

No. RW/NH-34016/6/92-S&R (R)

Dated, the 31st March, 2005

To

The Chief Engineers of States/UTs dealing with National Highways and Centrally Sponsored Schemes;
The Director General (Border Roads); The Chairman, National Highways Authority of India

Subject : Tentative Specifications for Cold Applied Reflective Road Marking Paint

Central Electrochemical Research Institute (CECRI), Karaikudi, a CSIR Laboratory, has developed a cold applied reflective road marking paint under Ministry's R&D Scheme No. R-40. Based on the study, tentative guidelines and specifications for Cold Applied Reflective Road Marking Paint have been prepared and are enclosed herewith. The guidelines and specifications may be adopted on trial basis in road works and feedback reported to the Ministry. These guidelines and specifications will be further updated based on the feedback received from user organizations.

2. It is requested that the contents of the circular may please be brought out to the notice of all field officers in your Organisation/Department.

*(Enclosure to Ministry of Shipping, Road Transport & Highways, (Department of Road Transport & Highways),
letter No. RW/NH-34016/6/92-S&R(R) Dated the 31.3.2005)*

Annex-I**Guidelines for applications of Cold Applied Reflective Road Marking Paint****1.1 General:**

- (i) The work under this section consists of marking traffic stripes using a solvent based cold applied paint.
- (ii) The cold applied paint shall be applied on the asphalt/cement concrete road surface by brush or by Road Marker [Spray equipment capable of spraying the paint on the road surface]. Glass beads shall be subsequently spread pneumatically on to the paint when it is still wet so that the beads will be firmly held by the paint after drying.
- (iii) Colour of the paint shall be white or yellow [IS Colour No. 356] as specified in the drawings or as directed by the engineer.
- (iv) Where the paint is to be applied on cement concrete pavement, no primer is necessary as in the case of hot applied thermoplastic material.

1.2 Cold Applied Paint Material:

1.2.1 General: The cold applied paint material shall be homogeneously composed of binder, pigment, extenders and other additives as required for the formulation.

1.2.2 Requirements:

- (i) **Composition:** The pigments and extenders shall be uniformly dispersed in the binder medium dissolved in organic solvents. The material shall be free from skin, dirt and foreign objects and shall comply with requirements indicated in Table 1.1

**Table 1.1. Proportions of Constituents of Paint
[Percentage by weight]**

Component	White	Yellow
Binder	25.0 min.	18.0 min.
Titanium Dioxide	20.0 min.	—
Calcium Carborate & cement filler	16.0 min.	29.0 min.
Yellow Pigments	—	14.0 min.

(ii) **Properties of Liquid Paint:**

- a. Non-Volatile Matter content by weight shall be a minimum of 65% as determined in accordance with test method ASTM D1644.
- b. The liquid paint shall have a density of 1.3 minimum as determined in accordance with test method ASTM D1475.

(iii) **Apperance Properties:**

- a. **Drying Time:** No Pickup Time of the paint as determined by the test method ASTM D711 shall be a maximum of 20 minutes at a wet film thickness of 350 microns. The paint shall set to bear traffic after 40 minutes when the ambient temperature is higher than 24°C.
- b. **Application Temperature:** The paint shall not be applied when the surface temperature of the road is higher than 40°C.

(iv) **Properties of the drie paint film:**

a. **Resistance to wear:**

When tested using a sand abrasion tester as described in ASTM D968, the quantity of sand required for removal of a 75 micron thick unbeaded dry film shall be greater than 65 liters.

OR

When tested using a Taber Abraser as described in ASTM D4060, the weight loss from a 75-micron thick unbeaded dry film shall be less than 80 milligrams using 500 grams load for 500 revolutions.

- b. **Elongation:** The unbeaded dry film shall pass the test in accordance with ASTM D1737 and ASTM D2205.
- c. **Water Resistance:** The unbeaded dry film shall pass the test in accordance with ASTM D1647 and ASTM D2205.
- d. **Skid resistance:** Skid resistance for the beaded dry film shall be not less than 45 as per BS 6044.
- (v) **Storage life:** The material shall meet the specifications for a period of one year. During this period, the paint material when stored in an airtight container shall not form skin. The material shall also not form a cake at the bottom of the container.

(vi) **Minimum thickness of the Unbeaded Cold Applied Paint Coat:**

- a. The minimum thickness of the wet unbeaded coat of paint shall not be less than 400 microns.
- b. The minimum thickness of the dry unbeaded coat of paint shall not be less than 200 microns.

(vii) **Retro-reflective Properties:**

- a. The co-efficient of retro-reflection as per British Standards BS EN 1436:1998 shall be as under:
For white paint (Beaded) $\geq 300 \text{ mcd/m}^2/\text{lux}$ on application
 $\geq 100 \text{ mcd/m}^2/\text{lux}$ after defect liability period of one year.

For yellow paint (Beaded) ≥ 200 mcd/m²/lux on application

≥ 100 mcd/m²/lux after defect liability period of one year.

- b. The Luminous Co-efficient as per British Standards BS EN 1436:1998 shall be as under:

For white paint (Unbeaded) ≥ 100 mcd/m²/lux on application

For yellow paint (Unbeaded) ≥ 80 mcd/m²/lux on application

(viii) **Marking:**

Each container of the cold-paint shall be clearly and indelibly marked with the following information:

1. The name, trade/patent mark
2. Batch No.
3. Month of Manufacture
4. Colour (White or Yellow)

(ix) **Sampling and Testing:**

The cold applied reflective road marking paint shall be sampled and tested in accordance with appropriate ASTM/BS test methods.

The contractor shall furnish to the employer a copy of certified test methods from the manufacturer of cold applied reflective road marking paint showing the results of:

- a. No pick up time as per ASTM D711.
- b. Resistance to wear as per ASTM D4060 or as per ASTM D968 from approved laboratories.
- c. A material safety data sheet shall be obtained from the manufacturer and kept with the paint materials.

1.3 Reflectorising Glass Beads

1.3.1 General: Reflection is achieved by pneumatically spreading glass beads on to the paint when it is still wet. The beads will be firmly held by the paint after drying.

1.3.2 The glass beads shall be transparent, colourless and free from milkiness, dark particle and excessive air inclusions. These shall conform to the requirements spelt out in clause 1.3.3.

1.3.3 Specific requirements:

- A. **Gradation:** The glass beads shall meet the gradation requirements as per No. 4 of BS6088 as given in Table 1.2.

Table 1.2. Gradation Requirements for Glass Beads

Sieve Size	Percentage Retained
250 micron	0-10
150 micron	80-100
Below 150 micron	0-20

- B. **Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.
- C. **Refractive Index:** The glass beads shall have a minimum refractive index of 1.50.
- D. **Free flowing properties:** The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test as given in Clause 1.3.4.

1.3.4 Test Methods: The specific requirements shall be tested with the following methods:

- (i) **Free-flow test:** Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the dish in a 250 mm inside diameter desiccator which is filled within 25 mm of the top of a desiccator plate with sulphuric acid water solution (specific gravity 1.10). Cover the desiccator and let it stand for 4 hours at 20 to 29 degree C. Remove sample from desiccator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 mm stem and 6 mm orifice. If necessary, initiate flow by lightly tapping the funnel. The glass spheres shall be essentially free of lumps and clusters and shall flow freely through the funnel.
- (ii) The requirements of gradation, roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS 6088 and BS 3262 (Part-I).
- (iii) The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification. However, if so required, these tests may be carried out as directed by the Engineer.

1.4. Application

1.4.1 Marking shall be done by machine. For locations where painting can not be done by machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

1.4.2 The cold applied paint shall be applied on the asphalt/cement concrete road surface by brush or by Road Marker [Spray equipment capable of spraying the paint on the road surface.] Glass beads @300 gms per sqm shall be subsequently spread pneumatically on to the paint when it is still wet so that the beads will be firmly held by the paint after drying.

1.4.3 The pavement temperature shall not be more than 40°C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt, grease oils and all other foreign matter before application of Paint.

1.4.4 The material, when formed in to traffic stripes, must be readily renewable by placing an overlay of a new material directly over an old line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes place.

1.4.5 Cold applied paint shall be applied in intermittent or continues lines of uniform thickness of at least 200-micron of unbeaded dry film thickness unless specified otherwise. When arrows or letters are to be provided, cold applied paint may be applied manually. In addition to the beads recommended for, a further quantity of 300 gms of glass beads per Sqm conforming to the above noted specification shall be sprayed uniformly in to a mono-layer on to the cold paint line in quick succession of the cold paint spraying operation.

1.4.6 The minimum thickness specified above in para 1.4.5 is exclusive of surface applied glass beads.

1.4.7 The finished line shall be free from ruggedness on sides and ends and be parallel to general alignment of the carriage way. The upper surface of the lines shall be of uniform level and free from streaks.

1.5 Preparation:

The cold applied reflective road marking paint shall be stirred well to form homogeneously with the thinner recommended/supplied by the manufacturer and put into the machine with the consistency level recommended by the machine manufacturer by using proper viscometers. The thinner shall not be added more than that recommended by the manufacturer to avoid bleeding.

1.6 Properties of finished road marking:

- (a) The stripe shall not be slippery when wet.
- (b) The marking shall not lift from the pavement in freezing weather.
- (c) After application and proper drying, the stripe shall show no appreciable deformation or discolouration under traffic and under road temperatures up to 60°C.
- (d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.
- (e) The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.
- (f) The colour of yellow marking shall conform to IS colour No. 356 as given in IS:164.

1.7 Measurement for payments

- 1.7.1 The painted markings shall be measured in Sq. Meters of actual area marked (Excluding the gaps, if any).