TO:

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

SUPERSEDED BY EI 96-020 EFFECTIVE 9/5/96

SUBJECT: REMOVABLE PAVEMENT MARKINGS

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APPROVED:

R. H. EDWARDS, Deputy Chief Engr., Fac. Design Division

§619-3.01, Basic Maintenance and Protection of Traffic, requires that some temporary pavement markings be removed in such a manner that the finished pavement is neither damaged nor left in a pattern that will mislead the motorist. Traditionally, temporary pavement markings have consisted of painted lines and the methods used to remove them haven't been entirely satisfactory because they sometimes scar the surface. At night, these scars could have the potential to mislead a motorist.

To overcome this problem, we issued EI 82-51 and developed Special Specification 15619.1901 thru .1904 for white & yellow lines, letters and symbols. In these specifications under Materials we had a Durability requirement of 30 days with 90% retention.

This approach was not without its problems and to improve on the situation, we are adopting the attached special specification replacing Items 15619.0901 thru 15619.1904. These specifications will allow additional suppliers and are clearer on who pays for stripes that come off the pavement prematurely. They also allow raised pavement markers at the contractor's option and in accordance with the New York State Manual of Uniform Traffic Control Devices.

They should be specified only where complete removal of temporary markings is necessary to avoid confusing drivers, such as on surfaces which will later be used to carry traffic in a direction skewed to the line. Roadway surfaces in the work zone that are scheduled for removal or resurfacing shall be marked and paid for under other items.

A future Construction Manual change will provide EIC's with additional guidance on the specification's use in the field.

The attached specifications are:

15619.1905 - White Construction Pavement Markings Removable Lines

15619.1906 - Yellow Construction Pavement Markings Removable Lines

15619.1907 - White Construction Pavement Markings Removable Letters

15619.1908 - White Construction Pavement Markings Removable Symbols

These items are Main Office inserts. They may be used with the letting of November 29, 1984.

ITEM 15619.1905 White Removable Reflectorized Pavement Stripes
ITEM 15619.1906 Yellow Removable Reflectorized Pavement Stripes
ITEM 15619.1907 White Removable Reflectorized Pavement Letters
ITEM 15619.1908 White Removable Reflectorized Pavement Symbols

DESCRIPTION. Under these items of work, the Contractor shall furnish, apply and remove pavement markings at the locations and in accordance with patterns indicated in the Contract Documents, the New York State Manual of Uniform Traffic Control Devices, or in the patterns and at locations directed by the Engineer.

GENERAL. Removable pavement marking materials shall meet the requirements of this specification and shall be either a preformed reflectorized marking tape or a prefabricated, raised type, reflectorized marker. No substitutions of another type of marking material will be allowed.

The Contractor shall have the option of supplying either type of marking material. If approved by the Engineer, both materials may be used in conjunction with each other to delineate a single work zone; e.g. tape for edgeline and markers for broken line.

MATERIALS.

A. General Requirements. Removable pavement markings shall consist of white and yellow preformed reflectorized tape or white and yellow, raised type, reflectorized markers.

Removable preformed reflectorized marking tape shall be composed of a pigmented plastic or polymeric film, on a reinforced conformable backing. A retro-reflective layer of glass spheres shall be bonded to, or embedded in the top surface. The preformed marking shall be pre-coated on its bottom side with a pressure sensitive adhesive and shall be capable of adhering to bituminous or portland cement concrete surfaces without the use of heat, solvents or other means.

Removable raised type reflective markers shall be designed as single units, and consist of an acrylic plastic or another type durable casing, containing one or two reflective faces. The marker casing shall be approximately square in shape and designed to provide maximum daytime delineation. The removable marker shall be adhered to bituminous or portland cement concrete surfaces using the adhesives and/or methods recommended by the manufacturer.

B. Physical Properties.

1. Color. White removable markings, as placed, shall be white, free from dirt or tint.

Yellow removable markings, as placed, shall be yellow, free from dirt or tint, and conform to Highway Color Tolerance Chart, PR #1 (U.S. Department of Transportation, Federal Highway Administration, December, 1972).

2. Size. Removable preformed marking tape shall be of the specified size and shape and conform to the applicable requirements of the M.U.T.C.D.

Removable raised type markers shall be fabricated to the following requirements:

a. Casing dimensions, min. - 4 in. x 4 in. x 0.75 in.

b. Area of each reflective lens, min - 0.38 sq. in.

3. Reflectance.

a. White and Yellow Preformed Tape. Glass spheres for retro-reflectivity shall have a refractive index of not less than 1.50, as determined by the liquid immersion method at 25 °C. The spheres shall be firmly bonded, or embedded in the surface of the marking tape.

The quantity of glass spheres shall be such that white and yellow preformed markings have the following initial average reflectance values at 0.2° and 0.5° observation angles and 86.0° entrance angle as measured in accordance with the testing procedures of Federal Test Method Standard 370. The photometric quantity to be measured shall be specific luminance (SL) and it shall be expressed as millicandles per square foot per foot candle.

Color	White		Yellow	
Observation Angle	0.2°	0.5°	0.2 °	0.5°
Specific Luminance, [(mcd./ft^2). fc^{-1}]	1770	1270	1310	810

b. White and Yellow Reflective Marker Lenses. White and yellow reflective lenses shall have the following initial average reflectance values, when measured with incident light parallel to the base of the marker, at an observation angle of 0.2 ° and entrance angles of 0° and 20°. The photometric quantity to be measured shall be specific intensity (SI) and it shall be expressed as candlepower per footcandle.

Color	White		Yellow	
Entrance Angle	0°	20°	0°	20°
Specific Intensity, (Candlepower/Footcandle)	1.0	0.4	0.6	0.24

NOTES:

1. Observation Angle. Shall mean the angle at the reflector between the observer's line of sight and the direction of light incident on the reflector.

2. Entrance Angle. Shall mean the angle in the horizontal plane between the direction of incident light and the

normal to the leading edge of reflective marker.

3. Specific Intensity. Shall mean the candlepower of returned light at the chosen observation and entrance angles for each footcandle of illumination at the reflector on a plane perpendicular to the incident light.

4. Photometric Test Procedure. The reflective marker to be tested shall be located with the center of the reflective lens at a distance of 5 feet from a uniformly bright light source, having an effective diameter of 0.2 inches. The return of light shall be measured using an annular ring photocell (0.37 in. I.D. x 0.47 in. O.D.). The photocell shall be shielded to eliminate stray light. The distance from the light source center to the photocell center shall be 0.21 inches. If a test distance of other than 5 feet is used, the source and receiver shall be modified in the same proportion as the test distance.

4. Removability. Preformed marking tapes and raised type markers shall be removable from bituminous and portland cement concrete pavements, intact or in substantially large pieces, either manually or by the use of a mechanical roll-up device, and without the use of heat, solvents, grinding or blasting. After removal, no permanent marks, scars or damage to the pavement surface shall result.

C. Basis of Acceptance. Removable marking materials shall be approved by the Materials Bureau. Detailed requirements and procedures for approval are available from the Materials Bureau.

Approval of removable markings will be based on Engineering analysis for conformance to this specification and controlled field testing prior to their use on a Department project. If the proposed marking meets the specification requirements and performs satisfactorily in the controlled field tests the product will be placed on the Department's "Approved List" of materials.

In no case shall the appearance of a marking material on the Department's approved list release the Contractor from compliance with the requirements under "Construction Details" of this specification. Neither shall its approval be considered a warranty by the State of satisfactory performance.

Project acceptance will be based on the appearance of the marking material on the Department's approved list of removable reflectorized pavement markings.

CONSTRUCTION DETAILS.

A. General. All pavement markings and patterns shall be placed as shown on the plans, or directed by the Engineer, and in accordance with the M.U.T.C.D.

When raised type marker units are used to simulate a pavement marking they shall be spaced and applied in accordance with the M.U.T.C.D.

Before any pavement marking work is begun, a schedule of operations shall be submitted for the approval of the Engineer.

The application of pavement markings shall be done in the general direction of traffic.

When required by the Engineer, the Contractor shall establish marking line points at twenty five (25) foot intervals throughout the length of pavement or as directed by the Engineer.

B. Application of Pavement Markings. All pavement marking materials shall be installed in accordance with the manufacturer's instructions.

C. Maintenance of Pavement Markings. The Contractor shall be responsible for the maintenance of temporary markings in the work zone, for the duration of the detour. Any marking material that fails to provide for any reason, both satisfactory daytime and nighttime delineation shall be replaced immediately by the Contractor. The replacement of unsatisfactory pavement markings shall be as directed by and to the satisfaction of the Engineer and shall be performed at no expense to the State.

D. Removal of Pavement Markings. All pavement markings shall be removed, intact or in large pieces, using manual methods or a mechanical roll-up device. The use of heat, solvents or other chemicals, grinders or blasters will not be allowed. After removal there shall be no resultant damage to, or permanent marks or scars on the pavement surface.

Temporary marks that remain as a result of adhesive residues and that will eventually be worn from the pavement will be allowed to remain, providing that they are not left in a pattern that will mislead or misdirect the motorist. The Engineer shall be the sole determiner of misleading temporary marks.

E. Damage to Pavement Surfaces. Any damage to the finished pavement surface, or any permanent marks or scars on the finished pavement surface (including remaining pavement marking material), that result from the removal of pavement markings shall be repaired as directed by and to the satisfaction of the Engineer at no expense to the State. The Engineer shall be the sole determiner of satisfactory repair and may, at his discretion, require complete removal and/or replacement of the damaged pavement section.

METHOD OF MEASUREMENT. Pavement striping will be measured by linear feet along the centerline of the pavement stripe, and will be based on a 4-inch

wide stripe. When raised type markers are used to simulate a pavement marking they shall be measured as a number of linear feet of simulated pavement stripe (e.g. a 10 foot longitudinal line segment is simulated by four, or more, individual marker units; the pavement striping will be measured as 10 linear feet, regardless of the number of markers installed.) Measurement for striping with a plan width greater or less than the basic 4 inches as shown on the plans or as directed by the Engineer, will be made by the following method:

$$\frac{\text{Plan Width of Striping (inches)} \times \text{Linear Feet}}{4 \text{ (inches)}}$$

No measurement will be made for the number of linear feet of gaps between broken and dotted line segments.

Letters and symbols will be measured by each unit applied. When raised type markers are used to simulate a letter or symbol they shall be measured as a simulated unit, regardless of the number of markers installed. A unit will consist of one letter or one symbol. Example: "SCHOOL" would be measured as six units.

BASIS OF PAYMENT. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

The non-payment and Liquidated Damage provisions of § 619-5 Basis of Payment - General shall apply to these items of work.

Progress payments will be made. Quantities will be measured for payment when the pavement striping is satisfactorily installed and payment will be 50%. The remaining 50% will be measured for payment following satisfactory removal of the pavement striping.

Payment will be made under:

Item No.	Item	Pay Unit
15619.1905	White Removable Reflectorized Pavement Stripes	Linear Foot
15619.1906	Yellow Removable Reflectorized Pavement Stripes	Linear Foot
15619.1907	White Removable Reflectorized Pavement Letters	Each
15619.1908	White Removable Reflectorized Pavement Symbols	Each