ITEM 612 – REFLECTIVE THERMOPLASTIC STRIPPING MATERIALS (SOLID FORM)

612.1 Description

This standard specifies the requirement for reflectorized thermoplastic pavement striping material conforming to AASHTO M 249 that is applied to the road surface in a molten state by mechanical means with surface application of glass beads at a rate of not less than 350 g/L of glass beads having a size range of drop-in type and will produce an adherent reflectorized stripe of specified thickness and width capable of resisting deformation by traffic.

612.2 Materials Requirements

1. Reflectorized Thermoplastic Pavement Material shall be homogeneously composed of pigment, filler, resins and glass reflectorizing spheres.

The thermoplastic material shall be available to both white and yellow.

2. Glass Beads (Pre-Mix) shall be uncoated and shall comply with the following requirements:

Refractive Index, min. - 1.50
Spheres, Percent, min. - 90

Gradation:

Sieve mm	Mass Percent Passing
0.850	100
0.600	75-95
0.425	-
0.300	15-35
0.180	-
0.150	0-5

612.3 General Requirements

612.3.1 Composition

The pigment, beads and filler shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with the requirements as specified in Table 612.1.

Table 612.1 – Composition Requirements

Component	White	Yellow
Binder, min.	18.0	18.0
Glass Beads:		
min.	30	30
max.	40	40
Titanium Dioxide, min.	10.0	
Chrome Yellow, Medium, min.		10.0
Calcium Carbonate And Inert Fillers, Max.	42.0	42.0

612.3.2 Qualitative

The material shall conform to the qualitative requirements as specified in Table 612.2.

Table 612.2 – Qualitative Requirements

Property	Requirements	
	White	Yellow
Specific Gravity, max.	2.15	
Drying Time, minutes, max.	10.0	
Bond Strength to Portland Cement Concrete after heating for four (4) hours ±5 min. @ 218°C, MPa, max.	1.24	
Cracking Resistance @ low temp. after heating for four (4) hours ±5 min. @ 218 ±2°C.	No cracks	
Impact Resistance after heating for four (4) hours ±5 min. @ 218 ±2°C and forming test specimens, mm/kg, min.	115	
Softening Point after heating for four (4) hours ±5 min. @ 218 ±2°C.	102.5 ± 9.5°C	
Daylight reflectant @ 45 Degrees – 0 degrees, % min.	75	45

612.4 Application Properties

The material shall readily extrude at a temperature of 211 ± 7°C, from approved equipment to produce a line 3.2 to 4.8 mm thick which shall be continuous and uniform in shape having clear and sharp dimensions.

The material shall not exude fumes which are toxic, obnoxious or injurious to persons or property when heated during applications.

The application of additional glass beads by drop-in methods shall be at a rate of not less than 350 g/L of glass beads having a size range for drop-in type. The typical size range of spheres of drop-in type paints is as follows.

Passing 850 um (#20) sieve and retained on 250 um (#60) sieve, %	80 – 100

a) Preparation of Road Surface – the materials should be applied only on the surface which is clean and dry. It shall not be laid into loose detritus, mud or similar extraneous matter, or over an old paint markings, or over an old thermoplastic marking which is faulty. In the case of smooth, polished surface stones such as smooth concrete, old asphalt surfacing with smooth polished surface stones and/or where the method of application of the manufacturer of the thermoplastic materials shall be recommended, and with the approval of the Engineer.

b) Preparation of Thermoplastic Materials – The materials shall be melted in accordance with the manufacturer's instruction in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic and such the local overheating shall be avoided. The temperature of the mass shall be within the range specified by the manufacturer and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material shall be used as expeditiously as possible and for thermoplastics which have natural resin binders or otherwise sensitive to prolong heating the materials shall not be maintained in a molden condition for more than 4 hours.

c) Laying – Center lines, lane lines and edges lines shall be applied by approved mechanical means and shall be laid in regular alignment. Other markings may be applied by hand – screed, hand propelled machine or by self-propelled machine approved or directed by the Engineer. After transfer to the laying apparatus the materials shall be maintained within the temperature range specified by the manufacturer and stirred to maintain the right consistency for laying.

In the case of screen application, the material shall be laid to a thickness of not less than 3 mm or more than 6 mm unless authorized by the Engineer when laid over an existing markings. In the case of sprayed application the material shall

be laid to thickness of not less than 1.5 mm unless authorized by the Engineer. In all cases the surface produced shall be uniform and appreciably free from bubbles and steaks. Where the Contractor Documents require or the Engineer direct that ballotini shall be applied to the surface of the markings, these shall be applied uniformly to the surface of hot thermoplastic immediately after laying such that the quality of ballotini firmly embedded and retained in the surface after completion complies with the requirements of Sub-section 606.2.2, Material Requirements.

Road markings of a repetitive nature, other center lines, lane lines, etc., shall unless otherwise directed by the Engineer be set out with stencils which comply with the size and spacing requirements shown on the Plans.

d) Re-use of Thermoplastic Materials – At the end of day's as much as possible the material remaining in the heater and/or laying apparatus shall be removed. This may be broken and used again provided that the maximum heating temperature has not been exceeded and that the total time during which it is a molden condition does not exceed the requirements of Sub-section 606.2.3, Construction Requirements.

612.4.1 Defective Materials or Workmanship

Materials which are defective or have been applied in an unsatisfactory manner or to incorrect dimensions or in a wrong location shall be removed, the road pavement shall be made good and materials replaced, reconstructed and/or properly located, all at the Contractor's expenses and to the satisfaction of the Engineer.

612.4.2 Protection of the Traffic

The Contractor shall protect pedestrians, vehicles and other traffic adjacent to the working area against damage or disfigurement by construction equipment, tools and materials or by spatters, splashes and smirches or paint or other construction materials and during the course of the work, provide and maintain adequate signs and signals for the warning and guidance of traffic.

612.5 Sampling

A minimum weight of 10 kg. of Reflectorized Thermoplastic paint shall be taken for every 100 bags or fraction thereof.

612.6 Testing

The material shall be tested in accordance with AASHTO T 250 or with the appropriate method in ASTM designation.

612.7 Packing and Marking

The material shall be packaged in a suitable containers to which it will not adhere during shipment and storage. The blocks of cast thermoplastic material shall be approximately 300 x 915 by 51 mm and shall weigh approximately 23 kg. Each container label shall designate the color, manufacturer's name, batch number and date of manufacture. Each batch manufactured shall have its own separate number. The label shall warn the user that the material shall be heated to 211 ± 7°C during application.

612.8 Method of Measurement

The quantity of pavement markings to be paid for shall be the area as shown on the Plans of painted traffic line of the stated width and the area as shown on the plans of symbols, lettering, hatching and the like, completed and accepted.

The quantity shown in the Bill of Quantities represents the approximate quantity in square meter of pavement markings, with width as shown applied at the centerline of the road pavements to which may be increased or decreased depending on the Engineer's decision whether to require additional markings or delete parts of it. Other markings representing symbols, lettering, hatching and others in locations where they maybe required by the Engineer shall, likewise, be implemented by the Contractor using reflectorized thermoplastic pavement markings as approved and directed.

612.9 Basis of Payment

The quantities measured as determined in Subsection 612.8, Method of Measurement, shall be paid for at the appropriate contract unit price for the Pay Items shown in the Bid Schedule which price and payment shall constitute full compensation for furnishing and placing all materials, sampling and packing, for the preparation of the surface, and for all labor, equipment, tools and incidentals necessary to complete the Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
612(1)	Reflectorized Thermoplastic Pavement Markings (White)	Square Meter
612(2)	Reflectorized Thermoplastic Pavement Markings (Yellow)	Square Meter