SECTION 321720
RETROREFLECTIVE SPRAYABLE THERMOPLASTIC PAVEMENT STRIPING AND MARKING

PART 1 - GENERAL

1.01 SUMMARY
- A. Section Includes: All labor, materials, equipment, tools, accessories, transportation, and services as required for Retroreflective Sprayable Thermoplastic Pavement Striping And Marking
- B. Related Requirements
  1. Section 321200, Flexible Paving
  2. Section 321300, Rigid Paving

1.02 PRICE AND PAYMENT PROCEDURES
- A. Refer to Section 012000, Price and Payment Procedures.

1.03 REFERENCES
- A. Section 84, Traffic Stripes and Pavement Markings of the City Standard Specifications.
- B. State of California Specifications Designation: 8010-004, Inspection, Testing and Other Requirements for Protective Coatings.
- C. California Test Method Designation: No. 423, latest revision.
- D. California Test Method Designation: No. 660, latest revision.
- E. California Department of Transportation, Standard Specifications.
- F. Federal Standard Designation: No. 595b
- G. American Association of State Highway and Transportation Officials, AASHTO Designation: M 247.
- H. American Society for Testing and Materials, ASTM Designation: E 11, ASTM Designation: G 53, ASTM Designation: D 2794, ASTM Designation: E 28, ASTM Designation: E 1347, ASTM Designation: E 313.
- I. California Code of Regulations Designation: Title 22.

1.04 ADMINISTRATIVE REQUIREMENTS
- A. Sequencing: If applicable, pavement markings shall not be applied until the final color coat has dried for a minimum of forty eight (48) hours.

1.05 SUBMITTALS
- A. Product Data: Submit a complete list of all materials proposed for use. The list shall show the specific label name of each product for each coat of finish. After review by the Engineer, no deviation from the list will be permitted without further approval.
- B. Glass beads : Submit proposed glass beads before use. Only reviewed and approved glass beads can be used.
- C. Samples: Provide sample finishes on the actual surfaces to be sprayed to verify appearance. Approved samples will become the standard for the work. Sample should be 1ft long minimum.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. Materials: Attention is directed to Section 6, Control of Materials of the City Standard Specifications and these Special Provisions. All materials required to complete the work under this contract shall be furnished by the Contractor.

1.07 SITE CONDITIONS
- A. Ambient Conditions
  1. No paint shall be applied when moisture is present on the surface to be painted or when the air temperature is below 40 degrees F. Painting shall not be done when winds are sufficient to cause spray dust

1.08 WARRANTY

A. Final Guarantee: Contractor shall provide guarantee per Section 7-1.23, Final Guarantee of the City Standard Specifications.

PART 2 - PRODUCTS

2.01 RETROREFLECTIVE SPRAYABLE THERMOPLASTIC PAVEMENT STRIPING AND MARKING REQUIREMENTS

A. Composition:
   1. The thermoplastic material shall be 100 % solids. The binder shall consist of thermoplastic resin and plasticizers, and shall be homogeneously incorporated with all necessary pigments, fillers, and glass beads to produce a traffic coating to meet the requirements as specified herein.

B. Form:
   1. The thermoplastic material shall be supplied in either block or granular form as requested in the purchase order.

C. Application Type:
   1. The thermoplastic material shall be formulated for spray application at 163 -191°C to produce a line 0.64 - 0.90 mm thick.

D. Glass Beads:
   1. Glass beads to be applied to the surface of the molten thermoplastic material shall be 1.9 IOR high-index virgin glass beads, from Potters Industries Inc (1-800-552-3237). or approved equal. Gradation, drop rate and coating shall be per manufacturer's specification. Drop rate shall not be less than 8 pounds per 100 square feet.

E. Characteristics of the Finished Thermoplastic:
   1. California Test Method Designation: No. 423 unless otherwise specified

		White/Blue	Yellow
a.	Glass Beads 1.9 IOR high-index virgin glass beads, percent by weight, minimum,	25	25
b.	Inert Fillers, insoluble in hydrochloric acid, Percent passing a screen having openings of 150µm, ASTM Designation: E 11	100	100
c.	Binder, percent by weight, minimum	25	25
d.	Density, g/ml, maximum	2.00	2.00
e.	Ring and Ball Softening Point, minimum ASTM Designation: E 28	93°C	93°C
f.	Test on material after 4 hours heat with stirring at 191°C + 1°C which includes 1 hour for meltdown and temperature stabilization.		
g.	Tensile Bond Strength to an unprimed abrasive blasted Portland cement concrete block, 1.59 mm thick film draw down at 191°C,tested at 25°C + 1°C, Mpa, minimum	1.24 Mpa	1.24 Mpa
h.	Brookfield Thermosel Viscosity,	0.2 - 1.0	0.2 - 1.0
i.	Spindle SC4-27, 20 rpm at 191°C, Pa.S	Pa.S	Pa.S

j.	Impact Resistance, 1.59 mm thick film draw down at 191°C on an unprimed abrasive blasted Portland cement concrete block, male indentor 15.9 mm diameter, no female die. Test at 25°C + 1°C, kilogram force meter, with no cracks or bond loss, minimum ASTM Designation: D 2794	0.57	0.57
k.	Daylight Luminous Reflectance ASTM Designation: E 1347	80 Minimum	42 - 59
l.	Color, yellow, shall match Federal Standard Designation: No. 595b, color No. 33538 and chromaticity limits shall lie within HUE = 580.0 - 583.5 nanometers, CHROMA x = 0.7050 - 0.5000y and BRIGHTNESS Y = 42 - 59, measured according to California Test Method Designation: No. 660	---	Pass
m.	Yellowness Index, calculated as YI = 100(A-B)/G, ASTM Designation: E313, maximum	6	---
n.	Ultraviolet Light and Condensation Exposure, 200 hours total: alternate 4 hours UV exposure at 60°C; 4 hours condensate exposure at 40°C, ASTM Designation: G 53 White/Blue - Yellowness Index, maximum Yellow - Must meet chromaticity limits as specified in 3.4.6.5	 20 ---	 --- Pass
o.	Abrasion Test - 400 g of graded glass beads between 600 - 850 µm diameter, 150 kPa air pressure, cast sample approximately 125 by 125 by 10 mm Weight loss, grams, maximum	10	10
p.	Hardness, Shore A-2 Durometer with 2 kg weight, at 46.1°C	15 – 40	15 – 40
q	Thickness (maximum)	70 mils	70 mils
r	Thickness (minimum)	50 mils	50 mils
s	Minimum retro-refletivicity	600 mcd• m^{-2}• lx^{-1}	600 mcd• m^{-2}• lx^{-1}

F. Other Requirements:
1. The thermoplastic material shall readily spray at temperatures between 163°C - 191°C.
2. When applied to the pavement, the thermoplastic material shall be sufficiently tack-free to carry traffic in not more than 2 minutes when the pavement surface temperature is 10°C, and not more than 10 minutes when the pavement surface temperature is 54°C.
3. Paint for traffic stripes and pavement stripes shall be four inches wide.

G. Workmanship:
1. The thermoplastic material shall readily spray at temperatures between 163°C - 191°C.
2. The pigments, glass beads, and fillers shall be well dispersed in the binder. The material shall be free from all skins, dirt, foreign matter, and other deleterious substances, and shall be of such composition that it will not bleed, stain, or discolor when applied to pavements.

3. Thermoplastic material shall not emit fumes which are toxic or injurious to persons or property when it is heated to application temperature. The material shall not emit excessive smoke during heating and application.

H. Shelf Life:
1. The thermoplastic material shall readily spray at temperatures between 163°C - 191°C. The material shall maintain the requirements of this specification for a minimum period of one year. Any materials failing to do so shall be replaced by the manufacturer at their expense.

I. Air Pollution Compliance:
1. This material shall comply with all applicable air pollution control rules and regulations.

J. Material Safety Data Sheets:
1. Material Safety Data Sheets shall be provided by the manufacturer to include health hazard information on the material when it is heated to application temperature.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions
1. Verify that the work to be painted is clean and dry to receive each coat of paint per manufacture specification. Should the Contractor find surfaces and conditions unacceptable, he shall at once report such conditions to the City and cease operations on the portion of the work affected. Application of paint shall occur only upon acceptance of surface and working conditions, and the Contractor shall be held responsible for the results. Clean all surfaces before painting by compressed air or other effective means..
2. Pavement surfaces to receive paint shall be in condition to insure complete bonding of the applied material, and shall be subject to inspection and approval before such work commences.

B. Inspections
1. This material shall be sampled and inspected in accordance with State of California Specification Designation: 8010-XXX-99, or as otherwise deemed necessary. State Specification Designation: 8010-XXX-99 is on file and obtainable at the Department of General Services, Division of Procurement.
2. The minimum size batch of thermoplastic traffic striping material sampled and tested shall not be less than 900 kg unless the total order is less than this amount.
3. On delivery, the thermoplastic will be sampled for compliance to specification. Material not meeting the specification shall be removed and replaced by the manufacturer at their expense, including all costs for handling, testing, and shipping.

C. Testing
1. All tests shall be performed according to the specified test methods, latest revision.

3.02 PREPARATION

A. Protection of In-Place Conditions
1. Surrounding areas, surfaces and appurtenances already in place shall be protected during installation of pavement markings.
2. Take special care to prevent spilling paint materials on surfaces not intended to receive them.

3.03 PREPARATION FOR DELIVERY

A. Packaging
1. Block Form
The thermoplastic material shall be packaged in suitable containers to which it will not adhere nor interact during shipment or storage. The blocks of cast thermoplastic material

shall be approximately 900 by 300 by 50 mm and shall weigh approximately 22.7 kg.

2. Granular Form
   The thermoplastic material shall be packaged in meltable bags which are compatible with the thermoplastic and which weigh approximately 22.7 kg when filled. The containers must have sufficient strength and be properly sealed to prevent breakage and leakage during normal handling.
3. Markings
   Each container label shall include: State Specification Designation Number, color, type of binder, manufacturer's name and address, date of manufacturer, and batch number. All markings on containers shall be legible and permanent. Markings shall not smear or rub off container. Containers failing to meet marking requirements will not be accepted.
   The containers and labeling shall meet all applicable US Department of Transportation and Interstate Commerce Commission regulations. Concerning the content, each container shall be labeled with such warnings or precautions as are required by local, state, and federal laws and requirements.

3.04 CLEANING

A. Take special care to keep surrounding surfaces clean as the work progresses, and upon completion carefully remove all paint from surfaces not intended to receive it. Use no materials or methods that will damage surfaces.

B. All excess glass beads shall be vacuumed from the surface. Surrounding surfaces shall be clean of NO glass beads.

END OF SECTION