

No.RW/NH-33023/31/88-DO III

Dated, the 2nd May, 1994

To

The Secretaries, PWDs of all States/UT Governments; Chief Engineers of States/UTs, PWD (dealing with NHs and other Centrally sponsored schemes); Director General Border Roads; Director General (Works), Central Public Works Department; Chairman, National Highway Authority

Subject: Policy regarding installation of Road Signs using retro-reflective sheetings on National Highways

Guidelines regarding augmentation of Distance Informatory/ Destination Signs along National Highways were issued to Chief Engineers of all States and Union Territories dealing with National Highways vide this Ministry's letter No.NH-11047/1/87- DO.I dated 8th September, 1988. Additional clarifications/ guidelines on their procurement/installation, use of language, and warranty for satisfactory performance of these signs were subsequently issued vide this Ministry's letters No.NH- 11047/1/87-DO.I dated 21st December 1988, 7th July, 1980 and 11th March, 1993.

2. These guidelines inter-alia stipulated the use of retro- reflective sheeting of High Intensity Grade for use of road signs, satisfying Clause 801.3 on "Reflective Sheeting" of the Ministry's Specifications for Road and Bridge Works. Considering the overall needs of traffic guidance and regulation in relation to the type and importance of National Highways vis-a-vis the cost economics in use of retro-reflective sheetings, it has been decided to introduce retro-reflective sheeting of "Engineering Grade", in addition to the "High Intensity Grade" sheeting already in use for road signs. Appropriate specifications for "Engineering Grade" sheeting, as formulated in the Ministry, have been incorporated in the revised version of Clause 801.3 of this Ministry's Specifications for Road and Bridge Works (1988). A copy of the same is enclosed as Annexure-I for information and guidance in procurement and installation of road signs along National Highways.

3. With a view to facilitating and streamlining the process of installation of road signs using retro-reflective sheeting (both High Intensity and Engineering Grade) and making signing system more effective in traffic guidance and regulation, guidelines for the use of the type of retro-reflective sheeting, colour scheme for different signs and their transportation/storage, inspection and upkeep have been formulated by this Ministry. A copy of the same is enclosed as Annexure-II for guidance and adoption. It may be noted that these guidelines stipulate use of retro- reflective sheeting for mandatory/regulatory and cautionary/ warning signs, besides those already in use for informatory signs, on 2-lane and 4-lane NH sections. These also provide for a changed colour scheme for direction, destination, and place identification signs, keeping in view the international practices and the provisions contained in Vienna Convention on Road Traffic and Road Signs and Signals. This change has been made to render these signs more conspicuous, recognisable and readable and thereby attract better attention of the drivers both during day and night.

4. It is requested that the provision of road signs with retro-reflective sheeting, in accordance with the above guidelines, may be taken up so as to complete the installation process latest by December, 1996. Suitable proposals in this regard may be furnished to this Ministry early. It may be noted that the above guidelines cover installation of road signs on 2-lane and 4-lane sections of National Highways. The road signs on single lane/intermediate lane NH section shall, however continue to be provided as per the existing practice and conforming to IRC:67-1977.

5. The State/UT Governments may also like to consider introduction of retro-reflective sheeting in accordance with the above guidelines, for improving the road signing system on State Highways and other important State roads.

ANNEXURE-I

Enclosure to letter No.RW/NH-33023/31/88-DO III dated the 2nd May, 1994

801.3 TRAFFIC SIGNS HAVING RETRO-REFLECTIVE SHEETING

801.3.1. GENERAL REQUIREMENTS

The retro-reflective sheeting used on the sign shall consist of a white or coloured sheeting having a smooth outer surface which has the property of retro-reflection over its entire surface. It shall be weather-resistant and show

colour fastness. It shall be new and unused and shall show no evidence of cracking, scaling, pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having tested the sheeting for these properties in an unprotected outdoor exposure facing the sun for two years and its having passed these tests shall be obtained from a reputed laboratory, by the manufacturer of the sheeting. The reflective sheeting shall be either of Engineering Grade material with enclosed lens or of High Intensity Grade with encapsulated lens. The type of the sheeting to be used would depend upon the type, functional hierarchy and importance of the road.

801.3.2. HIGH INTENSITY GRADE SHEETING

This sheeting shall be of encapsulated lens type consisting of spherical glass lens elements adhered to a synthetic resin and encapsulated by a flexible, transparent water proof plastic having a smooth surface. The retro-reflective surface after cleaning with soap and water and in dry condition shall have the minimum co-efficient of retro-reflection (determined in accordance with ASTM standard E:810) as indicated in Table 800-1.

Table 800-1 - Acceptable Minimum Coefficient of Retro-reflection for High Intensity Grade (Candelas Per Lux Per Square Metre)

Observation Angle (in degrees)	Entrance Angle (in degrees)	White	Yellow	Orange	Green Red	Blue
0.2	-4	250	170	100	45	20
0.2	+30	150	100	60	25	11
0.5	-4	95	62	30	15	7.5
0.5	+30	65	45	25	10	5.0

When totally wet, the sheeting shall not show less than 90% of the values of retro-reflectance indicated in Table 800-1. At the end of 7 years, the sheeting shall retain at least 75% of its original retro-reflectance.

801.3.3. ENGINEERING GRADE SHEETING

This sheeting shall be of enclosed lens type consisting of microscopic lens elements embedded beneath the surface of a smooth flexible, transparent water proof plastic, resulting in a non-exposed lens optical reflecting system. The retro-reflective surface after cleaning with soap and water and retro-reflection (determined in accordance with ASTM standard: E-810) as indicated in Table 800-2.

Table 800-2 - Acceptable Minimum Coefficient of Retro-Reflection for Engg. Grade (Candelas Per Lux Per Square Metre)

Observation Angle (in degrees)	Entrance Angle (in degrees)	White	Yellow	Orange	Green	Red	Blue
0.2	-4	70	50	25.0	9.0	14.5	4.0
0.2	+30	30	22	7.0	3.5	6.0	1.7
0.5	-4	30	25	13.5	4.5	7.5	2.0
0.5	+30	15	13	4.0	2.2	3.0	0.8

When totally wet, the sheeting shall not show less than 90% of the values, of retro-reflection indicated in Table 800-2. At the end of 5 years, the sheeting shall retain at least 50% of its original retro-reflectance.

801.3.4. MESSAGES/BORDERS

The messages (legends, letters, numerals etc.) and borders shall either be screen-printed or of cut-outs. Screen printing shall be processed and finished with materials and in a manner specified by the sheeting manufacturer.

801.3.5. For screen-printed transparent coloured areas on white sheeting, the co-efficient of retro-reflection shall not be less than 50% of the values of corresponding colour in Tables 800-1 and 800-2, as applicable.

801.3.6. Cut out messages and borders, wherever used, shall be made out of retro-reflective sheeting (as per clause 801.3.2 or 801.3.3 as applicable), except those in black which shall be of non-reflective sheeting as specified by the manufacturer. The cutouts shall be bonded properly with the base sheeting in the manner specified by the manufacturer.

801.3.7. COLOUR

Unless specified otherwise, the general colour scheme shall be in accordance with IRC:67-1977, the colours shall be as stipulated in BIS Code 13:5-1961 "colour for Ready Mixed Plastics" viz.

Blue	-	IS colour No.166	:	French Blue.
Red	-	IS colour No.537	:	Signal Red.
Green	-	IS colour No.284	:	India Green.
Orange	-	IS colour No.591	:	Deep Orange.

The colours shall be durable and uniform in acceptable hue when viewed in daylight or under normal headlights at night.

801.3.8. ADHESIVES

The sheeting shall either have a pressure-sensitive adhesive of the aggressive-tack type requiring no heat, solvent or other preparation for adhesion to a smooth clean surface, or a tack free adhesive activated by heat, applied in a heat-vacuum applicator, in a manner recommended by the sheeting manufacturer. The adhesive shall be protected by an easily removable liner (removable by peeling without soaking in water or other solvent) and shall be suitable for the type of material of the base plate used for the sign. The adhesive shall form a durable bond to smooth, corrosion and weather resistant surface of the base plate such that it shall not be possible to remove the sheeting from the sign base in one piece by use of sharp instrument. In case of pressure-sensitive adhesive sheeting, the sheeting shall be applied in accordance with the manufacturer's specifications. Sheetings with adhesives requiring use of solvents or other preparation for adhesive shall be applied strictly in accordance with the manufacturer's instructions.

801.3.9. REFURBISHMENT

Where existing signs are specified for refurbishment, the sheeting shall have a semi-rigid aluminium backing pre-coated with aggressive-tack pressure sensitive adhesive. The adhesive shall be suitable for the type of material used for the sign and should thoroughly bond with that material to prevent the reflective sheeting from shocking off.

801.3.10. FABRICATION

801.3.10.1. Surface to be reflectorised shall be effectively prepared to receive the retro-reflective sheeting. The aluminium sheeting shall be used as substrate rigid backing upon which the retro-reflection sheeting is attached.

It shall be degreased either by acid or hot alkaline etching and all scale/dust removed to obtain a smooth plain surface before the application of retro-reflective sheeting. If the surface is rough, approved surface primer may be used. After cleaning, metal shall not be except by device or clean canvas gloves, between all cleaning and preparation operations and application of reflective sheeting primer. There shall be no opportunity for metal to come in contact with grease, oil or other contaminants prior to the application of retro-reflective sheeting.

801.3.10.2. Complete sheets of the material shall be used on the signs except where it is unavoidable. At splices, sheeting with pressure sensitive adhesives shall be overlapped not less than 5 mm. Sheetings with heat-activated adhesives may be spliced with an overlap not less than 5 mm or butted with a gap not exceeding 0.75 mm. Where screen printing with transparent colours is proposed, only butt jointing shall be used. The material shall cover the sign surface evenly and shall be free from twists, cracks and folds. Cut outs to produce legends and borders shall be bonded with the sheeting in the manner specified by the manufacturer.

801.3.11. WARRANTY

The contractor shall obtain a seven years warranty from the sheeting manufacturer for satisfactory field performance including stipulated retro-reflectance of the retroreflective sheeting of high intensity grade and a five years warranty for the retroreflective sheeting of engineering grade and pass on the same to the Engineer for the used sheeting. In addition, a seven year and a five year warranty for satisfactory in-field performance of the finished sign, with retroreflective sheeting of high intensity grade and engineering grade respectively, inclusive of the screen printed or cut out letters/legends and their bonding to the retro-reflective sheeting shall be obtained from the contractor/supplier and passed on to the Engineer. The contractor/supplier shall also furnish a certification that the signs and materials supplied against the assigned work, meeting all the stipulated requirements and carry the stipulated warranty.

801.4. INSTALLATION

801.4.1. Sign posts, their foundations and sign mountings shall be so constructed as to hold these in a proper and permanent position against the normal storm wind loads or displacement by vandalism. Normally signs with an area upto 0.9 sq. m. shall be mounted on a single post, and for greater area two or more supports shall be provided. Sign supports may be of mild steel, reinforced concrete or galvanised iron (G.I), Post-end(s) shall be firmly fixed to the ground by means of properly designed foundation. The work of foundation shall conform to relevant specifications as specified.

801.4.2. All components of signs and supports, other than the reflective portion and G.I. posts shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. Any part of mild steel (M.S.) post below ground shall be painted with three coats of red lead paint.

801.4.3. The signs shall be fixed to the posts by welding in the case of steel posts and by bolts and washers of suitable size in the case of reinforced concrete or G.I. Posts. After the nuts have been tightened, the tails of the bolts shall be furred over with a hammer to prevent removal.

801.5. MEASUREMENTS FOR PAYMENT

The measurement of standard cautionary, mandatory and information signs shall be in numbers of different types of signs supplied and fixed, while for direction and place identification signs, these shall be measured by area in square metres.

801.6. The contract unit rate shall be payment in full for the cost of making the road sign, including all materials, installing it at the site and incidentals to complete the work in accordance with the specifications.

ANNEXURE-II

Enclosure to letter No.RW/NH-33023/31/88-DO III dated the 2nd May, 1994

***GUIDELINES ON THE USE OF RETRO-REFLECTIVE SHEETINGS FOR ROAD
SIGNS ON 2-LANE AND 4-LANE NATIONAL HIGHWAY SECTIONS***

I. Retro-reflective sheeting of "High Intensity Grade" shall be used for -

- (i) All road signs (viz. regulatory/mandatory, cautionary/warning and informatory) on 4-lane National Highway (NH) sections;
- (ii) Mandatory/regulatory and cautionary/warning signs on 2-lane NH sections;
- (iii) Mandatory/regulatory, cautionary/warning and informatory signs on the existing 2-lane NH stretches which are to be widened to 4-lane carriageway in the next 2-3 years;
- (iv) All overhead signs.

2. Retro-reflective sheeting of "Engineering Grade" shall be used for informatory signs for 2-lane NH sections.

3. COLOUR SCHEME

- (i) Colour Scheme for mandatory/regulatory and cautionary/ warning signs shall conform to IRC:67-1977 "Code of Practice for Road Signs".
- (ii) Direction, destination and place identification signs shall have green background, white messages (legends, letters, numerals, etc.) and borders, instead of white background, black messages and borders.
- (iii) Colour scheme for facility information signs, other useful information signs and parking signs shall continue to conform to the provisions contained in IRC:67-1977 "Code of Practice for Road Signs".

4. In respect of informatory signs, the messages/ borders shall either be screen-printed or of cut-outs, while for warning and regulatory signs, these shall be screen-printed.

5. Clustering and proliferation of road signs shall be avoided for enhancing their effectiveness.

6. PRIORITY FOR REPLACEMENT

Existing road signs with retro-reflective sheetings, shall be replaced with signs adopting the above criteria, only if they are damaged, worn out or have outlived their useful service life.

7. TRANSPORTATION & STORAGE

- (i) While transporting the road signs for field installation, they should be secured vertically in racks to prevent them from rubbing against one another.
- (ii) All signs should be kept dry at all times and should not normally be stored in the open.
- (iii) The finished signs, if required, shall be stored in an upright position with space in between for air circulation.

8. INSPECTION & UPKEEP

- (i) Periodic inspection of road signs shall be carried out on a regular basis. During inspection, the following aspects shall be checked in particular and appropriate corrective measures adopted:-
 - (a) Condition of sign face - major cracking, blistering, missing message, etc.
 - (b) Orientation and structural stability of the post(s)
 - (c) Discolouration, streaking or fading of the sign
 - (d) Visibility of sign-roadside plantation or a structure may be hiding the sign
 - (e) Dirt or other substance on sign
 - (f) Damages/removal of the sign due to accident or vandalism
 - (g) Retro-reflectance properties
 - (ii) Sometimes, dirt, fungus or mildew can cause the signs to loose their retro-reflective properties. In case the dirt accumulation is severe and/or signs are in heavy industrial areas, washing of signs with a mild non-abrasive detergent free of solvents or alcohols should be carried out periodically.
 - (iii) Sometimes paper posters are pasted on the face of the road signs making them invisible. These should be immediately removed, apart from taking preventive action to avoid their recurrence.
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