f. capability of heating the material to application temperatures,

g. automatic device which will provide a line of the required pattern,

h. automatic bead dispenser which is synchronized with the marking application.

A hand-propelled machine may be used to apply markings. A brush may be used if approved to apply some markings.

**3. Performance Requirements**

The color and durability requirements shall be met for a minimum of 90 days after application.

Pavement marking segments which are found to have an average retro-reflectivity reading below the minimum required shall be re-striped with no additional payment. Pavement markings segments which have more than four of 16 individual readings below the minimum required shall be re-striped with no additional payment. The re-striping shall begin within 14 calendar days of the completion of the retro-reflectivity measurement. Line segments may be re-striped with no additional payment. Following each re-striping, additional retro-reflectivity measurements shall be made with no additional payment. Quality adjustments will be based on the final retro-reflectivity measurements. The alignment of all re-striped pavement markings shall be placed within ±1/4 in. in width and ±2 in. in length of the original placed markings. Re-striping will not be allowed more than two times, after which removal and replacement of the markings will be required.

**(b) Durable Pavement Marking Material**

Durable pavement marking material consists of thermoplastic, preformed plastic, or multi-component markings.

Durable pavement marking materials used for center lines, lane lines, or edge lines shall be installed within a groove in the pavement unless otherwise shown on the plans.

Durable pavement marking materials used for barrier lines, pavement message, and transverse markings shall be surface applied unless otherwise indicated on the plans.

**1. Grooving for Durable Pavement Markings**

**a. Application**

The pavement shall be grooved prior to the placement of longitudinal durable pavement markings, excluding bridge decks and approach slabs. The groove or recess shall be installed in a single pass using dry cut equipment that utilizes diamond cutting

blades and that is approved by the pavement marking manufacturer. If there are no markings on the pavement, a guide line shall be placed using paint without glass beads as a template for the grooving operation. The groove shall be at least 1 in. and no more than 2 in. wider than the pavement marking to be placed.

The Contractor may leave a gap in the grooving for longitudinal lines that delineate the radii of lane usage transitions, driveways, intersections, or adjacent to curb that does not have a curb offset to the marking of at least 12 in.

The depth of the groove shall be in accordance with the manufacturer's recommendations and shall be at minimum 5 mils greater than the thickness of the marking material including exposed glass beads, up to maximum allowable depth of 150 mils. A continuous groove shall not be allowed for broken or dotted lane lines. The groove may extend up to 3 in. at either end of a lane line. Grooves shall be no closer than 2 in. to the edge of a longitudinal joint.

**b. Groove Finish and Cleaning**

The grooved surface shall be cleaned with vacuuming equipment immediately following the grooving operation. The surface shall be clean and dry prior to pavement marking installation. The finished groove surface shall have a fine corduroy-like appearance with a maximum variation in depth of 10 mils.

**2. Thermoplastic**

**a. Application**

Thermoplastic marking shall be applied in molten form by conventional extrusion, by ribbon type extrusion, or spray when the pavement and ambient air temperatures are 50°F and rising. Heat bonded preformed thermoplastic may be used for transverse or message markings. The average final thickness of the thermoplastic marking shall be no less than 90 mils and no more than 125 mils. Immediately following the application of the thermoplastic markings, retro-reflectorization shall be provided by applying pavement marking beads to the surface of the molten material. A first drop of supplemental elements shall be applied in accordance with the manufacturer's recommendations and a second drop of standard, modified standard, or supplemental beads in accordance with the manufacturer's recommendations. Individual passes of markings shall not overlap or be separated by gaps greater than 1/4 in. longitudinally.

**b. Equipment**

The equipment used for the application of thermoplastic markings shall consist of a kettle for melting the material and an applicator for applying the markings. All of the equipment required for melting and applying the material shall maintain a uniform material temperature within the manufacturer specified limits, without scorching, discoloring or overheating any portion of the material.

A truck-mounted machine shall be equipped with the following: an air blast device for cleaning the pavement ahead of the marking operation; a guide pointer to