manufacturer’s recommendations and as denoted herein. Tape may be applied to asphalt concrete and hydraulic cement concrete pavements. Tape may be installed immediately following the final rolling of the new asphalt concrete surface. Tape shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent removed.
Section 704.03

Primer/adhesive shall be used for all installations except when tape is applied immediately following the final rolling of the new asphalt concrete surface and shall be from the same manufacturer as the tape.

Tape for pavement line markings shall be applied by an application cart as recommended by the manufacturer. Tape shall be tamped into place with a tamper cart with the weight as recommended by the manufacturer. The use of a vehicle to ride over the markings for tamping will not be permitted.

(b) Eradication:

Eradication of pavement markings for restriping when required shall be in accordance with Section 512 except only 90 percent removal of the existing markings is required.

(c) Pavement Markers:

1. Snow-plowable raised pavement markers shall be installed by cutting two parallel grooves into the pavement at the depth and dimensions recommended by the manufacturer. Grooves shall be parallel to the adjacent pavement marking. Grooves shall be cut with saw blades having a diameter to match the curvature of the steel casting bottom and keels. Keel surfaces shall be free from scale, dirt, oil, grease, or any other contaminant that might reduce bonding.

Casting keels shall be bonded in the saw-cut grooves in the manner recommended by the manufacturer of the marker. The bonding material shall be from the Department’s approved list or as recommended by the manufacturer of the marker. Noses of the casting shall be installed flush with the pavement surface. The installed height of the raised pavement marker shall be approximately 1/2 inch above the pavement surface. Ambient temperature at the time of installation of the snow-plowable raised pavement markers shall be at least 50 degrees F or higher.

The top of reflectors shall be mounted flush with the top of the casting.

2. Raised pavement markers shall be bonded to the pavement surface in accordance with the manufacturer’s recommendations. Bonding material shall be from the Department’s approved list or as recommended by the manufacturer of the marker except epoxy shall not be used on asphalt concrete pavements.
704.04—Measurement and Payment.

Pavement line markings will be measured and paid for at the contract unit price per linear foot. This price shall include the pavement marking material, surface preparation, quality control tests, daily log, guarding devices, primer/adhesive, and glass beads.

Pavement message markings will be measured and paid for at the contract unit price per each per location. This price shall include the pavement marking material, surface preparation, quality control tests, daily log, guarding devices, primer/adhesive, and glass beads.

Pavement markers will be measured and paid for at the contract unit price per each. This price shall include prismatic retroreflectors, pavement cutting, adhesive, and castings.

Eradication of pavement markings will be measured and paid for in accordance with Section 512.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement line marking (Type and/or class and width)</td>
<td>Linear foot</td>
</tr>
<tr>
<td>Pavement message marking (Message)</td>
<td>Each</td>
</tr>
<tr>
<td>Pavement marker (Type, [ ]-way, and/or type pavement)</td>
<td>Each</td>
</tr>
</tbody>
</table>