

कार्यालय प्रमुख अभियन्ता (विकास)

एच विभागाध्यक्ष

Office of Engineer-in-Chief (Dev.) &  
Head of Department

उ०प्र०, लो०नि०वि०, लखनऊ-226001

UP PWD, Lucknow-226001

उत्तर प्रदेश सरकार  
लोक निर्माण विभाग



96 महात्मा गांधी मार्ग, लखनऊ-226001

96, Mahatma Gandhi Marg, Lucknow

Office : 0522-2237315, 2235472

Fax No. : 0522-2236716

E-mail : pwdeinc@gmail.com

पत्रांक १५५ ख०टी०/६० एम०टी०/सामान्य वर्ग/२०२३-२५

दिनांक २३-०१-२०२४

### कार्यालय-ज्ञाप

प्रदेश में लगातार बढ़ती सड़क दुर्घटनाएँ चिंता का विषय हैं। सड़क दुर्घटनाओं के प्रमुख कारणों में ओवरस्पीडिंग, ओवरलोडिंग, वाहन सुरक्षा उपकरणों का प्रयोग न करना, खराब रोड इंजीनियरिंग तथा दोषपूर्ण सड़क सुरक्षा उपाय आदि हैं। प्रायः यह भी देखा गया है कि सड़क सुरक्षा से संबंधित कार्य गुणवत्तापरक न होने एवं उनका समुचित रख-रखाव न होने के कारण भी मार्गों पर दुर्घटनाएँ घटित होती हैं।

मार्ग सुरक्षा के दृष्टिगत समय-समय पर परिपत्र/निर्देश दिए जाते रहे हैं, जिसमें परिपत्र सं०-62 दिनांक:-16.01.2019 सम्मिलित है। बढ़ती सड़क दुर्घटनाओं के दृष्टिगत ही आई०आर०सी० द्वारा रोड सेफ्टी से संबंधित विभिन्न कोड जैसे- आई०आर०सी०-67, आई०आर०सी०-35, आई०आर०सी०-79 को समय-समय पर संशोधित किया गया है। आई०आर०सी०-67-2012 के स्थान पर आई०आर०सी०-67-2022 तथा आई०आर०सी० 79-1981 के स्थान पर आई०आर०सी० 79-2019 लागू हो जाने के कारण परिपत्र सं०:- 62 में वृहद स्तर पर संशोधन किये जाने एवं रोड सेफ्टी कार्यों की निविदा तथा कार्य सम्पादन के सम्बन्ध में स्पष्ट दिशा-निर्देश दिये जाने के साथ-साथ विभागीय अधिकारियों को रोड सेफ्टी के प्रति अधिक गम्भीर व संवेदनशील बनाने की आवश्यकता है।

इस उद्देश्य से नवीनतम कोड्स एवं मोर्थ गाइडलाइन्स के परिपेक्ष्य में मार्गों पर विभिन्न सड़क सुरक्षा उपायों हेतु एतद्द्वारा नए दिशा-निर्देश जारी किये जाते हैं, जो तत्काल प्रभाव से लागू होंगे:-

**A- सड़क सुरक्षा से सम्बन्धित कार्यों यथा-रोड साईनेज, रोड मार्किंग, रोड सेफ्टी फर्नीचर, के निविदा प्रपत्रों/निविदा प्रक्रिया में निम्नानुसार प्राविधान सुनिश्चित किये जाये:-**

### CONDITIONS FOR ROAD SAFETY BIDDER

1. The bidder shall be original manufacturer of the retro reflective sheeting and road furniture or specifically certified authorized converter /applicator by the original manufacturer and shall submit such converter certificate and also the **legal agreement** copy during the bid submission. The authorization certificate issued by distributor, dealer/power of attorney holder shall not be entertained. The bidder should produce such authorization in the name of the work from the manufacturer. At the time of bidding bidder must take certificate from the sheet manufacturer for existing factory set up, which should include the facility of sign shop, plotter, roller and printer in case of digital printing.

**(Ministry/ IRC Reference – MoRTH Section 800, Page no. 333. Warranty and Durability – The contractor/ supplier is the authorized converter of sheeting manufacturer)**

2. Bidder / Converter shall have all the requisite machinery for manufacturing proposed items.



Converter needs to enclose the original proof of purchase of required equipments and shall enclose the legal letter from OEM(original equipment manufacturer) of sheet for acknowledging the setup of following machinery:(IRC Reference- As per IRC 67-2022, Clause no 6.5.2, 6.6, 6.7.6, 6.8, 6.9 )

- (a) 4 feet+ wide plotter and roller.
  - (b) Digital printer 48 Inches or more, which uses ink with low VOC emissions or as proposed by sheeting manufacturer. Necessary documentary proof in the form of purchase bills/ invoice copies/transfer papers thereof along with detailed specifications of the digital printer duly recommended by OEM sheeting should be submitted.
  - (c) Original design software license for printing on reflective sheeting. Bidder or Vendor should submit necessary documentary proof in form of purchase bills/ invoice copies thereof.
  - (d) The Bidder or authorized Supplier/Vendor must have inhouse fabrication unit for converting reflective sheeting and other metal items required for the project. The proof of the same shall be submitted along with bid submission.
3. The bidder shall demonstrate requisite experience for road signage/road safety/ road safety furniture works including signages being completed in the last 5 years.
  4. Certificate of non-blacklisting to be given by both bidder and OEM of the product stating that the firm is neither blacklisted nor convicted in the past by any Government department/ agency or any Government regulatory authority.
  5. Bidder must get the Make in India certificate from the manufacturer for Retro reflective sheeting and other road furniture. (As per MII content defined by GOI).

**Note-If signage work is a part of major road/ bridge work, then the contractor shall produce a tripartite agreement between the manufacturer, converter and the authority to ensure the warranty of signages/road safety furnitures. (As per IRC 67- 2022, Clause no 6.5.2, 6.6, 6.7.6, 6.8, 6.9 )**

**B. सड़क सुरक्षा/साईनेज से सम्बन्धित कार्य के भुगतान से पूर्व निम्नलिखित शर्तों/प्रक्रिया का पालन सुनिश्चित किया जाये।**

1. The contractor shall submit warranty certificate issued by sheet/road furniture manufacturer (10 years for Type XI and 7 years for Type IV) in original at the time of installation of signboards as per requirement of IRC 67:2022
2. The contractor shall conduct the tests by Reflectometer to verify the reflectivity value of thermoplastic road marking/ sign board at his own cost in presence of authority before payment
3. Copy of invoices from the manufacturer of road furniture installed shall be produced for payment.
4. Manufacturer Test certificate need to be submitted by the converter for the item supplied, along with the invoices for processing the payment.
5. **The contractor shall submit the inventory sheet for the signages along with the photographs, co-ordinates and KMZ file indicating the locations of signages installed for processing the bill.**
6. The contractor shall obtain from the sheeting manufacturer of retro reflective sheeting a Pre- qualification warranty certificate in original of ten years for Type XI, seven years for Type IV



sheeting. (Ministry/ IRC Reference – MoRTH Section 800, Page no. 333 & IRC 67 -2022 page 18. Warranty and Durability)

#### 7. Retro reflective road signages

a) A certificate of having tested the sheeting for following properties and passed these tests shall be obtained from Government Laboratory/ Institute, by the manufacturer of the sheeting.

- (i) Coefficient of Retro Reflection
- (ii) Day time color & luminance
- (iii) 3 years outdoor weathering
- (iv) Shrinkage
- (v) Flexibility
- (vi) Liner Removal
- (vii) Adhesion
- (viii) Impact resistance
- (ix) Specular gloss
- (x) Fungus Resistance

(Ministry/ IRC Reference – IRC-67 2022, Page no. 10, Point no. 6.7)

b). The contractor shall submit 3 years outdoor weathering test report of retro reflective sheeting from an Indian Govt Lab from the manufacturers. If sheeting manufacturer is not having 3 year outdoor weathering report tested in Indian condition then a certificate conforming to ASTM: D4956 specification on artificial accelerated weathering requirements from a reputed laboratory in India can be accepted provisionally.

(Ministry/ IRC Reference – IRC-67 2022, Page no. 10, Point no. 6.7)

c). All sign boards to be dated during fabrication with indelible marking to indicate the date of manufacturing of the road signages and actual date of installation at site in an unprotected outdoor exposure.

(Ministry/ IRC Reference – MoRTH Section 800, Page no. 334. Warranty and Durability)

- d) During the warranty/maintenance period , all signs shall be inspected at least twice a year both in day and night times and at least once a year in the rain by the authorized converter/ manufacturer. (Replacement will be according to IRC 67-2022 Clause no 6.7.3.2, Table 6.6 & Clause no 6.7.4.3, Table 6.9)
- e) Product conformance certificate in original from the manufacturer of retro reflective sheeting, stating that the material & test certificates conforms to **clause 6.7 & 6.9** of IRC 67-2022. The certificate shall also state that the manufacturer takes all the responsibilities for the quality of material conforming to the provisions contained in IRC 67-2022. Failure of providing required certificate or providing false details shall lead to black listing of bidder / manufacturer.
- f) Contractor along with sheeting manufacturer must give the declaration letter for using the Annexure -VII for each board as per Section 13.2 of IRC 67-2022.

#### 8. Road safety furnitures-

##### i. Road Stud/ Cat eye/ Raised Pavement Marker (RPM)

a) The contractor shall submit test reports of raised pavement marker lens for visual observation, abrasion test and coefficient of luminous Intensity being tested by any Indian Government test laboratories (CRRI/ ARAI/ ICAT/ CPRI) .(MORTH Section 800, ASTM D 4280).

- b) The contractor shall submit test reports of raised pavement marker compressive strength (min. 13635 Kgf) & flexural Strength (min. 909 Kgf) in accordance to ASTM D 4280 being tested by any Government test laboratories .

The test report shall include the following tests as per **(MORTH Section 800, ASTM D 4280)**

- i. Construction
- ii. Coefficient of Luminous Intensity
- iii. Initial Abrasive Resistance
- iv. Color
- v. Temperature Cycling
- vi. Compressive Strength
- vii. Flexural Strength
- viii. Lens Impact Strength

**(Ministry/ IRC Reference – MoRTH Section 800, Clause No. 804.7.3, Page no. 355)**

**ii. Solar Road Stud/ Solar Cat eye/ Solar Raised Pavement Marker**

1. The contractor shall submit test reports of solar raised pavement marker for compressive strength (min. 13635 Kgf) & flexural Strength (min. 909 Kgf) in accordance to ASTM D 4280 as prescribed in MORTH Section 800 being tested by any Government test laboratories (CRRI/ARAI/ ICAT/ CPRI).
2. The contractor shall submit test reports of solar raised pavement marker for requirement of IP 65 as per the provisions of IS:12063:1987 in accordance with ASTM D 4280 and MORTH Section 800 being tested by any Government test laboratories .
3. The contractor shall submit a warranty certificate in original, jointly signed by the contractor and manufacturer of Solar RPM at the time of completion of work.

**(Ministry/ IRC Reference – MoRTH Section 800, Clause No. 804.7.3, Page no. 355)**

**iii. Aluminum Flexible Prismatic Sheeting/ Hazard Marker**

1. The contractor shall submit the test reports of AFP of object markers as per the provisions of IRC 79:2019 & ASTM D 4956-09 being tested by any Government test laboratory (CRRI/ ARAI/ ICAT/ CPRI) for the following tests
  - a) Co-efficient of retro reflection
  - b) Flexibility
  - c) Impact Resistance
2. The contractor shall submit a warranty certificate in original jointly signed by the contractor and manufacturer of Aluminium Flexible Prismatic sheeting at the time of completion of work.

**iv. Median Marker**

1. The contractor shall submit the test reports of Flexible Median marker for reboundability and tensile test as per IRC 79:2019 being tested by Government test laboratory (CRRI/ ARAI/ ICAT/ CPRI).
2. The contractor shall submit a warranty certificate in original jointly signed by the contractor and manufacturer of Flexible Median Marker at the time of completion of work.

**v. Road Delineator**

1. The contractor shall obtain from the manufacturer of Road Delineator a warranty certificate in original for two years replacement warranty. It should also conform that the delineator offered is made using Type XI retro reflective sheeting as per IRC 79-2019.

2. A certificate of having tested the Type XI sheeting for following properties and its having passed these tests shall be obtained from Government Laboratory Institute, by the manufacturer of the Sheeting.

- (i) Coefficient of Retro Reflection
- (ii) Day time color & luminance
- (iii) 3 years outdoor weathering
- (iv) Shrinkage
- (v) Flexibility
- (vi) Liner Removal
- (vii) Adhesion
- (viii) Impact resistance
- (ix) Specular gloss
- (x) Fungus Resistance

**(Ministry/ IRC Reference – IRC-67 2022, Page no. 10, Point no. 6.7)**

3. The contractor shall submit test reports for 3 years outdoor weathering test in Indian condition of Type XI retro reflective sheeting being tested by any Government Laboratory/Institute within 3 years of launching of product in India.

**(Ministry/ IRC Reference – IRC-67 2022, Page no. 10, Point no. 6.7)**

## **C. सड़क सुरक्षा से सम्बन्धित विभिन्न महत्वपूर्ण एवं updated items का संक्षिप्त विवरण:-**

### **➤ Road Signage (IRC 67-2022)**

The purpose of road signs is to ensure road safety and efficiency by providing for the smooth and safe movement of all road users on all type of roads . Road signs notify regulations and provide warning and guidance needed for safe, uniform and efficient traffic movement . The traffic signs should be uniform which simplifies the task of the road user by helping in recognition and understanding, thereby reducing perception/reaction time. Uniformity assists road users, traffic police and highway agencies by giving everyone the same interpretation message.



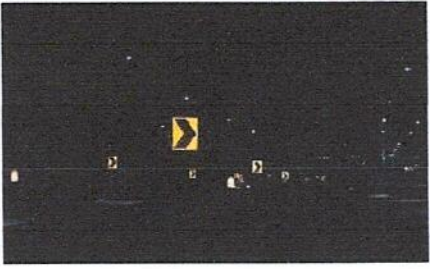

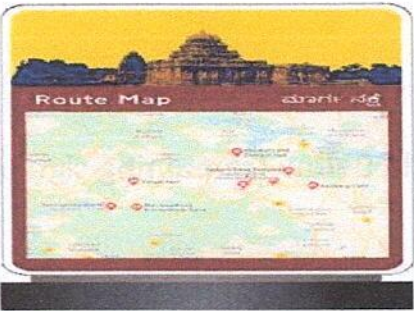
#### **(a) Ministry Guidelines**

The guidelines that are followed for Road Signs are:

- a. IRC: 67 2022 .
- b. MoRTH Section 800.
- c. IRC SP 73-2018, IRC SP 84-2019, IRC SP 87-2019






**(b) Details of Few Important Sign Boards as per Table Below (remaining sign boards can be fetched from IRC 67-2022)**



S.No.	INDICATIVE IMAGE	DESCRIPTION	LOCATION
1		<p><b>Cantilever Butterfly/ Cantilever</b></p> <p>Size: 5400mm x 2100mm/ as per requirement</p>	<p>All the junctions</p>
2		<p><b>Cautionary Boards</b></p> <p>Size: 900mm triangle / as per requirement</p>	<ul style="list-style-type: none"> <li>• Two-way approach road</li> <li>• School Zone</li> <li>• Pedestrian Crossing</li> <li>• Median Opening</li> <li>• Curve treatment</li> <li>• Rock falling Zone</li> </ul>
3		<p><b>Chevron Boards</b></p> <p>Size: 500 X 600 mm or 750x 900 mm / as per requirement</p>	<p>On curvature of the road</p>
4		<p><b>Facility information Boards</b></p> <p>Size: 800 X 600 / as per requirement</p>	<p>All Bus Stops / all facility location</p>
5		<p><b>Map Sign Board</b></p> <p>Size: as per requirement</p> <p>Scenario: You are Here</p>	<p>All tourism /important place, along with major bus stops/public gathering areas</p>



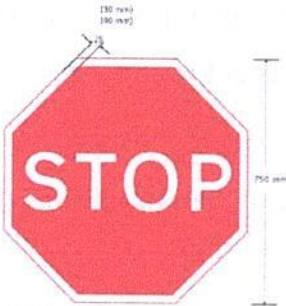




6		<p><b>Other useful Information Sign</b> Size: 600x800</p> <p>Scenario: Parking</p>	<p>All Parking lots</p>
7		<p><b>Speed Limit Boards</b> Size: 900mm Circle</p> <p>Scenario: Speed Limit</p>	<p>All roads</p>
8		<p><b>Street name board</b> Size: 1600 x 900</p> <p>Scenario: Street/Colony</p>	<p>Double Road</p>
9		<p><b>U-Turn Board</b> Size: 600 x800mm</p> <p>Scenario: U-Turn</p>	<p>All U-Turns</p>
10		<p><b>Way finding sign board - Advance Direction</b> Size: may change based on matter</p> <p>Scenario: Direction information</p>	<p>Before junctions</p>

11		<b>School/Hospital sign board</b>	All School & Hospitals
12		<b>AFP</b> Size: NA Scenario: Poles & Culverts	All Pillars on road and Along all Culverts
13		<b>Overhead Gantry</b> Size: 7m x 1.8m (for 2 lane road) and size may change depends on matter and number of lanes Scenario: major junctions	before major junctions
14		<b>Flag Type Direction Sign</b> Size: change based on matter Scenario: The sign shows where a road leads	At major roads before major junctions
15		<b>Place Identification Sign</b> Size: change based on matter Scenario: The sign should be used along highways to mark entrance to the place or city.	At all intersections in all arms.





16		<p><b>Reassurance Sign</b>  Size: change based on matter  Scenario: to reassure a driver of a vehicle that the desired direction is being followed.</p>	<p>It should be erected at the entrance to the area under the jurisdiction of the local authority</p>
17		<p><b>Gateway Sign</b>  Size: change based on matter  Scenario: to distinguish the new speed limit applicable at the approach road.</p>	<p>It shall be placed on approach to a town or an old town area, or on local roads merging with any arterial/sub-arterial roads</p>
18		<p><b>STOP Sign</b>  Size-750mm/900mm as per approach speed  Scenario- In side roads where visibility funnel is not achieving and in Toll plaza area</p>	<p>In all minor roads approaching/intersecting major road where visibility funnel is obstructed</p>
19		<p><b>Give Way Sign</b>  Size-600mm/900mm as per approach speed  Scenario- In side roads and roundabouts</p>	<p>In non-urban areas at all junctions having equal priority on all approaches (like National Highway meeting National Highway or State Highway meeting a State Highway)</p>
20		<p><b>School Zone with Speed Limit</b>  Size: 1820mm x 1200mm  Scenario- On approach to the school zones</p>	<p>On approach to school zones</p>






### (c) Material Inspection Details

As per IRC:67 2022 recommendation the material used for making signs are as under. The converter shall ensure the use of recommended material only and the same need to be checked at site by the site engineer. The list is given below:



- a) **Concrete:** Concrete shall be of M25 grade.
- b) **Reinforcing Steel:** Reinforcing steel shall conform to the requirements of IS 1786 unless otherwise specified.
- c) **Bolts, Nuts and Washers:** High strength bolts shall conform to IS 1367 whereas precision bolts, nuts, etc. shall conform to IS 1364.
- d) **Aluminum Composite Panel:** ACM sheets used for sign boards is a sandwiched construction with a thermoplastic core of 'Low Density Polyethylene' (LDPE) between two thick skins/sheets of aluminum with overall thickness of 4 mm, and aluminum skin thickness of 0.5 mm respectively on both sides.
- e) **Retro-reflective Sheeting:** As per IRC:67 2022 Clause 6.7 the general guidelines for selecting retro-reflecting sheeting are given as under:
  - The retro reflective sheeting used on the signs shall consist of white or colored sheeting having a smooth outer surface which has the property of retro reflection over its entire surface.
  - It shall be weather resistant and exhibit color fastness.
  - It shall be new and unused and show no evidence of cracking, scaling, and pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion.
  - A certificate of having the sheeting tested for coefficient of retro reflection, daytime color and luminance, shrinkage, flexibility, liner removal, adhesion, impact resistance, specular gloss and fungus resistance, 3 years outdoor weathering and its having passed these tests shall be obtained from International/Government Laboratory/ Institute by the manufacturer of the sheeting and in case the certificate is obtained from international agency, it should also be obtained from Indian agency within 3 years of launching of product by the manufacture in abroad.
  - Alternatively, a certificate conforming to ASTM Specification (D 4956-) on artificial accelerated weathering requirements from a reputed laboratory in India can be accepted provisionally.

f)

### Guidelines for checking material used for different kind of signage:

Type of Board	ACP to be used	Type of Sheeting	Back Support Frame details	Post Details	Foundation Details	Message/ Letters	Warranty
<b>Cautionary Boards</b> 	Overall thickness-4mm Aluminum skin thickness-0.5mm	Type-XI or Type-IV as per site requirement	25mmx25mmx3mm angle	75mmx75mmx6 mm	450mmx450mmx600 mm of M25 grade	Screen printed or of cut out from transparent durable overlay or cut out from the same type of reflective sheeting	7 years for Type-IV and 10 years for Type-XI sheeting.
<b>Mandatory Sign Boards</b> 	Overall thickness-4mm Aluminum skin thickness-0.5mm	Type-XI or Type-IV as per site requirement	25mmx25mmx3mm angle	75mmx75mmx6 mm	450mmx450mmx600 mm of M25 grade	Screen printed or of cut out from transparent durable overlay or cut out from the same type of reflective sheeting	7 years for Type-IV and 10 years for Type-XI sheeting.
<b>Directional or place identification signs up-to 0.9 sq.m</b> 	Overall thickness-4mm Aluminum skin thickness-0.5mm	Type-XI or Type-IV as per site requirement	25mmx25mmx3mm angle	75mmx75mmx6 mm	450mmx450mmx600 mm of M25 grade	Cut-out from durable transparent overlay film or cutout from the same reflective sheeting only.	7 years for Type-IV and 10 years for Type-XI sheeting.



<b>Directional or place identification signs above 0.9 sq.m</b> 	Overall thickness-4mm Aluminum skin thickness-0.5mm	Type-XI or Type-IV as per site requirement	35mmx35mmx5mm angle	75mmx75mmx6mm	450mmx450mmx600mm of M25 grade	Cut-out from durable transparent overlay film or cutout from the same reflective sheeting only.	7 years for Type-IV and 10 years for Type-XI sheeting.
<b>Cantilever Sign Board</b>	Overall thickness-4mm Aluminum skin thickness-0.5mm riveted with 6mm aluminum rivets	Type-XI	40mmx40mmx3mm	350 NB (355.60 mm OD) pipe with 7.92 mm wall thickness	PCC 2m*2m*0.1m=0.4 Cum Raft 1.8m*1.8m*0.23m=0.7452 Cum Column 0.9m*0.9m*2.07m=1.6767 Cum	Cut-out from durable transparent overlay film	10 years for Type-XI sheeting.
<b>Gantry Sign board</b> 	Overall thickness-4mm Aluminum skin thickness-0.5mm riveted with 6mm aluminum rivets	Type-XI	40mmx40mmx3mm	350 NB (355.60 mm OD) pipe with 7.92 mm wall thickness	PCC 1.7m*1.7m*2.1m=0.289 Cum Raft 1.5m*1.5m*0.23m=0.517 Cum Column 0.9m*0.9m*2.3m=1.863 Cum	Cut-out from durable transparent overlay film	10 years for Type-XI sheeting.

### Suggested Guidelines for Usage of Retro-Reflective Sheeting

Class of Sheeting	Type of Sheeting (ASTM)	Category of Road				
		Expressway	National / State Highway	Major District Roads	Other District Roads and Village Roads	Urban/ City Roads
CLASS A	Type I	No	No	No	Yes	No
CLASS B	Type IV	No	No <sup>#</sup>	Yes	Yes	No <sup>#</sup>
CLASS C	Type IX	No	No	Yes <sup>\$</sup>	No	Yes
	Type XI	Yes	Yes	Yes <sup>\$</sup>	No	Yes

# - for Work Zone, Type IV can be used

\$ - Optional: can be used based on site requirements



### (d) Color Pattern of Signages for Various Categories of Roads

The mandatory and warning signs shall be provided with white background and red border. The legend/symbol for these signs shall be in black.

Color pattern for **direction information** signs is given below in the table:

Road Type	Background	Arrows/Border/Letters
Expressway	Blue	White
National Highway (NH)	Green	White
State Highway (SH)	Green	White
Major District Road (MDR)	Green	White
Village Road (ODR & VR)	White	Black
Urban/City Road	Blue	White

### (e) Size of Letters

Letter size should be chosen with due regard to the speed, classification and location of the road, so that the sign is of adequate size for legibility but without being too large or obtrusive.

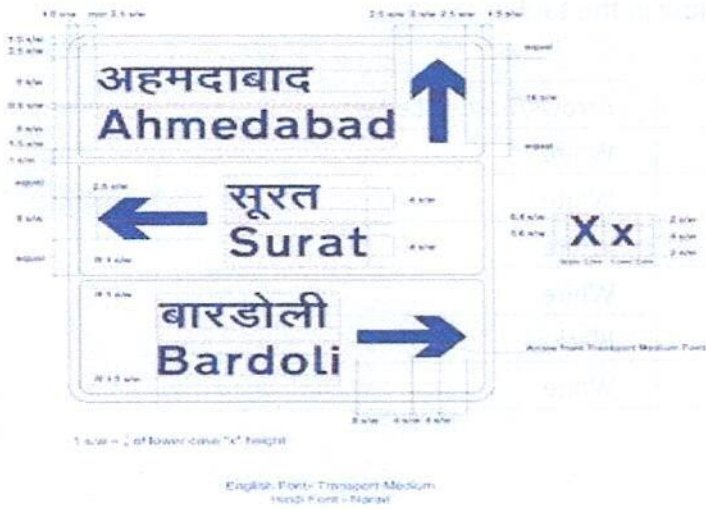
The size of the letter, in terms of x-height, to be chosen as per the design speed is given in table below:

Design Speed (Kmph)	Advance Direction Signs (Shoulder Mounted)					Flag Type Direction Signs Reassurance Signs Place Identification Signs			Overhead Direction Signs		
	"x" height (mm) lower case	"X" height (mm) upper case	Minimum clear visibility to the sign (m)	ONE Sign: Distance from junction (m)	TWO Signs: Distance between 1 <sup>st</sup> and 2 <sup>nd</sup> sign (m)	"x" height (mm) lower case	"X" height (mm) upper case	Minimum clear visibility to the sign (m)	"x" height (mm) lower case	"X" height (mm) upper case	Minimum clear visibility to the sign (m)
1	2	3	4	5	6	7	8	9	10	11	12
Up to 30	70	100	55	20	Nil	55	75	35	210	290	155
31 - 50	100	140	75	45	45	80	110	55			
51 - 65	125	175	95	90	50	100	140	65			
66 - 80	175	245	130	90 - 150	70	140	195	95			
81 - 100	215	300	160	150 - 225	100	170	240	115	250	350	190
101 - 120	305	425	230	225 - 300 See Note 1	100 See Note 1	245	345	165	330	460	250
121 - 150	340	475	255	See Note 1	See Note 1	270	380	180	380	530	285

Note: Where there are site/space constraints, 80 percent of the values shall be adopted for x height

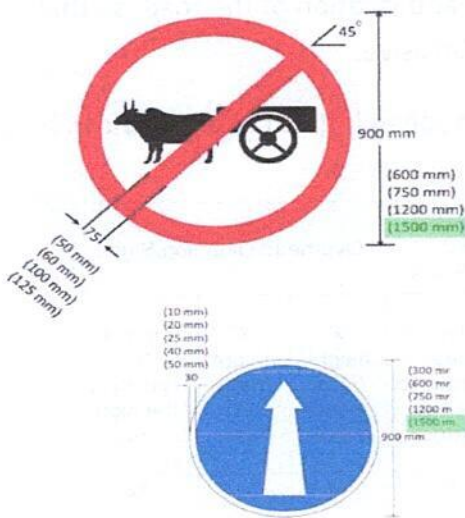
#Derived from the first principle presented in **Annexure VI**

**(f) Sign Design-Informatory signs**



**Sign Sizes – Cautionary and Regulatory Signs**

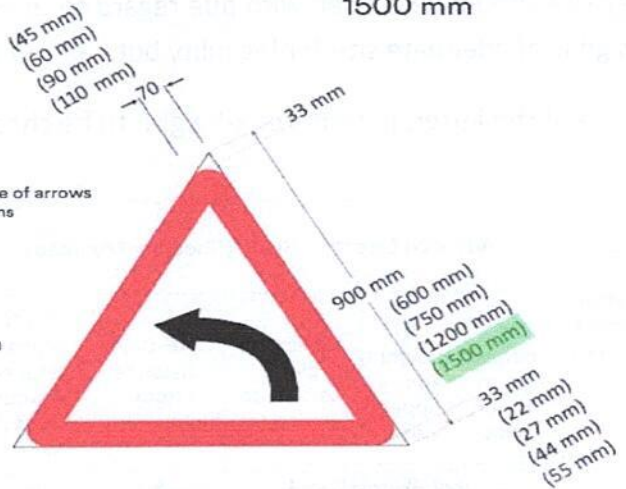
Extra Large Size - 1500 mm



Uniformity in case of arrows and icons

Radius - 45 mm

- (30 mm)
- (37.5 mm)
- (60 mm)
- (75 mm)



Clarity Regarding Side Dimensions after Smoothing

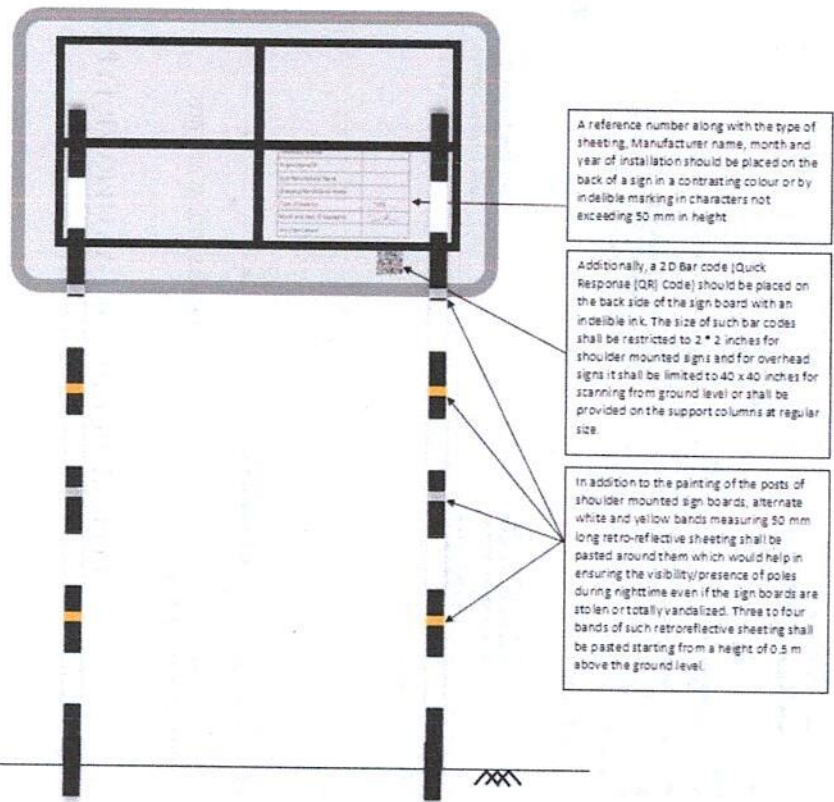
**(g) Maintenance of Sign Boards**

Below mentioned are the mandatory conditions for the maintenance of sign boards and they must be followed by converter and monitored by the authorities.

- **For Type-IV Retro-reflective sheeting:** For the sign boards made of Type-IV retro reflective sheeting, the converter must submit a Pre-Qualification Warranty for 7-years at the time of bidding and subsequently after the completion of work, actual warranty of 7-years must be submitted by the converter to the authorities.



- **For Type XI Retro-reflective sheeting:** For the sign boards made of Type-XI retro reflective sheeting, the converter must submit a Pre-Qualification Warranty for 10-years at the time of bidding and subsequently after the completion of work, actual warranty of 10-years must be submitted by the converter to the authorities.
- A reference number along-with the month and year of installation, & converter details should be placed on the back of a sign in a contrasting color or by stamping in character not exceeding 50mm in height.
- All signs shall be inspected at least twice a year both in day and night times and atleast once a year in the rain. **(Replacement will be according to IRC 67-2022 Clause no 6.7.3.2, Table 6.6 & Clause no 6.7.4.3, Table 6.9)**
- All signs should be replaced at the end of the warranty period provided for the retro-reflective sheeting used on the sign.
- Damaged signs should be replaced immediately.
- The posts and other components of the sign boards, except the retro- reflective part should be painted periodically in every 2-year.
- In case of overhead signs, adequate provision is to be made to have access to the signs for maintenance activities. This must be ensured at the time of installation.
- Details regarding the installation and maintenance of road sign to be given as per IRC 67-2022. Sign post shall be given with 3-4 bands of retro reflective strips to enhance the safety and shall be provided as per IRC 67-2022



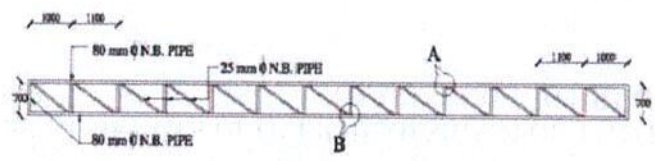
A reference number along with the type of sheeting, Manufacturer name, month and year of installation should be placed on the back of a sign in a contrasting colour or by indelible marking in characters not exceeding 50 mm in height

Additionally, a 2D Bar code (Quick Response (QR) Code) should be placed on the back side of the sign board with an indelible ink. The size of such bar codes shall be restricted to 2 \* 2 inches for shoulder mounted signs and for overhead signs it shall be limited to 40 x 40 inches for scanning from ground level or shall be provided on the support columns at regular size.

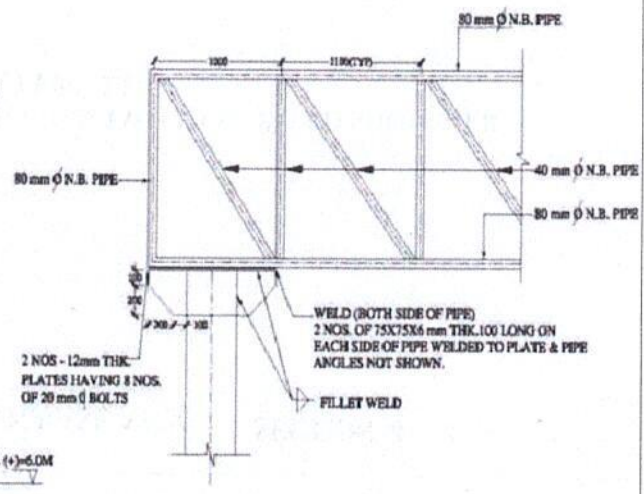
In addition to the painting of the posts of shoulder mounted sign boards, alternate white and yellow bands measuring 50 mm long retro-reflective sheeting shall be pasted around them which would help in ensuring the visibility/presence of poles during nighttime even if the sign boards are stolen or totally vandalized. Three to four bands of such retroreflective sheeting shall be pasted starting from a height of 0.5 m above the ground level.



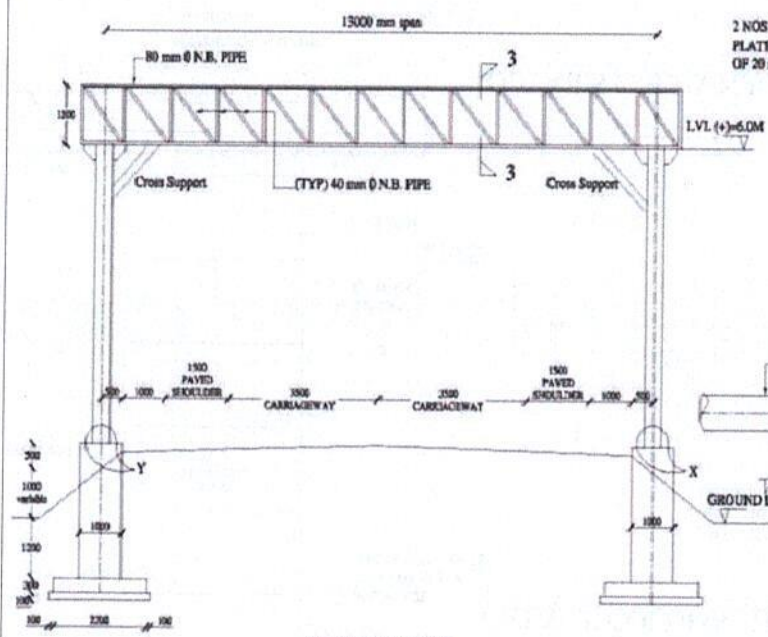




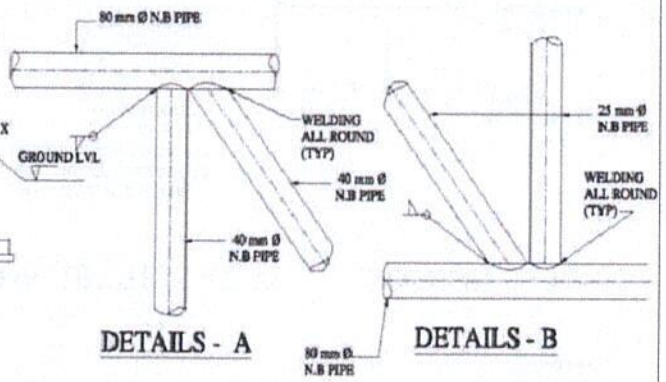
TOP AND BOTTOM PLAN



SECTION 2-2



ELEVATION



DETAILS - A

DETAILS - B

TYPICAL DETAILS OF OVER HEAD SIGNS FOR TWO LANE & TWO LANE PAVED SHOULDER CARRIAGEWAY (PORTAL TYPE) 1/2

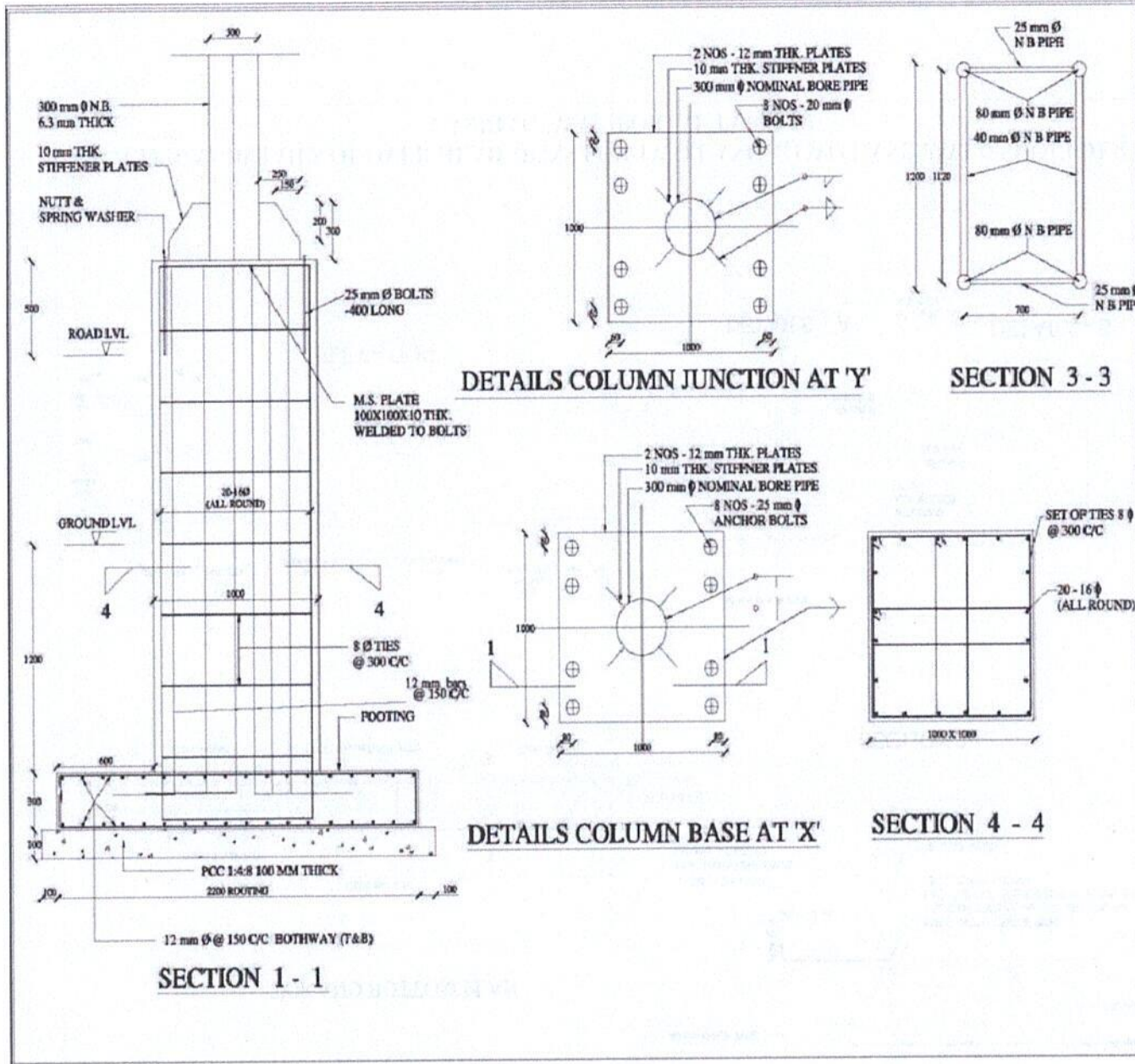
NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE MENTIONED.
2. ONLY THE WRITTEN DIMENSIONS ARE TO BE FOLLOWED AND NO DIMENSION SHALL BE CALLED.
3. SAFE BEARING CAPACITY HAS BEEN TAKEN AS 10 TONS/SqM.
4. CONCRETE GRADE SHALL BE M20.
5. CLEAR COVER TO THE OUTERMOST STEEL SHALL BE -
  - (a) MEMBERS = 40mm
  - (b) FOUNDATION = 50mm
6. STEEL TUBES USED ARE DESIGNATED BY THEIR NOMINAL BORES INDICATED ON DRAWING.
7. STEEL TUBES USED ARE CLASSIFIED MEDIUM TYPE STEEL TUBES.
8. STEEL TUBES SHALL CONFORM TO GRADE Yc210.
9. STEEL TUBES USED SHALL BE CONFORMING TO IS: 1663-1998.
10. TUBES MEMBERS SHALL HAVE ANNUAL CUT HEAD, SMOOTH FINISHED SO AS TO HAVE PROPER FIT OVER THE SUPPORTING TUBE.
11. ELECTRODE USED SHALL CONFORM TO RELEVANT IS SPECIFICATIONS AND THE CHEMICAL COMPOSITION OF ELECTRODE AND THE FIT SHOULD MATCH.
12. SLAG SHALL BE REMOVED BEFORE MEASURING THE DIMENSION OF FULLY WELD.
13. WELDING SHALL BE DONE BY ARC WELDING.
14. 4.5 mm SIZE WELD SHALL BE MADE WITH A SINGLE PASS.
15. WELD SIZE SHALL BE 4.5 mm UNLESS OTHERWISE MENTIONED AND SHALL BE DONE ALL ROUND ON THE CONTACT LENGTH OF MEMBERS.
16. HIGH STRENGTH BOLTS SHALL CONFORM TO IS: 4000-1992.
17. DIA OF HOLES IN MS PLATES SHALL BE MACHINE MADE & AS FOLLOWS:
 

DIA OF BOLTS	DIA OF HOLES
(i) 20mm	21.5mm
(ii) 25mm	26.5mm
18. SIZE OF LETTERS & COLOUR OF PAINT SHALL CONFORM TO:
  - (i) IRC - 67-2015
  - (ii) IRC - 36-1968
19. SHADE OF ANTI-CORROSIVE PAINT FOR PIPES SHALL BE DECIDED BY ENGINEER IN CHARGE.
20. RETRO-REFLECTIVE SHEETING SHALL BE AS PER MORT & IS SPECIFICATIONS SECTION 509.

Reference:

1. NH&M Letter no. 11041/20/2002-Admn. III dated 10.12.2020.

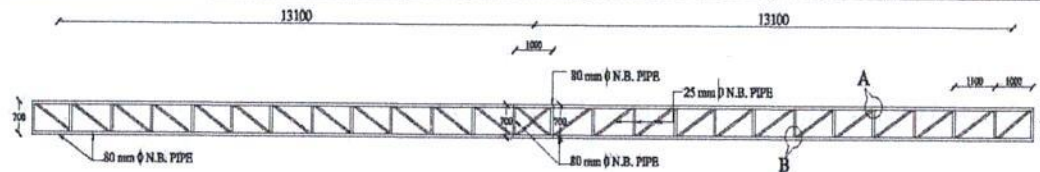


- NOTES:-**
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE MENTIONED
  2. ONLY THE WELDED DIMENSIONS ARE TO BE FOLLOWED AND NO DIMENSION SHALL BE SCALLED.
  3. SAFE BEARING CAPACITY HAS BEEN TAKEN AS 10 TONS/Sq.m
  4. CONCRETE GRADE SHALL BE M20
  5. CLEAR COVER TO THE OUTERMOST STEEL SHALL BE -
    - (i) PEDISTAL - 40mm
    - (ii) FOUNDATION - 50mm
  6. STEEL TUBES USED ARE DESIGNATED BY THEIR NOMINAL BORES INDICATED ON DRAWING
  7. STEEL TUBES USED ARE CLASSIFIED MEDIUM TYPE STEEL TUBES.
  8. STEEL TUBES SHALL CONFORM TO GRADE Ys-210
  9. STEEL TUBES USED SHALL BE CONFORMING TO IS:1161-1998
  10. TUBULAR MEMBERS SHALL HAVE ANGULAR CUT HEAD, SMOOTH FINISHED SO AS TO HAVE PROPER SEAL OVER THE SUPPORTING TUBE.
  11. ELECTRODE USED SHALL CONFORM TO RELEVANT IS SPECIFICATIONS AND THE CHEMICAL COMPOSITION OF ELECTRODE AND THE TUBE SHOULD MATCH
  12. SLAG SHALL BE REMOVED BEFORE MEASURING THE DIMENSION OF FLEET WELD
  13. WELDING SHALL BE DONE BY ARC WELDING.
  14. 4.5mm SIZE WELD SHALL BE MADE WITH A SINGLE PASS.
  15. WELD SIZE SHALL BE 4.5 mm UNLESS OTHERWISE MENTIONED AND SHALL BE DONE ALL ROUND ON THE CONTACT LENGTH OF MEMBERS.
  16. HIGH STRENGTH BOLTS SHALL CONFORM TO IS: 4000-1992.
  17. DIA OF HOLES IN MS PLATES SHALL BE MACHINE MADE & AS FOLLOWS.
 

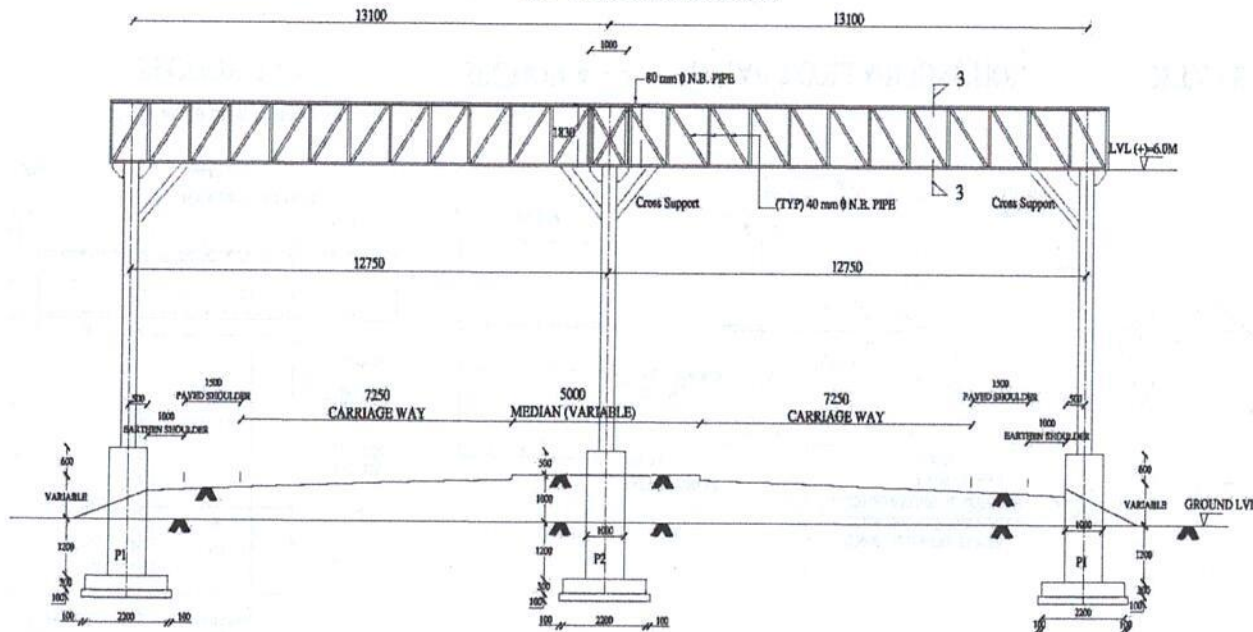
DIA OF BOLTS	DIA OF HOLES
(i) 20mm	21.5mm
(ii) 25mm	26.5mm
  18. SIZE OF LETTERS & COLOUR OF PAINT SHALL CONFORM TO:
    - (i) IRC: 107-2015
    - (ii) IRC: 106-1968
  19. SHADE OF ANTICORROSIIVE PAINT FOR PIPES SHALL BE DECIDED BY ENGINEER IN CHARGE.
  20. RETRO-REFLECTIVE SHEETING SHALL BE AS PER MORE & T SPECIFICATIONS SECTION 800.

Reference:  
 I. SHALL refer no. 11041/20-2000-Adm.III dated 06.12.2020

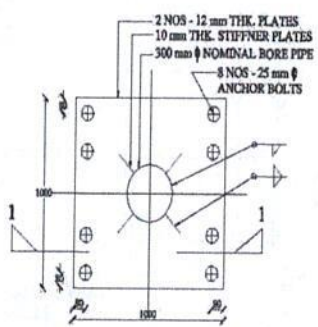
**TYPICAL DETAILS OF OVER HEAD SIGNS FOR TWO LANE & TWO LANE PAVED SHOULDER CARRIAGEWAY (PORTAL TYPE) 2/2**



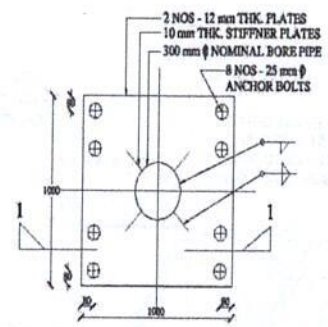
TOP AND BOTTOM PLAN



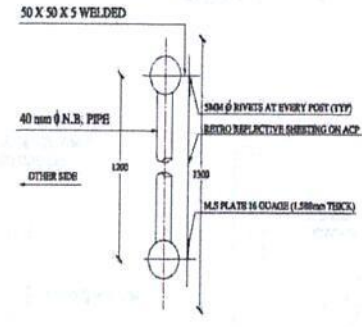
ELEVATION



DETAILS COLUMN BASE AT 'P1'



DETAILS COLUMN BASE AT 'P2'



SECTION 3-3

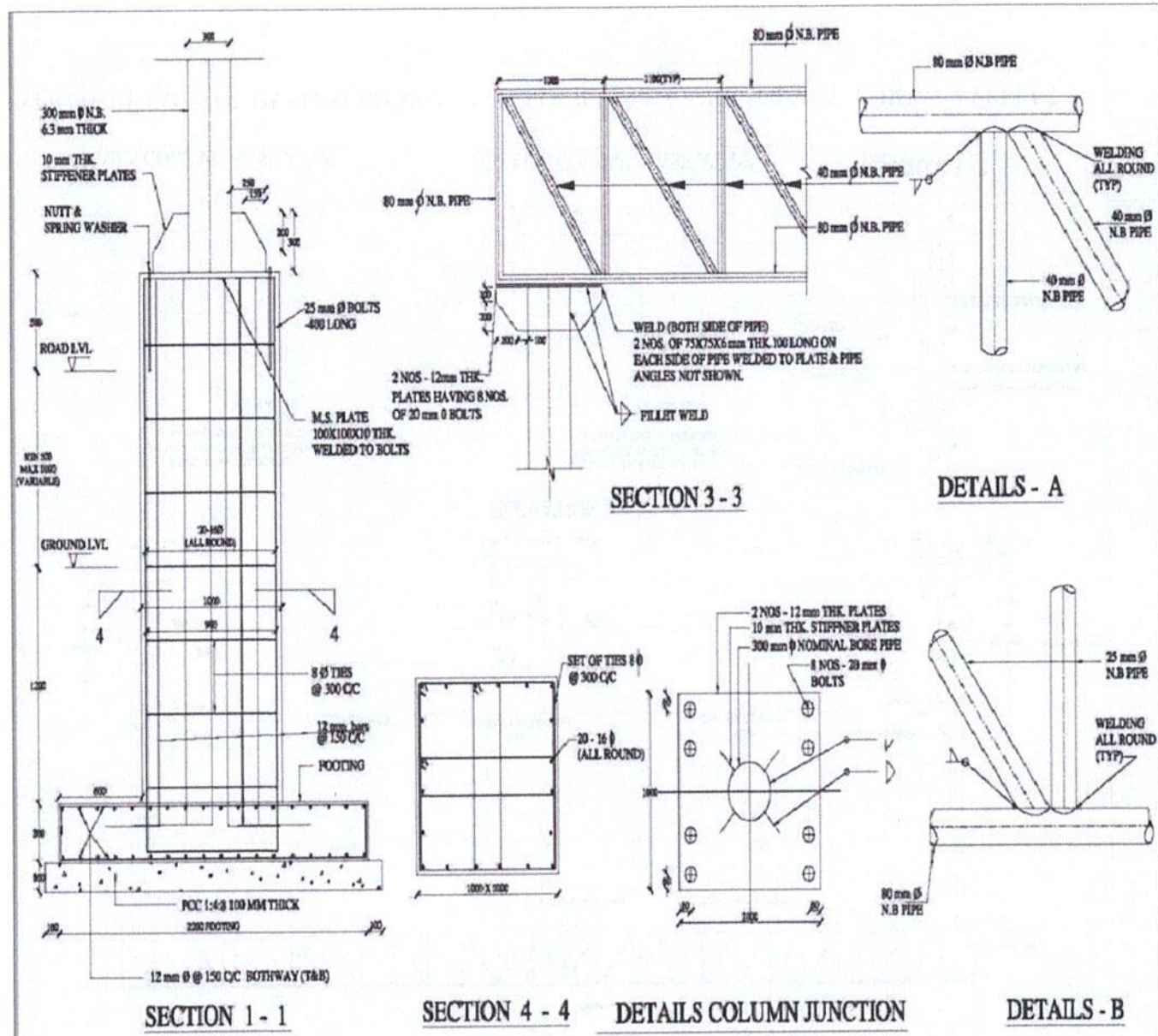
TYPICAL DETAILS OF OVER HEAD SIGNS FOR FOUR LANE CARRIAGEWAY (PORTAL TYPE) 1/2

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE MENTIONED.
2. ONLY THE WIDTHS DIMENSIONS ARE TO BE FOLLOWED AND NO DIMENSION SHALL BE SCALED.
3. SAFE BEARING CAPACITY HAS BEEN TAKEN AS 10 TONS/Sq.m
4. CONCRETE GRADE SHALL BE M20
5. CLEAR COVER TO THE OUTERMOST STEEL SHALL BE -
  - (i) PEDESTAL - 40mm
  - (ii) FOUNDATION - 50mm
6. STEEL TUBES USED ARE DESIGNATED BY THEIR NOMINAL BORES INDICATED ON DRAWING
7. STEEL TUBES USED ARE CLASSIFIED MEDIUM TYPE STEEL TUBES.
8. STEEL TUBES SHALL CONFORM TO GRADE Ys 210
9. STEEL TUBES USED SHALL BE CONFORMING TO IS: 1161: 1998.
10. TUBI MEMBERS SHALL HAVE ANNULAR CUT END SMOOTH FINISH SO AS TO HAVE PROPER SEAL OVER THE SUPPORTING TUBE.
11. ELECTRODE USED SHALL CONFORM TO RELEVANT IS SPECIFICATIONS AND THE CHEMICAL COMPOSITION OF ELECTRODE AND THE TUBE SHOULD MATCH.
12. SLAG SHALL BE REMOVED BEFORE MEASURING THE DIMENSION OF FELLE WELD.
13. WELDING SHALL BE DONE BY ARC WELDING.
14. 4.5 mm SIZE WELD SHALL BE MADE WITH A SINGLE PASS.
15. WELD SIZE SHALL BE 4.5 mm UNLESS OTHERWISE MENTIONED AND SHALL BE DONE ALL ROUND ON THE CONTACT LENGTH OF MEMBERS.
16. HIGH STRENGTH BOLTS SHALL CONFORM TO IS: 4000: 1992.
17. DIA OF HOLES IN MS PLATES SHALL BE MACHINI MADE & AS FOLLOWS:
 

DIA OF BOLTS	DIA OF HOLES
(i) 20mm	21.5mm
(ii) 25mm	26.5mm
18. SIZE OF LETTERS & COLOUR OF PAINT SHALL CONFORM TO:
  - (i) IRC: 67: 2015
  - (ii) IRC: 30: 1968
19. SHADE OF ANTI-CORROSIVE PAINT FOR PIPES SHALL BE DECIDED BY ENGINEER IN CHARGE.
20. RETRO-REFLECTIVE SHEETING SHALL BE AS PER MORTI & B SPECIFICATIONS SECTION 808.

Reference  
 I. MHAI Letter no. 11041/20/2002-Admn.III  
 dated 03.12.2020.



- NOTES:-**
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE MENTIONED.
  2. ONLY THE WIDTH DIMENSIONS ARE TO BE FOLLOWED AND NO DIMENSION SHALL BE SCALED.
  3. SAFE BEARING CAPACITY HAS BEEN TAKEN AS 10 TONS/Sq.m
  4. CONCRETE GRADE SHALL BE M20
  5. CLEAR COVER TO THE OUTERMOST STEEL SHALL BE :-
    - (i) PILE/STAL - 40mm
    - (ii) FOUNDATION - 50mm
  6. STEEL TUBES USED ARE DESIGNATED BY THEIR NOMINAL BORES INDICATED ON DRAWING
  7. STEEL TUBES USED ARE CLASSIFIED MEDIUM TYPE STEEL TUBES.
  8. STEEL TUBES SHALL CONFORM TO GRADE Ys210.
  9. STEEL TUBES USED SHALL BE CONFORMING TO IS:1161:1998
  10. TUBULAR MEMBERS SHALL HAVE ANNULAR CUT BEAD, SMOOTH FINISHED SO AS TO HAVE PROPER LAP OVER THE SUPPORTING TUBE.
  11. ELECTRODE USED SHALL CONFORM TO RELEVANT SPECIFICATIONS AND THE CHEMICAL COMPOSITION OF ELECTRODE AND THE TUBE SHOULD MATCH.
  12. SLAG SHALL BE REMOVED BEFORE MEASURING THE DIMENSION OF FILLET WELD.
  13. WELDING SHALL BE DONE BY ARC WELDING.
  14. 4.5 mm SIZE WELD SHALL BE MADE WITH A SINGLE PASS.
  15. WELD SIZE SHALL BE 4.5 mm UNLESS OTHERWISE MENTIONED AND SHALL BE DONE ALL ROUND ON THE CONTACT LENGTH OF MEMBERS.
  16. HIGH STRENGTH BOLTS SHALL CONFORM TO IS:4000:1992.
  17. DIA OF HOLES IN MS PLATES SHALL BE MACHINE MADE & AS FOLLOWS:
 

DIA OF BOLTS	DIA OF HOLES
(i) 20mm	21.5mm
(ii) 25mm	26.5mm
  18. SIZE OF LETTERS & COLOUR OF PAINT SHALL CONFORM TO:
    - (i) IRC:67:2015
    - (ii) IRC:36:1968
  19. SHADE OF ANTI CORROSIVE PAINT FOR PIPES SHALL BE DECIDED BY ENGINEER IN CHARGE.
  20. RETRO REFLECTIVE SHEETING SHALL BE AS PER MORE & H SPECIFICATIONS SECTION 800.

Reference  
 1. NHAI Letter No:11041/20/2005-Admin/III dated 10.12.2020

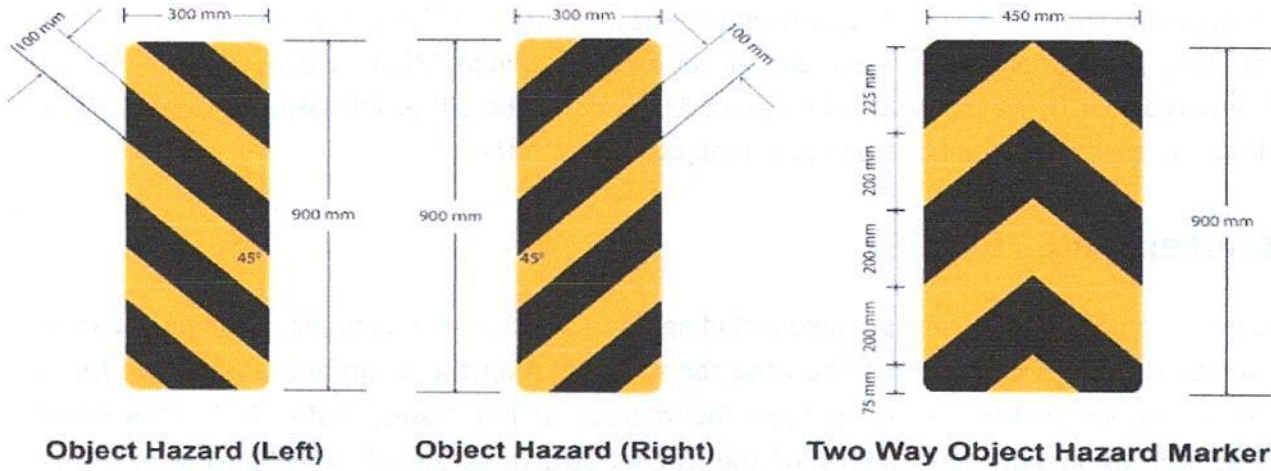
TYPICAL DETAILS OF OVER HEAD SIGNS FOR FOUR LANE CARRIAGEWAY (PORTAL TYPE) 2/2



# Hazard Markers (IRC 79- 2019)

## (a) Design

As per IRC:79 -2019, the design of Hazard Markers is shown in the figure below.

These are striped markers consisting of alternately black and yellow strips sloping downwards at an angle of 45° towards the side of the obstruction on which the traffic is to pass.



Type of Board	ACP to be used	Type of Sheeting	Back Support Frame details	Post Details	Foundation Details	Size/ Shape/ Color	Warranty
<b>Object Hazard Markers</b> 	Overall thickness s- 4mm Aluminum skin thickness s- 0.5mm	Type-XI or Type-IV as per site requirement	25mmx25mmx3mm angle	MS pipe of 80 mm dia having 1.6mm thickness	300mmx300mmx450 mm of M25 grade	Rectangular of size 300x900 mm, with Yellow background of Retro Reflective Sheeting and black strips (nonreflective)	7 years for Type-IV and 10 years for Type-XI sheeting.
<b>Two Way Object Hazard Marker</b> 	Overall thickness s- 4mm Aluminum skin thickness s- 0.5mm	Type-XI or Type-IV as per site requirement	25mmx25mmx3mm angle	MS pipe of 80 mm dia having 1.6mm thickness	300mmx300mmx450 mm of M25 grade	Rectangular of size 450mmx900 mm, with Yellow background of Retro Reflective Sheeting and black strips (nonreflective)	7 years for Type-IV and 10 years for Type-XI sheeting.

## (b) Application and Placement

- Hazard markers should be put up, wherever there are objects so close to the road as to constitute an accident hazard.
- The markers should be erected immediately ahead of the line of obstruction, for instance on a narrow bridge, just where the bridge rail starts.
- The inside edge of the marker should be in line with the inner edge of the obstruction as far as possible.
- All physical objects projecting above the Finished Road Level (FRL) that are falling within 3 m from the carriageway edge line shall be illuminated with Object Hazard Markers (OHM). The objects shall include foot path or utility poles or parapet or concrete barrier of Major bridge, Minor bridge, Culverts, RE wall at start of Underpass or flyovers. The Object Hazard Marker shall be either left OHM or right OHM or Two way Hazard Marker with respect to position of object to the traffic

### ➤ Object Markers ( IRC 79-2019)

Several designs of object markers are possible including circular shape. For example, Aluminum-backed flexible prismatic reflective sheeting shall be used for application on the beam and post of the Metal crash barrier or porous concrete structures like roundabout, at bull noses, Traffic Police/Toll Booth Structures, as well as at entry/exit points of the Tunnel structures aimed at enhancing nighttime visibility. This Aluminum-backed flexible prismatic sheeting shall be made of yellow colored flexible prismatic sheeting with non-metallic prismatic lens formed in a transparent, synthetic resin as retro reflective elements. This flexible prismatic sheeting shall have black and yellow stripes with aluminum backed flexible prismatic Type VI sheeting conforming to ASTM: D4956 specifications and standards of coefficient of retro reflectivity, flexibility and impact resistance applicable for reboundable devices. This flexible prismatic sheeting shall have screen printed arrow/slant line pattern in black colour in a continuous roll format. These object markers may be bigger if the conditions so warrant on the ground



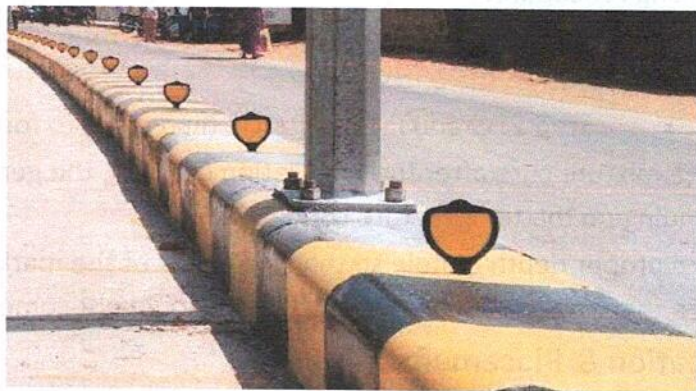
## (a) Application and Placement

- i. On the beam and post of the Metal Crash Barrier (MCB)/Wire Rope Barrier post.
- ii. Periphery of the roundabout as well as bull noses of the traffic islands pointing towards the direction of travel.
- iii. Traffic Police/Toll Booth Structures as well as at entry/exit points of the Tunnel structures etc

## (b) Placement Details:

These markers should be pasted on the above locations for instance in the case of a channelizing island/roundabout at its nose point only (facing the direction of traffic) without having the need to put on the entire periphery which will help in achieving enhanced safety with minimal investment. Width of object marker shall be 300 mm and length of object markers might vary depending upon the situation but shall be generally minimum around 400 to 500 mm so that reflectors are fully visible to the approaching.

## ➤ Median Markers (IRC 79-2019)



## (a) Technical Specifications

Below are the technical details of the median marker to be checked before application.

- Flexible Median Markers shall be made of combination of tough, high impact resistant molded thermoplastic body having florescent yellow color retro-reflective Type XI sheeting with minimum exposed reflective area 285 sq.mm and with rebound property.
- The retro-reflective sheeting shall be on both sides of the Flexible Median Marker and shall be edge protected with no exposed edges which will prevent edge lifting, vandalism, sheeting damage, etc.
- The reflective sheeting should confirm to Type XI Florescent Yellow sheeting as per IRC 67 2022 and ASTM D4956-

- The flexible median marker shall have overall height of minimum 180 mm, body thickness of minimum 2mm and shank depth of minimum 30mm, with a logo of manufacturer embossed on either side of the body.

The plastics used for the molding the flexible median marker shall have a minimum notched Izod Impact strength value of 4.11J/cm (thickness 3.17mm) at room temperature, tested in accordance with ASTM D256.

## (b) Installation Instructions

- Clean the road surface thoroughly with blower and wire brush.
- Drill a hole on the surface using a drill bit of dia 22-25mm.
- Use blower to clean the hole and remove all the debris present after drilling.
- Use manufacturer's recommended Epoxy for fixing the Median Markers. The adhesive mixture is prepared as per the steps mentioned below:

i) The adhesive used for installing the Flexible Median Markers consists of 3 parts:

- Part-A, Resin – 1 Kg
- Part-B, Hardener – ½ Kg
- Part-C, Filler – 3 Kg

ii) Mixing Procedure:

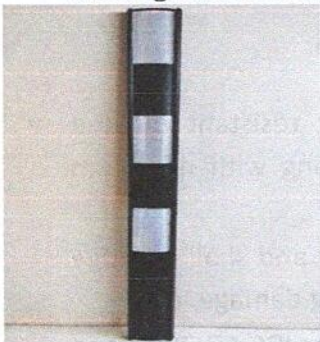
- Step-1: Mix Part-B and Part-A in 1:2 ratio. Continue the mixing till we get a uniform mix of both the parts.
- Step-2: Gradually mix Part-C (in 6 ratio) to form a thick paste.
- Let the mixture cure after the installation of FMM, the general setting time for the epoxy is 60-90 mins depending on the temperature conditions.
- Ensure proper depth of hole so that the shank of the marker is completely inserted inside the hole and ensure that after installation the markers should not come and are installed properly.

## (c) Application & Placement

FMM shall be used for the illumination of median as well as Parapet wall structures etc. Recommended minimum application distance is 2 m in the case of urban areas, 5 m for interurban highways and expressways or as suggested by Engineer In-charge(IRC 79-2019)

### ➤ Road Delineators (IRC 79-2019)

Road delineators are intended to delineate the edges of the roadway to guide the drivers about the alignment ahead, particularly where it might be confusing for any reason.





Delineators are basically driving aids and should not be regarded as a substitute for warning signs, road markings, or barriers for out of control vehicles.

## (a) Technical Specifications

### DESCRIPTION

- Delineators shall consist of retroreflective strips, capable of clearly retro-reflecting light under normal atmospheric conditions from 300m (1,000 ft) when illuminated by the high beams of standard automobile lights.
- The Standard Delineator shall have an elliptical curved design, with grooves across the length of the delineator as an embodiment that helps in sufficient protection of the edge of the reflective sheets from vandalism.
- The continuous curve design of the profile allows reflective sheeting to reflect in a wider entrance angle thereby increasing visibility.

### MATERIAL

The Delineator shall be made up of Mild Steel with desired thickness and should be manufactured in Roll forming process. The metal shall have pure polyester powder coating with the minimum thickness of not less than 40 microns for protection against corrosion. Type XI Retro reflective sheeting should be pasted on both sides such that it provides better visibility for vehicles moving in continuous curves at various conditions such as high and low entrance angles.

### DIMENSIONS

- The height of the Standard Delineator should not be less than 800 mm above the ground after installation.
- The width of delineator should not be less than 100 mm.
- The front and back faces of delineator should be curved with a radius of not more than 200 mm and with delta angle (or central angle of curve) lying between  $20^\circ$  and  $30^\circ$ , to increase the visibility for vehicles moving in continuous curves.
- It should have a drilling hole of 12 mm for fixing the anchor bolt.
- The center of this drilling hole should be 150 mm from the base of the delineator.
- The tail of delineator inside the ground should not be more than 300mm.
- The Delineator should consist of top retroreflective unit consisting of white color micro prismatic non-metallic retroreflective sheeting conforming with ASTM D4956 Type XI standards of minimum exposed area  $330 \text{ cm}^2$  on one side i.e. height of sheeting should be minimum 150mm whereas width of sheeting should not be less than 75mm.
- The Type XI strips should be placed at 15 cm at every alternative and should have same exposed area for the other side if the delineator indicated is two-sided reflectivity.

## (b) OPTICAL PERFORMANCE

The Delineator should consist of top retroreflective unit consisting of white color micro prismatic non-metallic retroreflective sheeting conforming with ASTM D4956 type XI standards of minimum exposed area 330 cm<sup>2</sup> on one side i.e. height of sheeting should be minimum 150mm whereas width of sheeting should not be less than 75mm (should be placed every alternative 15cm) and should have same exposed area for the other side if the delineator indicated is two-sided reflectivity. Retro reflectivity should meet the coefficient of retroreflection as per the Table.

Observation Angle °	0.2		0.5		1	
Entrance Angle °	-4	30	-4	30	-4	30
Coefficient of retroreflection for White color	580	220	420	150	120	45

## (c) Color

The color of retroreflective sheeting shall be white with the whiteness index (Cap Y) not less than 27.

## (d) Installation Instructions

The use of road delineators should be considered under following situations:

### Curved Sections

- Horizontal curves of radius 1000 m or less.
- Vertical curves with inadequate visibility.

### Straight Sections

- Sections where visibility is often poor due to mist, fog or snowy conditions.
- Reaches where alignment appears uncertain to the driver, e.g. pavement width transitions, temporary road diversions, etc.
- Road sections subject to frequent submergence and ponding due to storm water.
- Approaches to narrow bridges and culverts.
- Valley side of hill roads.
- Road embankment exceeding 3 m in height.
- Approaches to important intersections.
- Special problem points such as causeways and tunnels.

### (e) Application

- The height of the Standard Delineator should not be less than 800 mm above the ground after installation.
- The Standard Delineator shall be fixed to the ground by inserting the root of the delineator up to 300mm below the ground.
- This portion of the delineator is to be anchored with an anchoring bolt & to be filled with concrete of grade M20.

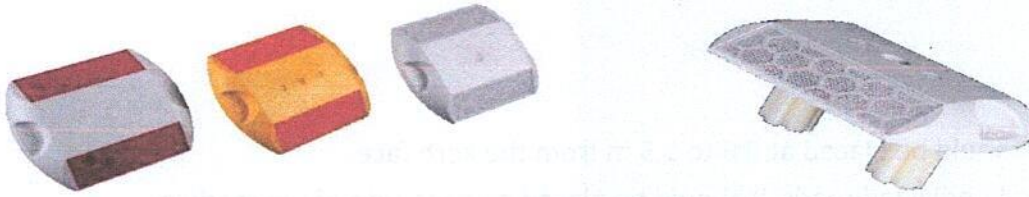
### (f) Placement

- On kerbed sections, it should be placed at 0.6 to 1.5 m from the kerb face.
- On straight sections and undivided roads, it should be placed on each side of the roadway.
- On divided roads it should also be placed on medians and on each side of the roadway.
- On hill roads, it should be placed on the parapet or at the edge of the shoulder.
- On horizontal curves, the fixing should be done as per the curve radius and should be continued beyond the curve on either side.
- On vertical curves and problem locations the placement should be done as per site requirement.

Radius of Curve (meters)	Spacing on Curve, (S) (meters)	Application guideline
30	6	shall be installed along with Chevron signs if crash barrier is not present
50	8	
100	12	
200	20	
300	25	
400	30	
500	35	If chevron signs are provided delineators may supplement it. On hill roads delineators should be provided
600	38	
750	40	
751-1200	40	To be provided if the deflection angle is less than 20 degree
1201-2000	40	Delineators to be provided in all highways in Expressways to be provided if the deflection angle is less than 20 degree
1201-3000	40	
>3000-5000	40	
vertical curves where visibility is not adequate	30 to 50	in all highways.
At problematic locations	5 to 10	in all highways.
Straight sections	50 to 70	in all highways.

## ➤ Road Studs/ Raised Pavement Markers (IRC 35-2015)

The retro-reflective studs are used to supplement longitudinal/ traverse retro-reflectorize road marking, which would increase visibility in night and adverse weather conditions. The kind of studs that can be used on roads are shown below:



### Some of the key parameters of selecting and installing an RPM are mentioned below:

- Road Stud/ Raised Pavement Marker (RPM) shall be made up of single mold twin shank poly carbonate or ABS body.
- The RPM should have micro prismatic lens capable of providing total internal reflection of the light entering the lens face.
- The RPM should support a load of 13,635 kg tested in accordance with ASTM D 4280 and a test certificate confirming the same from an independent laboratory shall be submitted by the converter/applicator to the authorities before the start of work.

RPM shall be of Category A with optical performance (Coefficient of Luminous Intensity- CIL ) shall not be less than that given in Table 800-13 of MoRTH specification (5th revision) for Bi-directional stud as per the observation angle & Entrance Angle defined in MoRTH

- The height, width and length of the stud shall not exceed 20 mm, 130 mm and 105 mm respectively. The slope of retro-reflecting surface shall be  $35 \pm 5^\circ$  to the base and the area of retro-reflecting surface shall not be less than 13 Sq.cm.
- The installation of RPM's shall be done only by authorized Converters or Applicators as per the installation instructions given by the manufacturer like 3M or other reputed brands.
- No nails shall be used to fix RPM's to avoid safety hazard. Only manufacturer's recommended epoxy adhesives shall be used to fix the RPM.
- A sample of the stud with shank confirming to the specifications mentioned above shall be submitted by the converter/applicator prior the start of work to the engineer in charge and concerned authorities.



- The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 +/- 2 mm and height not less than 30 +/- 2 mm) from the body is to be a minimum value of 500 Kgf.
- Two-years replacement warranty is mandatorily required post installation. Bills and payment can be released only after the submission of warranty and certificates mentioned in this document.
- Test certificate from an Indian Government laboratory (CRRI/ARAI/ICAT) on Abrasion resistance as per ASTM D 4280, Coefficient of Luminance Intensity-CIL as per MoRTH table 800-13, Material, Marker Height, Color, Slope of Reflecting Surface (Lens), Lens Impact strength, Resistance to temperature cycling, & Longitudinal Flexural Strength to be submitted by the manufacturer and enclosed along with the bid at the time of bid opening and to be submitted to Engineer in charge before start of the work.

### (a) Ministry Guidelines

The guidelines that are followed for Raised Pavement Markers are:

- a. Section 5 of IRC: 35 2015.
- b. Clause 804 of MoRTH Section 800.
- c. ASTM D 4280-

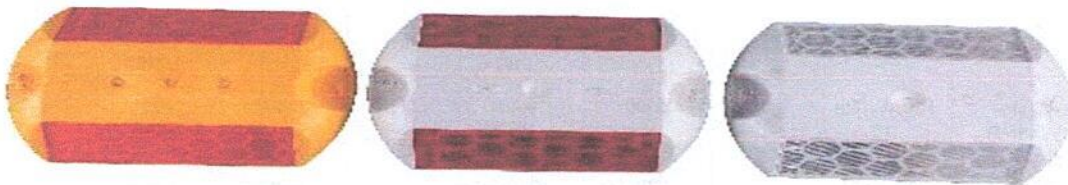
As per Clause 804 of MoRTH-

**Material Details of RPM:** RPM/road stud shall be made of plastic body moulded, either from polycarbonate or ABS or equivalent. It should support a load of 13,635 KG tested in accordance with ASTM D 4280. It should consist of reflective panels with micro-prismatic lens capable of providing total internal reflection of the light entering the lens face.

**Design:** The slope of retro-reflecting surface shall be  $35 \pm 5^\circ$  to the base and the area of retro-reflecting surface shall not be less than 13 Sq.cm.

**Optical Performance:** All the studs should comply to Tables 800-13 and 800-14 for Coefficient of Luminous Intensity (C.I.L) values.

### (b) Colour Bifurcation



*[Handwritten signature]*



**The usage of different colors of RPM are as under:**

- a. White- These are used to indicate traffic lane line and center of carriageway.
- b. Red- These are used to delineate the left-hand edge of the running carriageway i.e. these studs should be used on shoulder side edge line.
- c. Yellow- These are used to delineate the right-hand edge of the running carriageway i.e. these are used on the median side edge line.
- d. Green - Green road studs are to be employed to indicate crossable edge line like the lay byes and to show the boundary of acceleration or deceleration line on left hand side of the carriageway in case of the multi-lane divided carriageways.

**(c) Installation Instructions**

**Spacing /Placement of Road Studs**

The placement details are given below as per Table 5.2 of IRC:35 2015 for undivided and divided carriageways along-with the diagrams.

**Road Studs for Undivided Carriageways**

Description Road Category	Traffic Movement	Carriage Way	Normal Section			Warning Section			No Overtaking Section		
			Centre Line	Edge Line	Traffic Lane Line	Centre Line	Edge Line	Traffic Lane Line	Centre Line	Edge Line	Traffic Lane Line
Single/ Intermediate Lane Road	Two way	<5.5 m	NA	Red-White Bi-directional at 18 m interval (Optional)	NA	NA	Red-White Bi-directional at 9 m interval (Optional)	NA	NA	Red-White Bi-directional at 6 m interval (Desirable)	NA
Two Lane Road	Two way	5.5 m to 7 m	White-White Bi-directional at 18 m interval (Optional)	Red-White Bi-directional at 18 m interval (Optional)	NA	White-White Bi-directional at 9 m interval (Desirable)	Red-White Bi-directional at 9 m interval (Desirable)	NA	Yellow-Yellow Bi-directional at 6 m interval (Desirable)	Red-White Bi-directional at 6 m interval (Desirable)	NA



Two Lane Road with Paved Shoulder	Two way	> 7 m	White-White Bi-directional at 18 m interval (Optional)	Red-White Bi-directional at 18 m interval (Optional)	NA	White-White Bi-directional at 9 m interval (Desirable)	Red-White Bi-directional at 9 m interval (Desirable)	NA	Yellow-Yellow Bi-directional at 6 m interval (Desirable)	Red-White Bi-directional at 6 m interval (Desirable)	NA
Three Lane Undivided Road	Two way	>11 m	Yellow-Yellow Bi-directional at 18 m interval (Desirable)	Red-White Bi-directional at 18 m interval (Optional)	Not Required	Yellow-Yellow Bi-directional at 9 m interval (Desirable)	Red-White Bi-directional at 9 m interval (Desirable)	Not Required	Yellow-Yellow Bi-directional at 6 m interval (Desirable)	Red-White Bi-directional at 6 m interval (Desirable)	White-White Bidirectional at 6 m interval (Optional)
Four Lane Undivided Road	Two way	>14	Yellow-Yellow Bi-directional at 18 m interval (Desirable)	Red-White Bi-directional at 18 m interval (Optional)	Not Required	Yellow-Yellow Bi-directional at 9 m interval (Desirable)	Red-White Bi-directional at 9 m interval (Desirable)	Not Required	Yellow-Yellow Bi-directional at 6 m interval (Desirable)	Red-White Bi-directional at 6 m interval (Desirable)	White-White Bidirectional at 6 m interval (Optional)

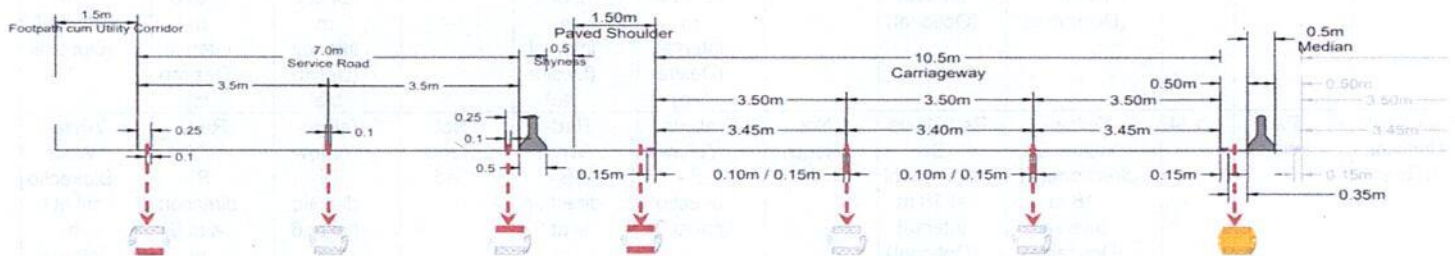
### Road Studs for Divided Carriageways

Description	One Side Carriageway Width (in m)	Normal Section			Warning Section			No Overtaking Section		
		Traffic Lane Line	Shoulder Side Edge Line	Median Side Edge Line	Traffic Lane Line	Shoulder Side Edge Line	Median Side Edge Line	Traffic Lane Line	Shoulder Side Edge Line	Median Side Edge Line
Four Lane Divided Carriageways	>7.3	Not Required	Red Unidirectional at 18 m interval (Desirable)	Yellow Unidirectional at 18 m interval (Desirable)	White-White Bi-directional at 9m interval (Optional)	Red Unidirectional at 9 m interval (Desirable)	Yellow Unidirectional at 9m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)
Six Lane Divided Carriageways	>10.8	Not Required	Red Unidirectional at 18 m interval (Desirable)	Yellow Unidirectional at 18 m interval (Desirable)	White Unidirectional at 9m interval (Optional)	Red Unidirectional at 9 m interval (Desirable)	Yellow Unidirectional at 9m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)
Four Lane Divided Expressway	>9.5	Not Required	Red Unidirectional at 18 m interval (Desirable)	Yellow Unidirectional at 18 m interval (Desirable)	White Unidirectional at 9m interval (Optional)	Red Unidirectional at 9 m interval (Desirable)	Yellow Unidirectional at 9m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)
Six Lane Divided Expressway	>12	Not Required	Red Unidirectional at 18 m interval (Desirable)	Yellow Unidirectional at 18 m interval (Desirable)	White-White Bi-directional at 9m interval (Optional)	Red Unidirectional at 9 m interval (Desirable)	Yellow Unidirectional at 9m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)	Red Unidirectional at 6m interval (Desirable)

For Chevron/diagonal markings on gorge, red colour road studs shall be provided and spacing shall be the same as that for the spacing of diagonal and chevrons (2/4/6 meter). The studs shall be placed to mark the



continuous line of diagonal and chevron marking. Road studs shall be placed inside the continuous line marking at the midpoint of diagonal or chevron. For crossable continuous line like acceleration/deceleration lanes involving lane changing, green colour road studs shall be provided at 8 m spacing. Two rows of Yellow road studs shall be provided for zebra crossing at 0.5 m spacing across the carriageway which can be achieved by installing road studs at four corners of each block of BM01/BM02/BM03. On approaches to any hazardous situation also, two arrays of road studs shall be provided at 0.5 m gap across the carriageway and the two arrays of road studs shall be placed at 0.5 m apart.



**Speed Arresters:** Speed arresters shall be placed using the road studs not less than ten rows with the raised markings. These speed arresters are effective in reducing the speeds of vehicles up to the posted speed limit. The placement of speed arresters shall be further guided by the proper signboards

## ➤ Road marking (IRC 35-2015)

### Introduction

Road marking are essential to guide the road user and to ensure a smoother flow of traffic. Marking have to be of standard colour and dimension and should be marked at appropriate places so as to optimize their visibility and effectiveness.

### (a) Definition

Road surface marking is any kind of device or material that is used on a road surface in order to convey official information. Road Marking are defined as lines, devices, applied to or attached to the carriageway or kerb or to the object within as well as the adjacent to the carriageway, for controlling, warning, guiding and information all the road user.

### (b) Ministry guidelines

The Guidelines that are followed for road marking are:

- a- IRC:35-2015
- b- Clause 803of MoRTH

### (c) Color & Sizes

#### White:

White color is the general and most widely used color for road marking because of its visibility and good contrast against the road surfaces.

White color is used for longitudinal marking to delineate:

- A. The separation of traffic flow in the same direction.





B. The left edge of the roadways.

Most of the transverse marking like word and symbol marking, stop lines, yield lines, pedestrians crossings and other, shall be white unless otherwise specified herein.

## **Yellow**

The longitudinal marking in yellow color should be used to convey message where it is not permitted to cross the marking. Yellow color is also used to show parking restriction and to impose other traffic control.

Yellow longitudinal marking are used to delineate:

A. The right edge of the roadway of divided carriageway.

## **(d) Testing of road marking**

### **i. Testing Equipment**

Retro-reflectivity is the ability of road marking to reflect light from a vehicle's headlights back to the driving position of a vehicle. Retro-reflectivity is measured using a piece of equipment know as a Retro-Reflectometer. For reflection in daylight or under road light the luminance illumination Qd is used and is expressed in med/m<sup>2</sup>/lux. Retro-reflectivity is measures using a coefficient in diffuse reflectometer.

Portable handheld retro-reflectometer for determination of night visibility (RL) and day visibility (Qd) of road marking.

One instrument for all types of road marking Both RL & Qd measurements should be under the body of main instrument only. Extensions in instrument body for measurement of RL & Qd are not acceptable

Retroreflectometer for determination of night visibility (RL) and day visibility (Qd) of road marking in accordance with ASTM E-1710 (RL), ASTM E 2302 (Qd), ASTM 2177 (RL Wet) and IRC: 35

All- important data such as Day & Night Visibility, GPS coordinates, ambient temperature (oC/OF), relative humidity (rH%), picture as as date and time should be measured at the sametime.

### **ii. Testing Procedure:-**

#### **1. For pavement marking line 3KM or less:**

1. Any randomly located evaluation selected.
2. Sample size shall be at least 20 numbers.
3. Average of 20 numbers determines retro reflectivity of marking

#### **2. For 3KM-16 KM marking line:**

1. At least 3 randomly selected sections.
2. Evaluation section shall not overlap.
3. Each evaluation section measurement should be of 20 number sample size.
4. Average of 20 number give retro reflectivity of that section.

5. Grand average is determined using the average retro reflectivity from each evaluation section.

### 3. For more than 16 KM marking line:

1. Select more than 3 evaluation sections.
2. Evaluation section shall not overlap.
3. Each evaluation section measurement should be of 20 number sample size.
4. Average of 20 number give retro reflectivity of that section.
5. Grand average is determined using the average retro reflectivity from each.

### 4. Retro- reflectivity under wetness:

1. The test condition is created using clean water poured from a bucket with an approximately capacity of 10 litter and from a height of 0.5m above the surface so that the measuring field and it's surrounding area is momentarily flooded by a crest water. The retro reflectivity shall be measured under the test condition on minutes after the water has been poured.

#### 2. Precautions:

- Testing area should be flat and avoid damaged, broken & twisted area.
- Testing area should be neat and clean.
- Testing area should be free from dust, moisture, oil, grease etc.

(नोट:—रोड मार्किंग एवं अन्य ऐसे मद जो इस कार्यालय ज्ञाप में सम्मिलित नहीं है, उनको सम्बन्धित IRC Codes से Review किया जा सकता है)

## D. सड़क सुरक्षा से सम्बन्धित कार्यों हेतु निम्नलिखित बिन्दुओं का समावेश करते हुए आगणन गठन की कार्यवाही की जाये।

प्रेषित किये जा रहे आगणन में रोड सेफ्टी से सम्बन्धित प्राविधान किये जाने है तो प्रेषित किये जा रहे आगणन में सेफ्टी ऑडिट रिपोर्ट (अधिशाली अभियन्ता एवं अधीक्षण अभियन्ता की संयुक्त हस्ताक्षरित) अवश्य संलग्न की जाये एवं संलग्न किये जा रहे स्ट्रिप प्लान में रोड सेफ्टी से सम्बन्धित समस्त प्राविधानों का चैनेजवार सुस्पष्ट उल्लेख किया जाये।

सेफ्टी ऑडिट करते समय निम्नलिखित बिन्दुओं का विशेष ध्यान रखा जाये:—

- रोड की Geometry (मोड़ो, जंक्शन आदि पर)के सुधार की आवश्यकता।
- मोड़ो व जंक्शनों पर दृष्टि बाधिता (vision Obstruction) का सुधार एवं यथावश्यक रोड साइनेज एवं ट्रैफिक मार्किंग मेजर्स का प्राविधान किया जाना।
- Accidental Hazard object जैसे—Electric poles, tree, culvert parapet, starting points of dividers आदि पर समुचित Delineation किया जाना।
- Edge/Shoulder drop के सुधार की आवश्यकता।
- IRC: 35-2015 (Code of practice of road marking) के अनुसार रोड मार्किंग का होना।
- सकरी पुलिया/कल्वर्ट का सुधार/ चौड़ीकरण की आवश्यकता।

## E. रोड सेफ्टी से सम्बन्धित आगणन में निम्नानुसार प्राविधान किए जा सकते है।

### ➤ जंक्शन सुधार का कार्य।

- a. Widening of junction
- b. Utility shifting as per minimal requirement (X- checked by PWD officers)
- c. Rotary, island as and where needed

- d. Speed calming measures (**Type & location to be selected very carefully**)
- e. Signages, Road marking & road safety furniture.
- f. Drain( आबादी भाग में आवश्यकतानुसार, अगर जल भराव की स्थिति उत्पन्न हो रही है)
- g. Cantilever/overhead board (depending upon road crossing at junction)
- तीव्र मोड़ (curve) पर **Horizontal & Vertical curves का सुधार** ।
  - a. Smoothing of curves as per availability of ROW.
  - b. Extra widening.
  - c. Introduction of proper super elevation.
  - d. Chevron sign- Should be placed at outer edge of road at single post with both direction indication.
  - e. Signages, Road marking & Road furnitures.
  - f. Speed calming measure (**Type & location to be selected very carefully**)
  - g. Crash barrier as per site condition ( if height of embankment is > 3m )
- **High embankment (height > 3m) पर सुरक्षा की दृष्टि से कैश-बैरियर का कार्य।**
- **संकीर्ण/संकीर्ण पुल/पुलियों का सुधार ।**
  - a. Widening of culvert (less than 6m span)
  - b. Parapet wall का सुधार कार्य
  - c. Hazard markers/ signages
  - d. Road safety furniture
  - e. Road marking
  - h. Speed calming measures at approaches (**Type & location to be selected very carefully**)
- घनी आबादी भाग में गति नियंत्रण अथवा ट्रैफिक जाम वाले क्षेत्र में
  - a. Interlocking tiles द्वारा widening का कार्य।
  - b. Speed calming measures (**Type & location to be selected very carefully**)
  - c. Signages
- **रोड साईनेज का कार्य (as per IRC 67-2022)**
  - a. For Express ways/NH/ SH- Type XI sheet should be used in signages.
  - b. For MDR/ODR- Type IV sheet should be used in signages.
- **रोड मार्किंग का कार्य(as per IRC 35-2015)**
  - a. 5.5 मी0 चौड़ाई वाले मार्ग पर केवल एज लाईन का प्राविधान किया जाये।
  - b. 7 मी0 या अधिक चौड़ाई वाले मार्ग पर एज लाईन एवं सेन्टर लाईन का प्राविधान किया जाये।
  - c. चौराहों/तिराहों तथा आबादी एवं शहरी भागों में आवश्यकतानुसार जेब्रा क्रॉसिंग का कार्य।
- **Traffic calming measure(as per IRC 99-2018)**
  - a. Speed table
  - b. Rumble strips
  - c. Repeated bars
  - d. Textured patch
- **Road safety furnitures**
  - a. Cat eye- चौराहों/तिराहों/कर्व पर ही प्राविधान किया जाय।
  - b. Tree plate- ट्रैफिक की दिशा में पेड़ के केवल एक साईड पर ही लगाई जाय।
  - c. Delinators, Median marker

## F. ब्लैक स्पॉट सुधार से सम्बन्धित आगणनों के गठन हेतु आवश्यक दिशा निर्देश:-

- आगणन के प्रतिवेदन में कार्य का नाम के अन्तर्गत, मार्ग का नाम एवं ब्लैक स्पॉट्स के नाम (चिन्हीकरण का वर्ष सहित) का समावेश अवश्य किया जाये।
- प्रतिवेदन में इस तथ्य का उल्लेख अवश्य किया जाये कि सम्बन्धित ब्लैक स्पॉट का सेफ्टी ऑडिट कर लिया गया है तथा ऑडिट करने वाले अधिकारी/एजेंसी का नाम उल्लेखित किया जाय।
- प्रतिवेदन में, आगणन में किये गये समस्त प्राविधानों का अंकन तालिका के रूप में अवश्य किया जाये।
- आगणन के साथ किये गये सेफ्टी ऑडिट रिपोर्ट को अवश्य संलग्न किया जाये तथा सेफ्टी ऑडिट रिपोर्ट में ब्लैक स्पॉट्स के सुधार हेतु आवश्यक प्राविधानों का उल्लेख सुस्पष्ट रूप से अंकित किया जाये।
- आगणन में एक से अधिक ब्लैक स्पॉट्स के सुधार कार्यों को सम्मिलित किये जाने की दशा में, प्रत्येक ब्लैक स्पॉट की पृथक-पृथक D.O.M/ B.O.Q संलग्न करते हुये Abstract of Cost में प्रत्येक ब्लैक स्पॉट में B.O.Q के अनुसार उनकी लागत का अंकन करते हुये कार्य की कुल लागत का अंकन किया जाये।
- आगणन में सम्मिलित प्रत्येक ब्लैक स्पॉट से सम्बन्धित पृथक-पृथक Strip plan व Line Diagram अवश्य संलग्न किये जाये। Strip plan में किये जा रहे प्राविधानों जैसे कि-साईनबोर्ड, स्पीडटेबल, कैंश बेरियर, डिवाइडर आदि का चैनेजवार अंकन किया जाये। Strip plan व Line Diagram सक्षम स्तर के अधिकारी से हस्ताक्षरित होना चाहिए।
- आगणन में संलग्न समस्त दर विश्लेषण अधीक्षण अभियन्ता से हस्ताक्षरित होना चाहिए।
- आगणन में सेफ्टी ऑडिट किये जाने के समय ब्लैक स्पॉट की वर्तमान स्थिति दर्शाते हुये कम से कम तीन फोटो अधिशासी अभियन्ता से हस्ताक्षरित करते हुये संलग्न किया जाये।

अरविन्द कुमार (जैन)

प्रमुख अभियन्ता (विकास) एवं विभागाध्यक्ष  
लो0नि0वि0, उ0प्र0 लखनऊ  
दिनांक :

पत्रांक-

प्रतिलिपि : निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. प्रमुख सचिव, लो0नि0 उ0प्र0 शासन लखनऊ।
2. प्रमुख अभियन्ता, (ग्रामीण सड़क)/(परिकल्प/नियोजन), लो0नि0वि0 लखनऊ।
3. समस्त मुख्य अभियन्ता, लो0नि0वि0 उ0प्र0।
4. अधीक्षण अभियन्ता, लखनऊ वृत्त लो0नि0वि0 लखनऊ को इस निर्देश के साथ प्रेषित कि IRC 67-2022 के अनुसार रोड साईनेज से संबंधित SOR items का संशोधन करना सुनिश्चित करें।
5. अधीक्षण अभियन्ता, आई0डी0एस0 वृत्त लो0नि0वि0 लखनऊ को इस निर्देश के साथ प्रेषित कि इस कार्यालय ज्ञाप को विभागीय वेब साईट पर अपलोड करना सुनिश्चित करें।
6. समस्त अधीक्षण अभियन्ता, लो0नि0वि0 उ0प्र0।
7. समस्त अधिशासी अभियन्ता, लो0नि0वि0 उ0प्र0।

23/11/2024  
प्रमुख अभियन्ता (विकास) एवं विभागाध्यक्ष  
लो0नि0वि0, उ0प्र0 लखनऊ