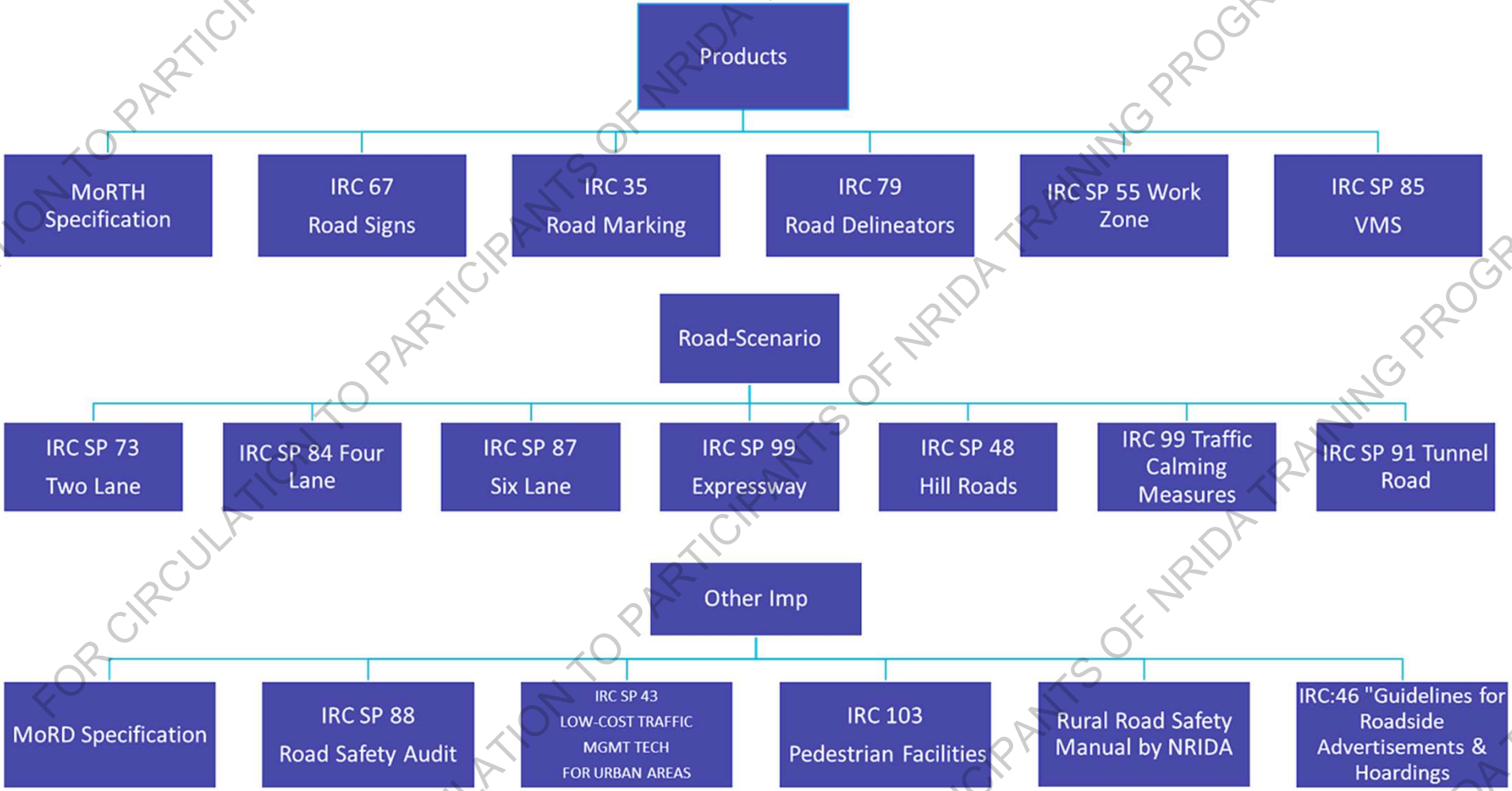
Rural Road Safety Course

Road Signages & Road Furniture including Night Time Safety

Indian Standards & Manuals

Manuals



Night Time Safety Includes

- Visibility
- Principle of Retro-reflection
- Reflective Road Signs
- Reflective Raised Pavement Markers
- Reflective Road Markings
- Glare
- Reflective Clothing
- Reflective Tapes
- Street Lighting
- Delineators
- Work Zones during Night Time

Visibility

- Increase in visibility means more reaction time which in turn leads reduction in chances of collision
- Daylight - Bright colors are more visible than dull colors under daylight condition
- Low light conditions - Fluorescent colors are more effective than bright colors under low light (e.g. dawn and dusk).
- Dark conditions (In Night) – Retro reflective materials provides greater visibility in night.

Visual Hazard During Night

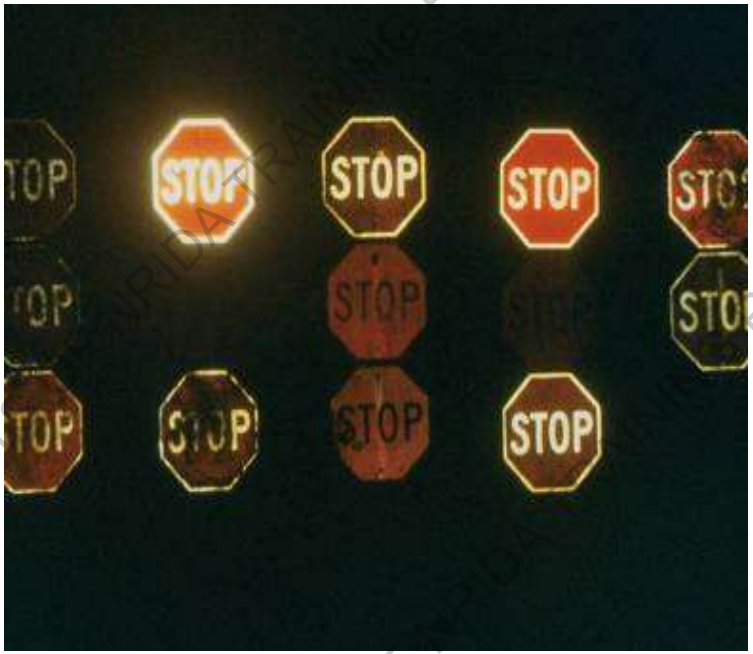
- **Poor lighting** decreases visibility
- **Problem of glare** causes increase in distraction level.
- At night , **field of vision** narrows down only to the area illuminated by head light which is **80-100m** in front of the motor vehicle.
- Headlights can not follow the **curves and dips** which create blind spots to motorists.
- **Eye fatigue** causes lack in alertness

How retro-reflection guide us on road

Science of Retro Reflection

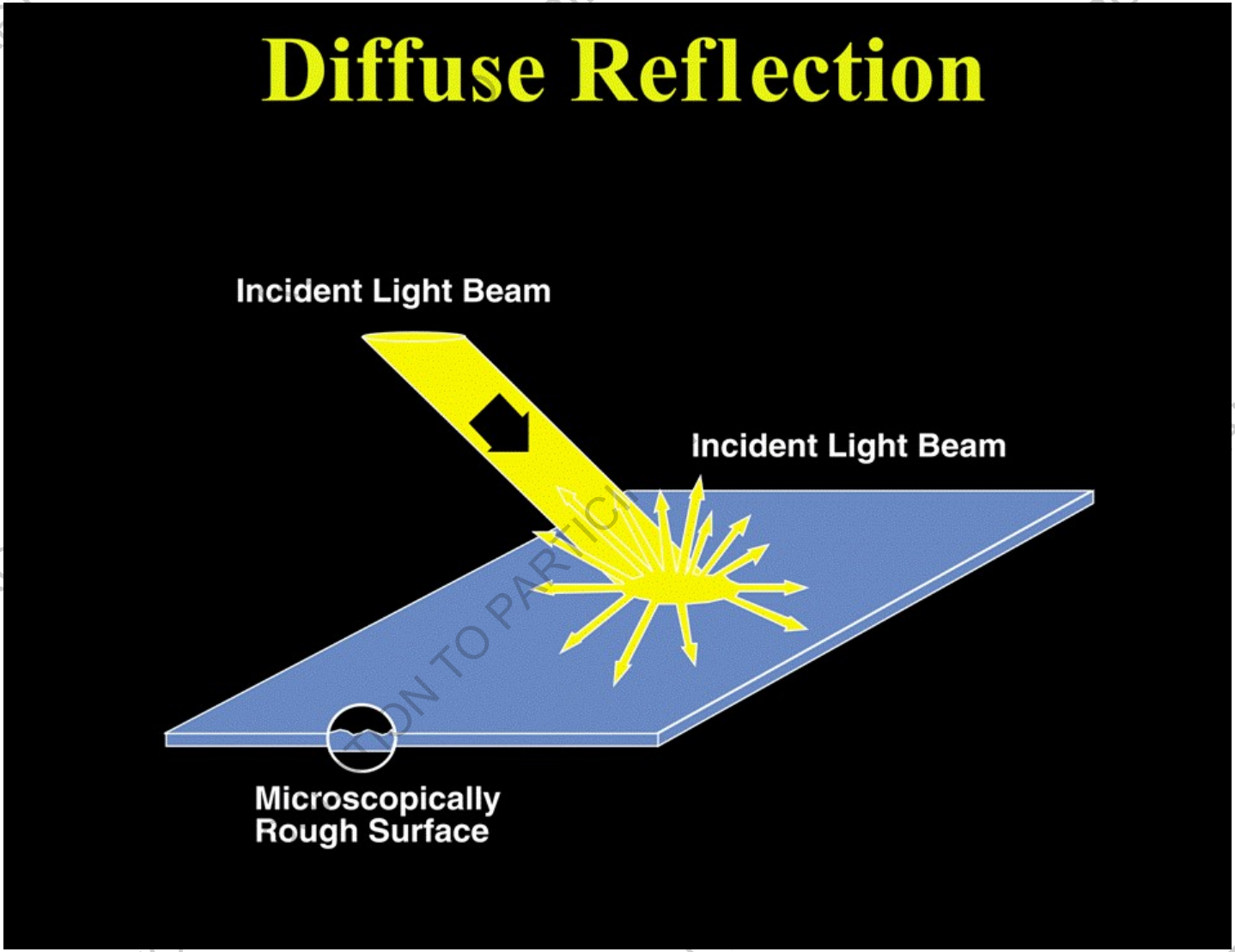
Day vs. Night

Because what you see during the day

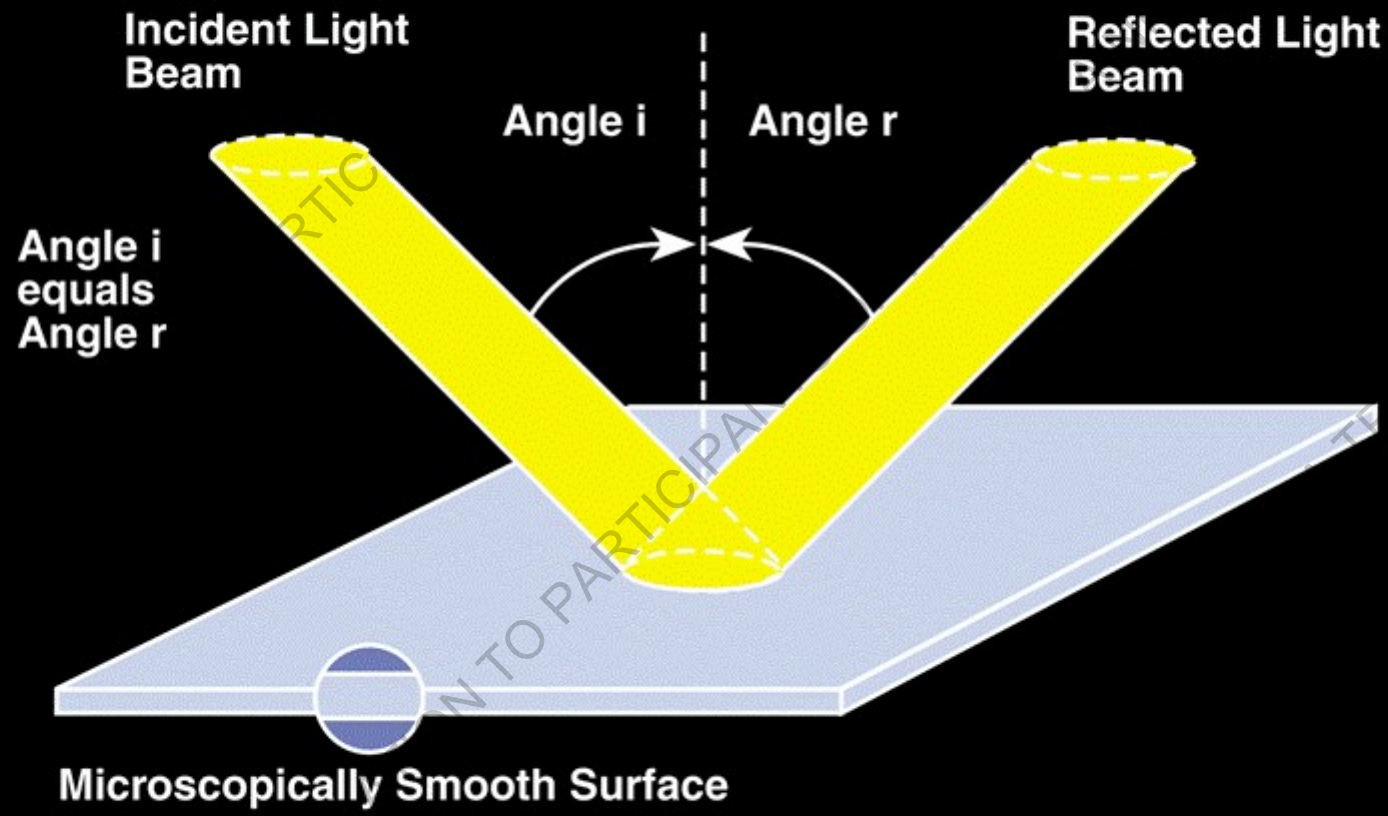


Is not always what you get at night !

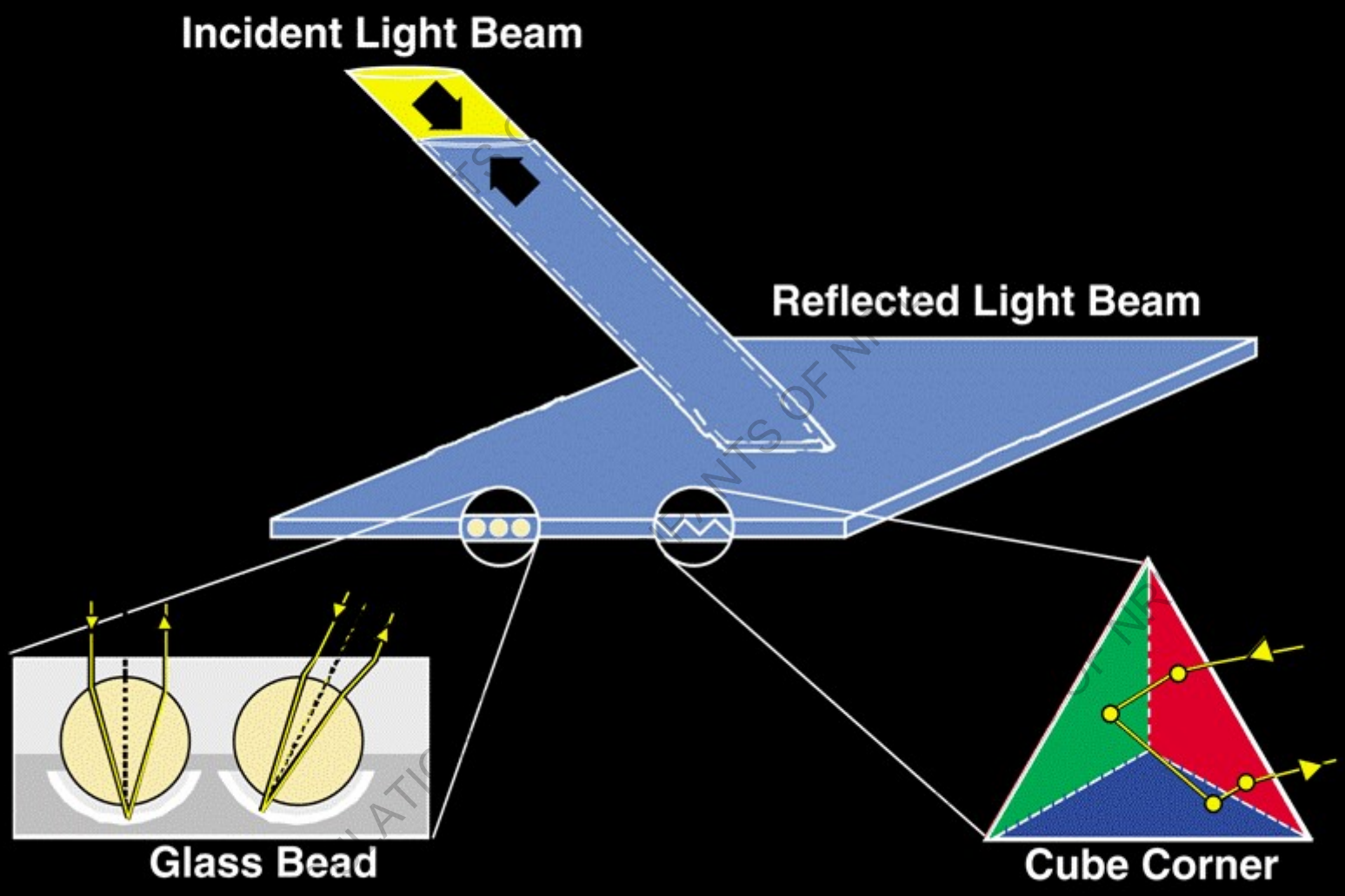
Principal of Retro Reflection



Mirror Reflection

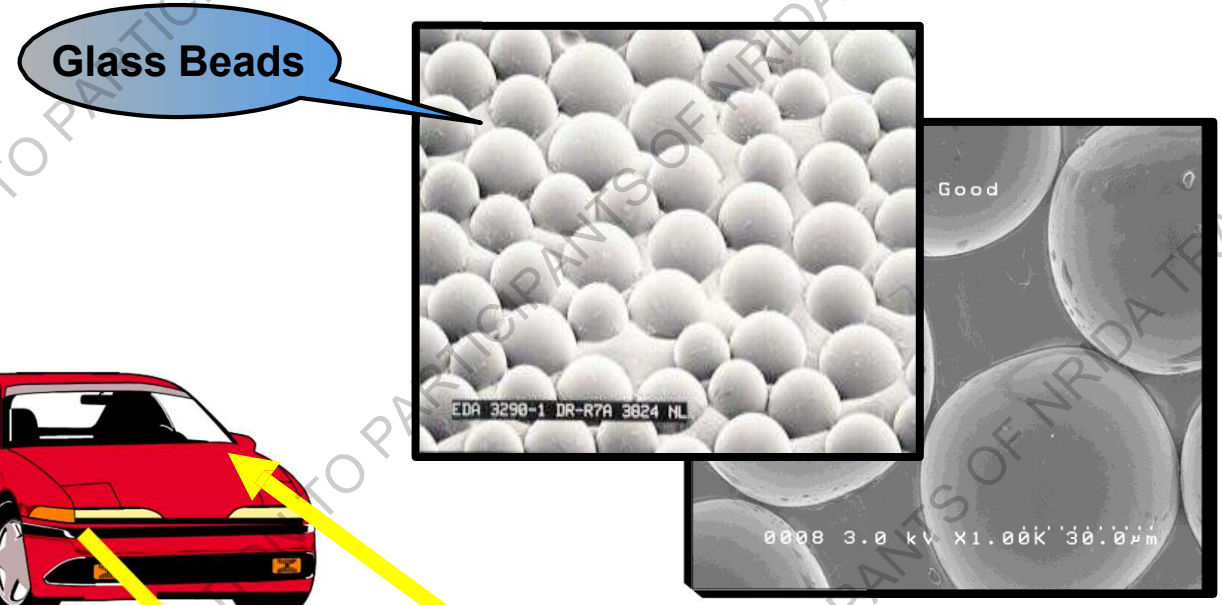


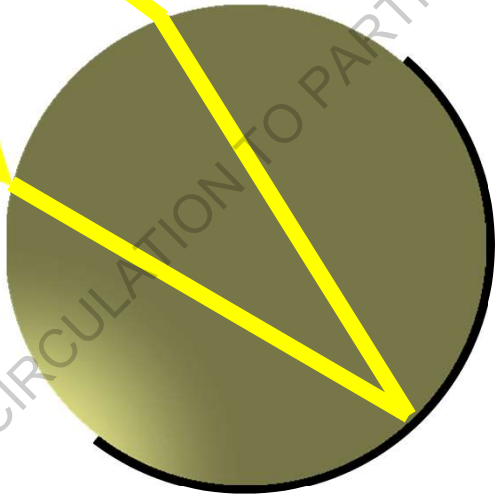
Retroreflection

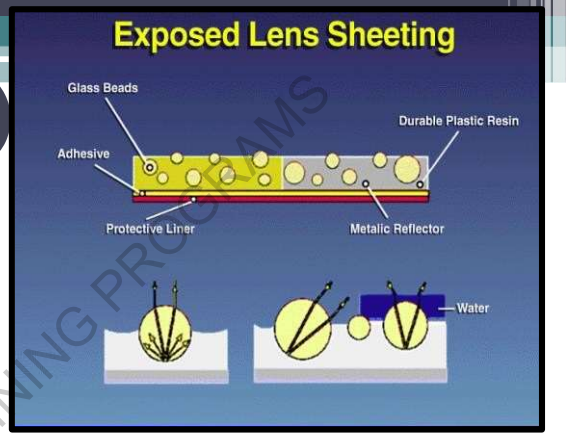


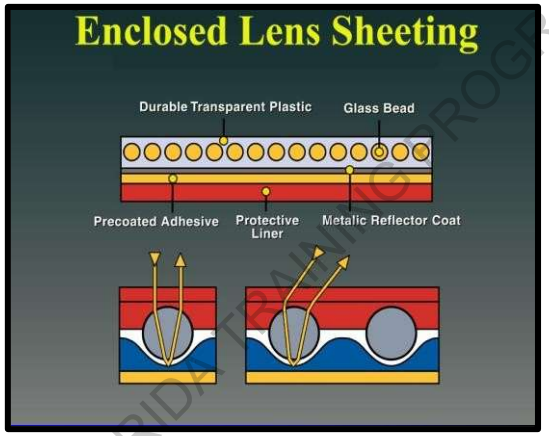
Two Systems of Retroreflection

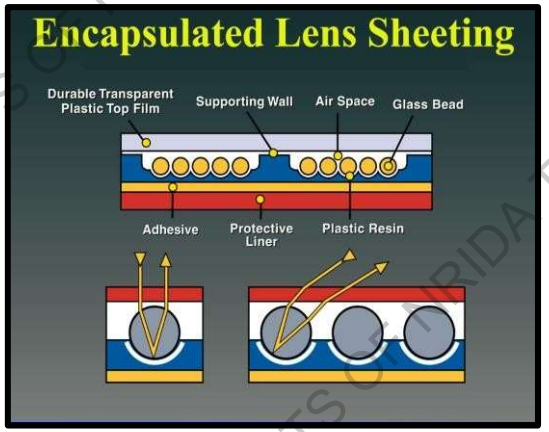
Glass Bead Technology (1930's)





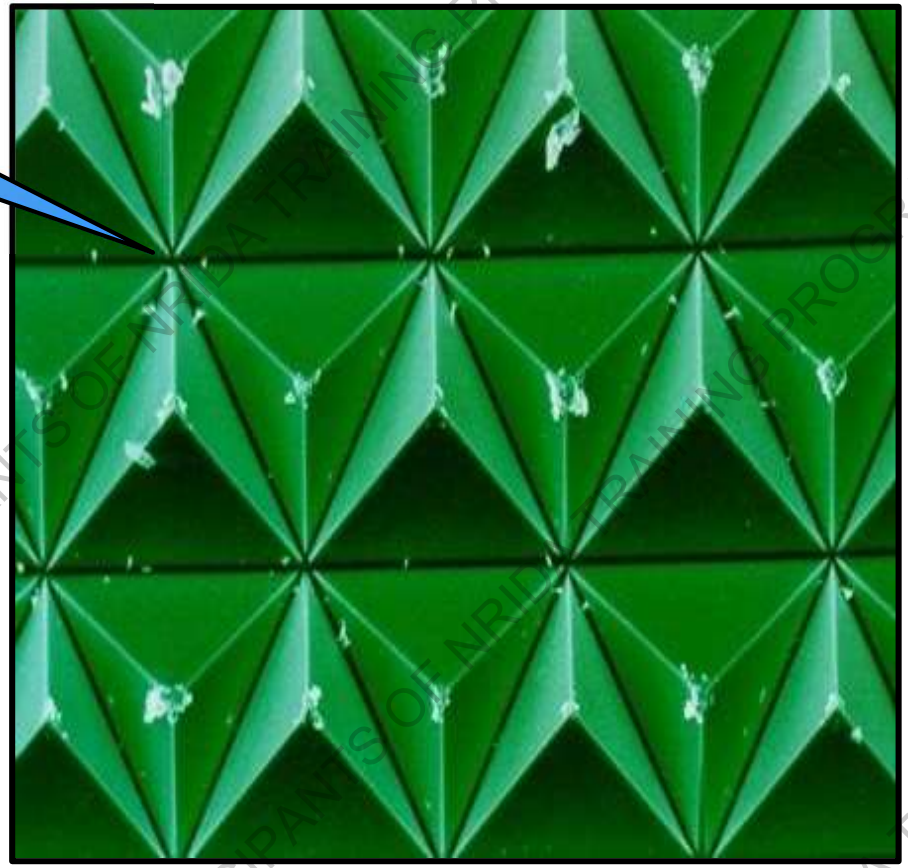


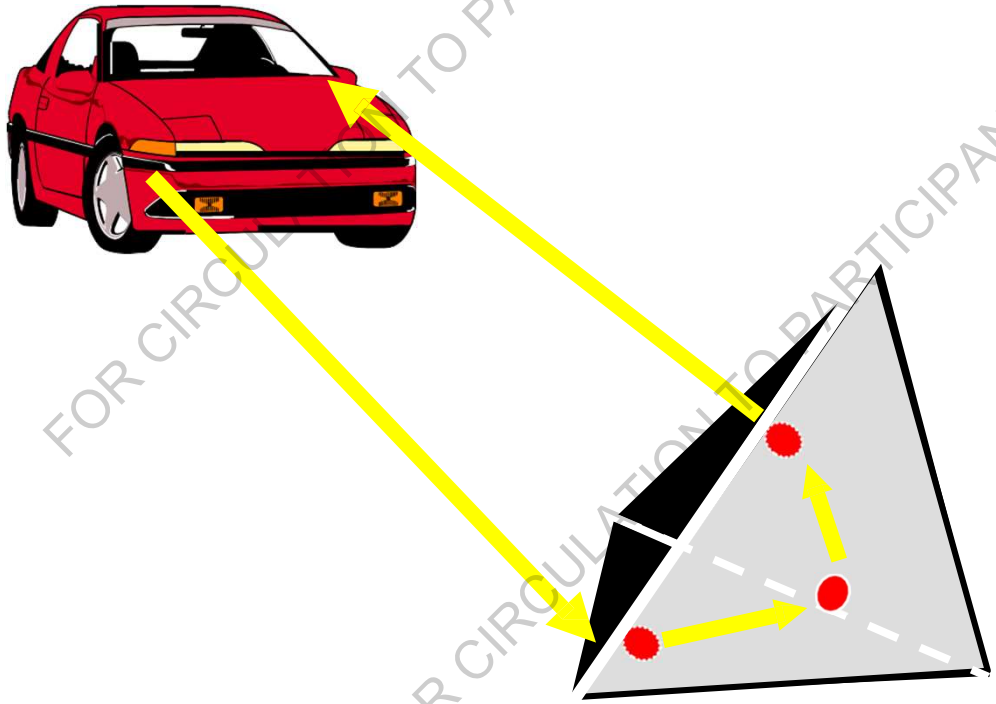




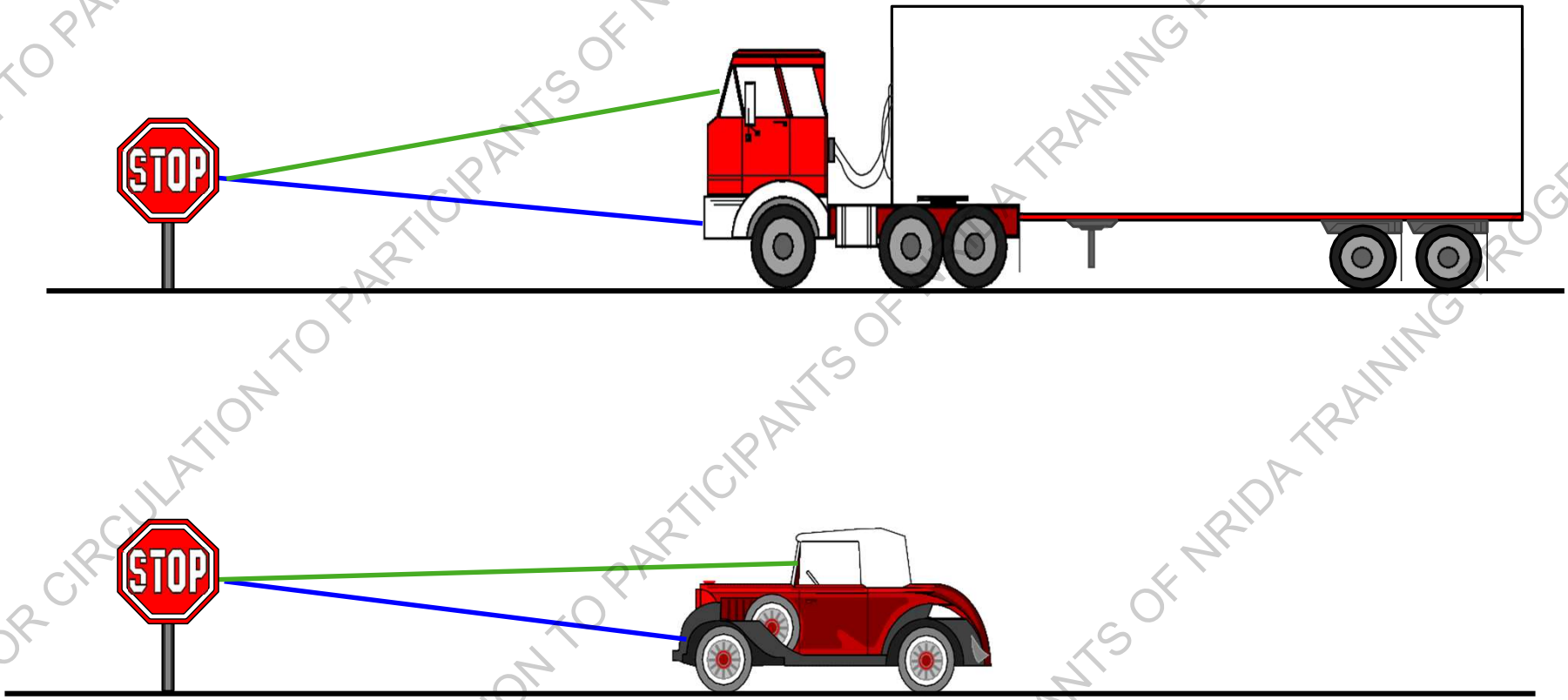
Micro Prismatic Technology (1970's)

Highly Efficient
Cube - Corners



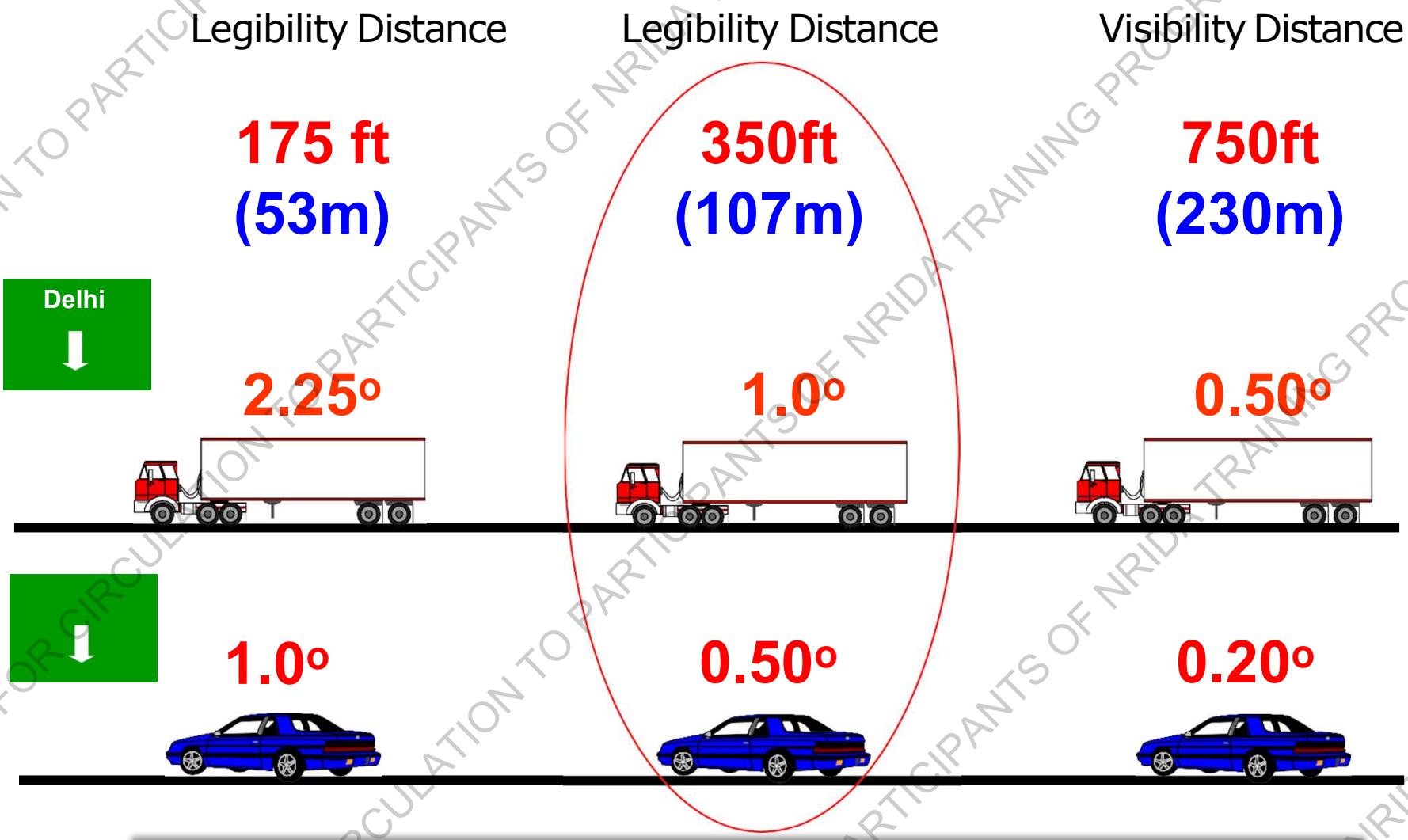


Observation Angle : Truck vs. Car

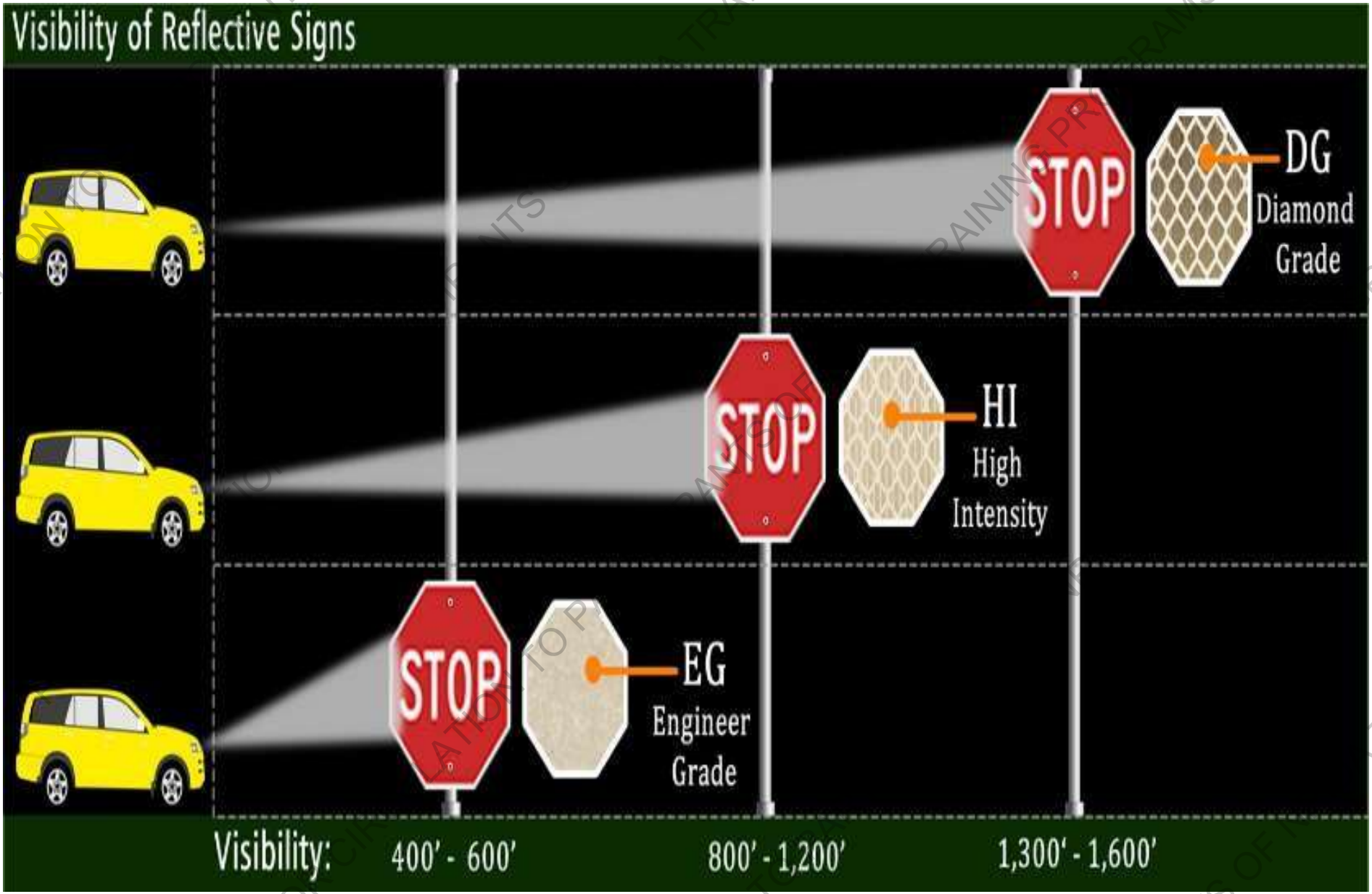


Observation Angle for Trucks is higher than Cars

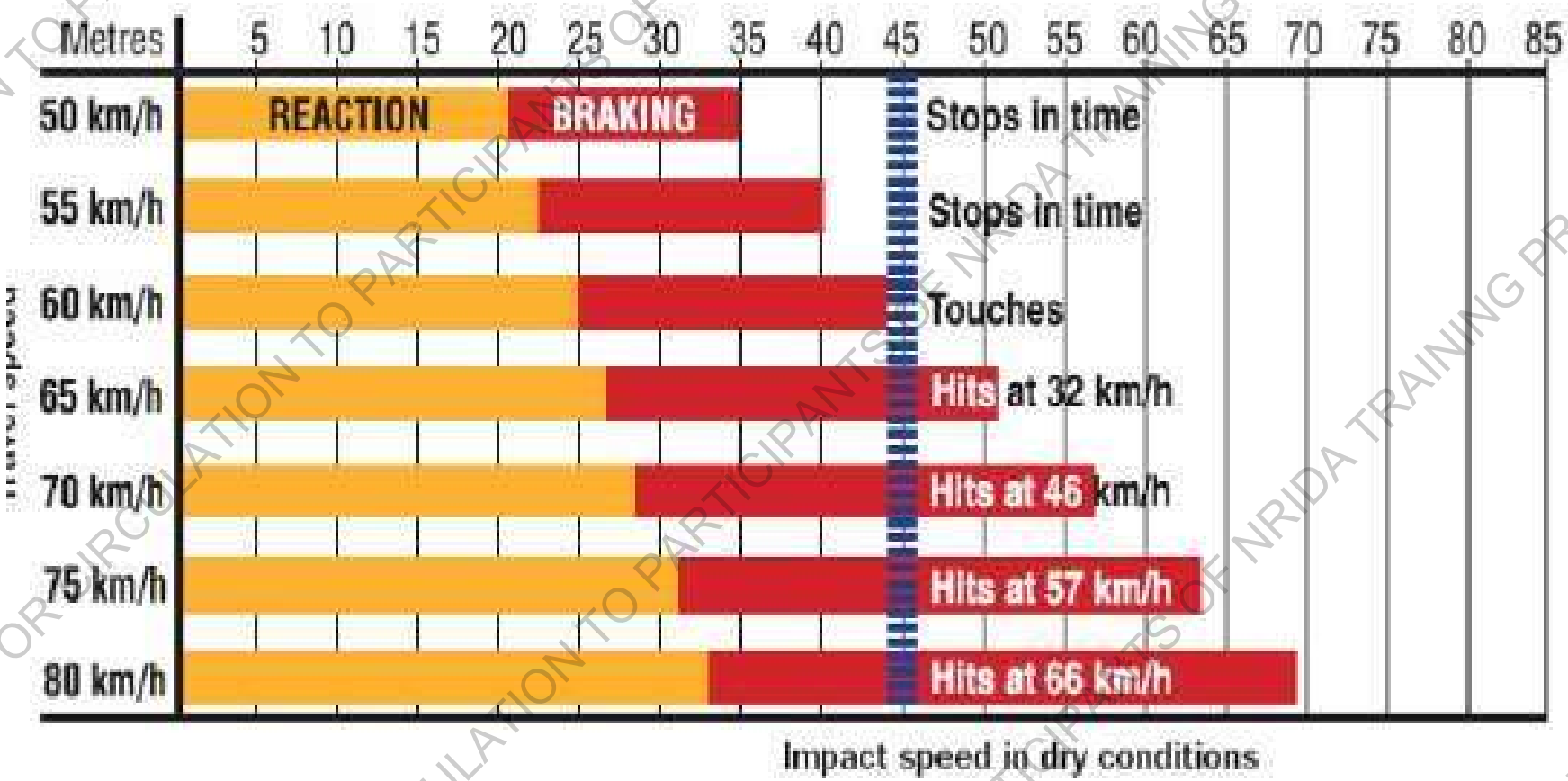
Observation Angles : Overhead Sign Approach



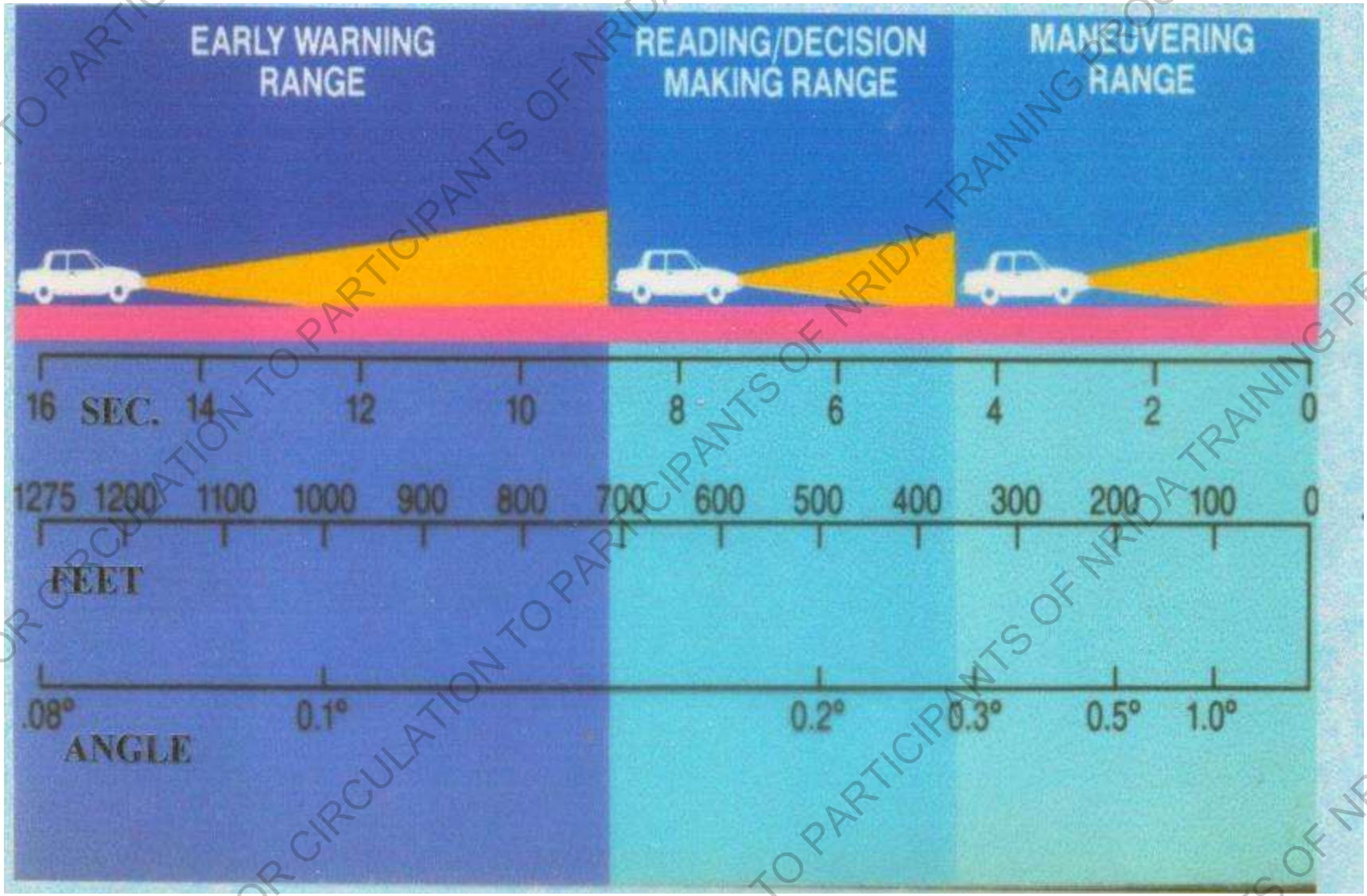
Large trucks have at least twice observation angle as sedans

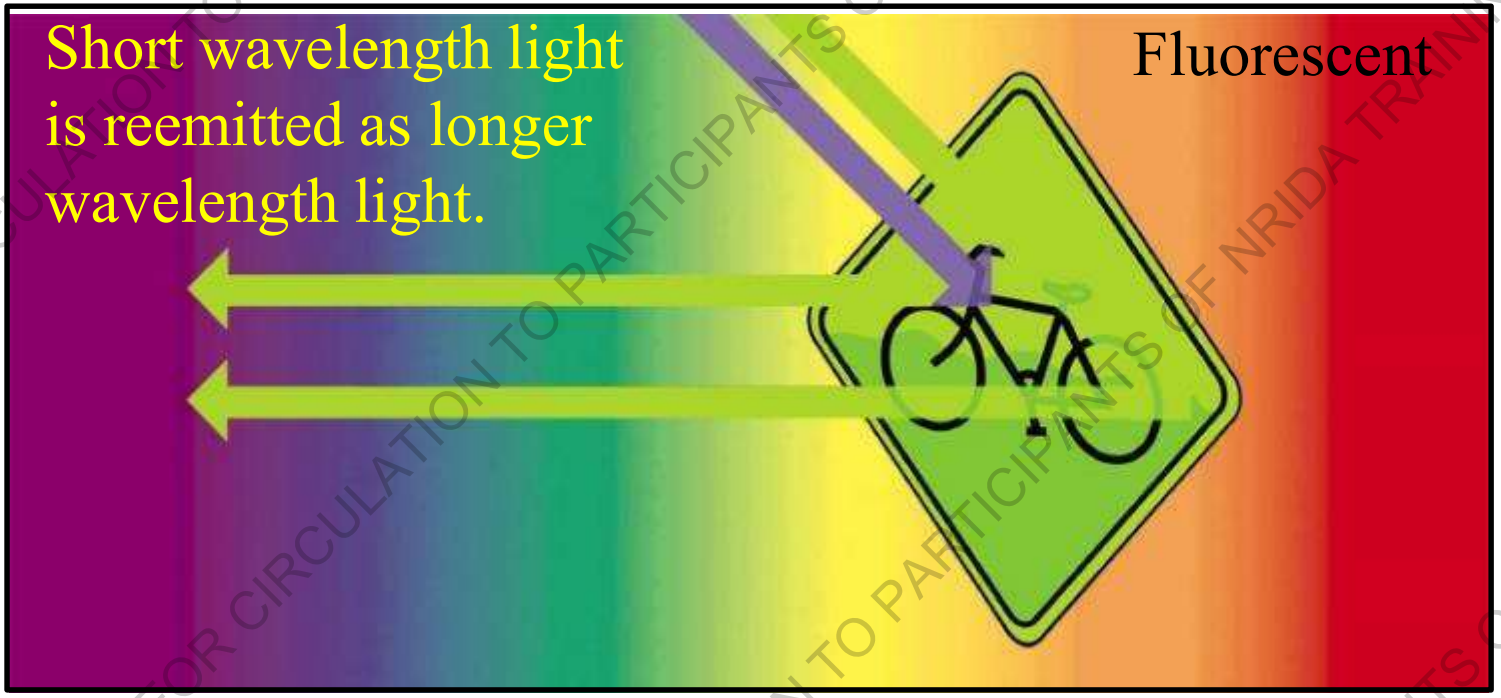

Visibility of Reflective Signs
STOP
DG
Diamond
Grade
STOP
HI
High
Intensity
STOP
EG
Engineer
Grade
Visibility:
400' - 600'
800' - 1,200'
1,300' - 1,600'

Travel speed, stopping distance and crash impact speed



Importance of Early Detection of Road- Sign





Fluorescent Orange

Standard Orange

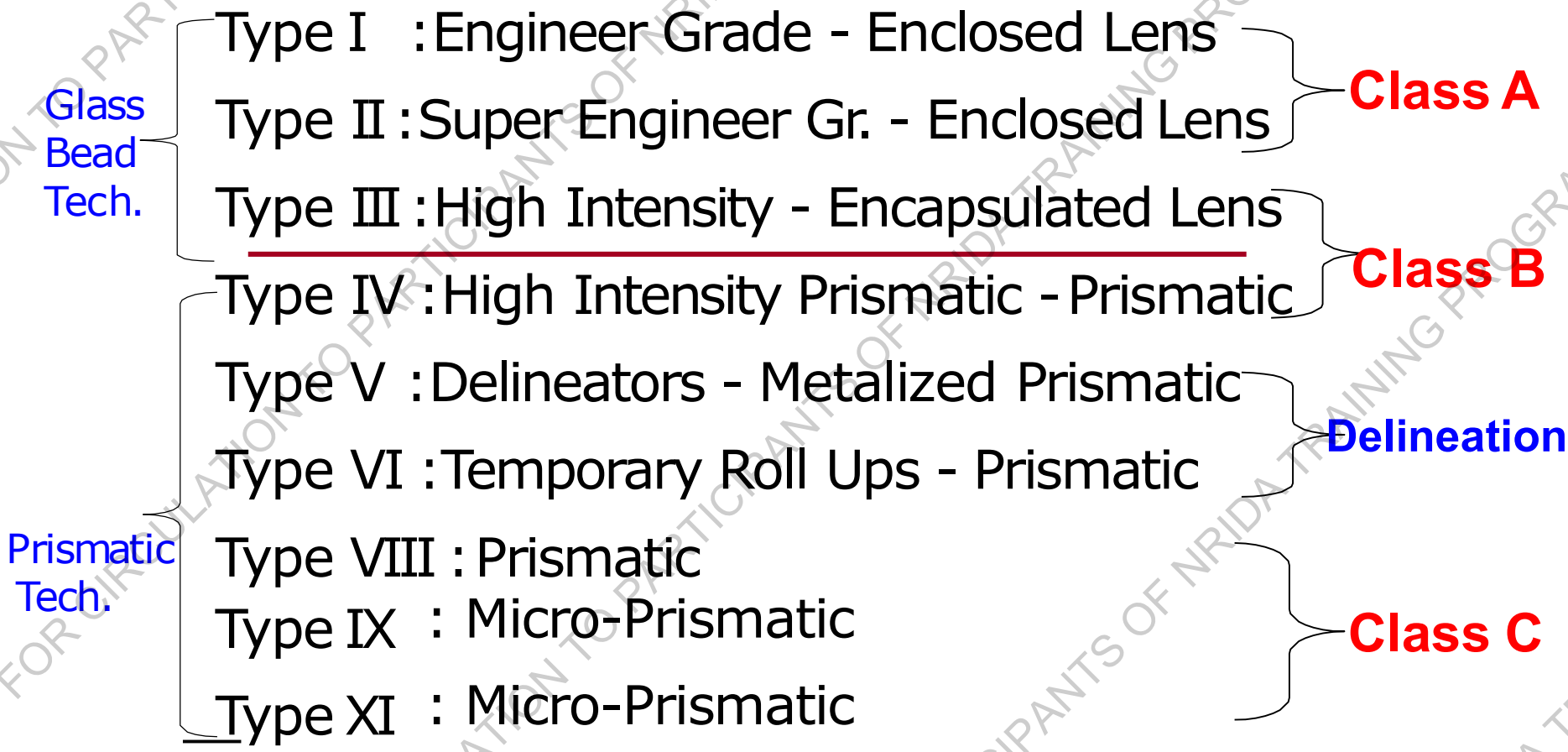
Fluorescent Yellow-Green

Standard Yellow

Fluorescent Yellow

Standard Yellow

IRC 67- 2012 : Types of Sheeting



IRC 67 - 2012

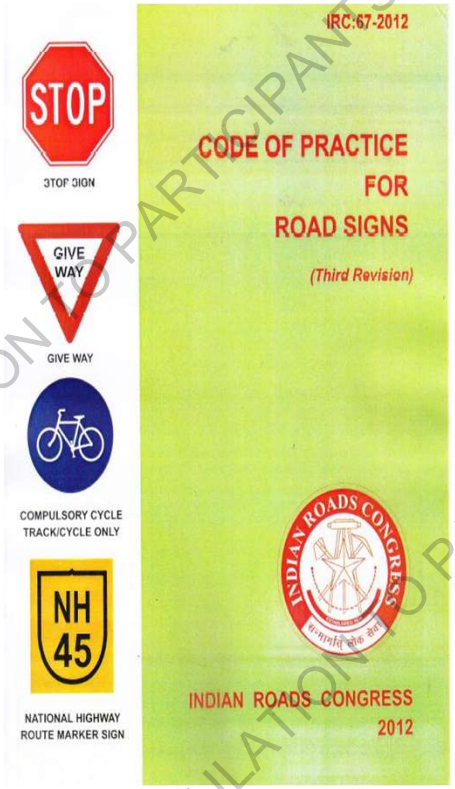


Table 6.2 Suggested Guidelines for Usage of Retro-Reflective Sheeting

Class of Sheeting	Type of Sheeting (ASTM)	Category of Road				
		National/ State Highway	Major District Roads	Rural Roads	Urban/ City Roads	Expressway
Class A	Type I	No	Yes	Yes	No	No
	Type II	No	Yes	Yes	No	No
Class B	Type III*	Yes	Yes	Yes	Yes	No
	Type IV	Yes	Yes	Yes	Yes	No
Class C	Type VIII	Yes	No	No	Yes	Yes
	Type IX	Yes	No	No	Yes	Yes
	Type XI	Yes	No	No	Yes	Yes

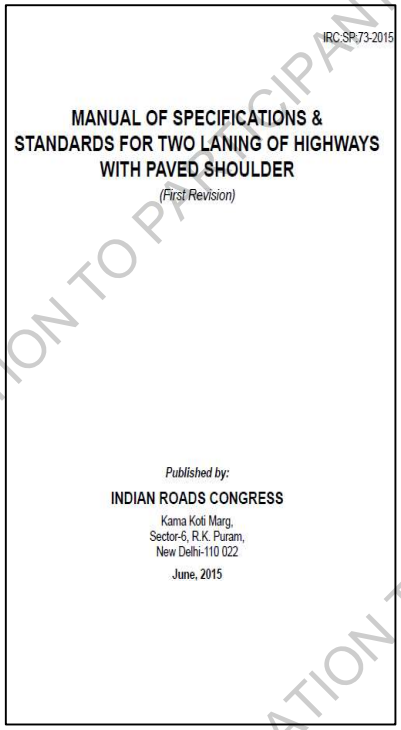
3 class of sheeting are defined
Class A – 1 & 2
Class B – 3 & 4
Class C – 8, 9 & 11

Class C is recommended for NH, SH and Expressways Class B can be used all roads except expressway

Most of the new developments of roads is almost equivalent to expressway

Hence type 11(Class C) passes standard requirement as well

IRC 73


IRC:SP:73-2015

MANUAL OF SPECIFICATIONS & STANDARDS FOR TWO LANING OF HIGHWAYS WITH PAVED SHOULDER

(First Revision)

Published by:

INDIAN ROADS CONGRESS

Kama Koti Marg,
Sector-6, R.K. Puram,
New Delhi-110 022

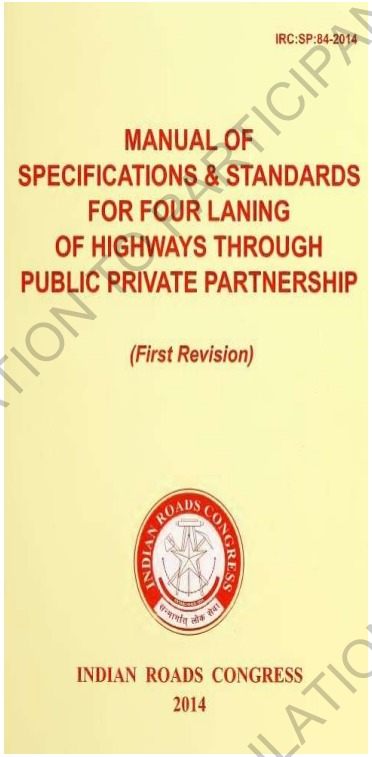
June, 2015

9.2.3 All road signs shall be of Prismatic Grade Sheeting corresponding to Class C Sheeting described in IRC:67 and any of the sheeting types VIII, IX or XI as per ASTM D 4956-09 fixed over Aluminium or Aluminium Composite Material. The sheeting for different type of signs can be chosen based on the selection guidance provided in IRC:67 depending upon the situation encountered by road users in viewing the signs. Sheeting with high coefficient of retro reflection at small observation angle are for a road sign to be viewed by a driver from a long distance, whereas the sheeting with wide observation angle for better performance at short distance viewing. The Type XI sheeting will have better performance at short and medium distances. Micro prismatic sheeting is preferred for gantry mounted overhead signs. Type IV micro prismatic sheeting can be used for delineator posts.

Class C sheeting as per IRC 67 is recommended for all road signs

Type XI is preferred for gantry mounted overhead signs

IRC 84



9.2.3 All road signs shall be of Prismatic Grade Sheeting corresponding to Class C Sheeting described in IRC:67 and any of the sheeting types VIII, IX or XI as per ASTM D 4956-09 fixed over Aluminum or Aluminum Composite Material. The sheeting for different type of signs can be chosen based on the selection guidance provided in IRC:67 depending upon the situation encountered by road users in viewing the signs. Sheeting with high coefficient of retro reflection at small observation angle are for a road sign to be viewed by a driver from a long distance, whereas the sheeting with wide observation angle for better performance at short distance viewing. The Type XI sheeting will have better performance at short and medium distances. Micro prismatic sheeting is preferred for gantry mounted overhead signs. Type IV micro prismatic sheeting can be used for delineator posts.

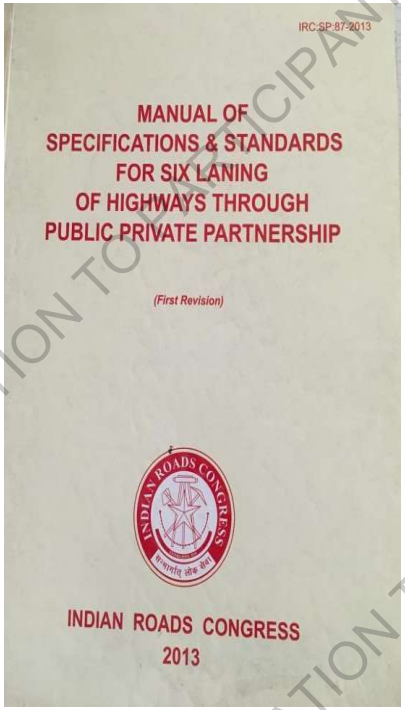
79

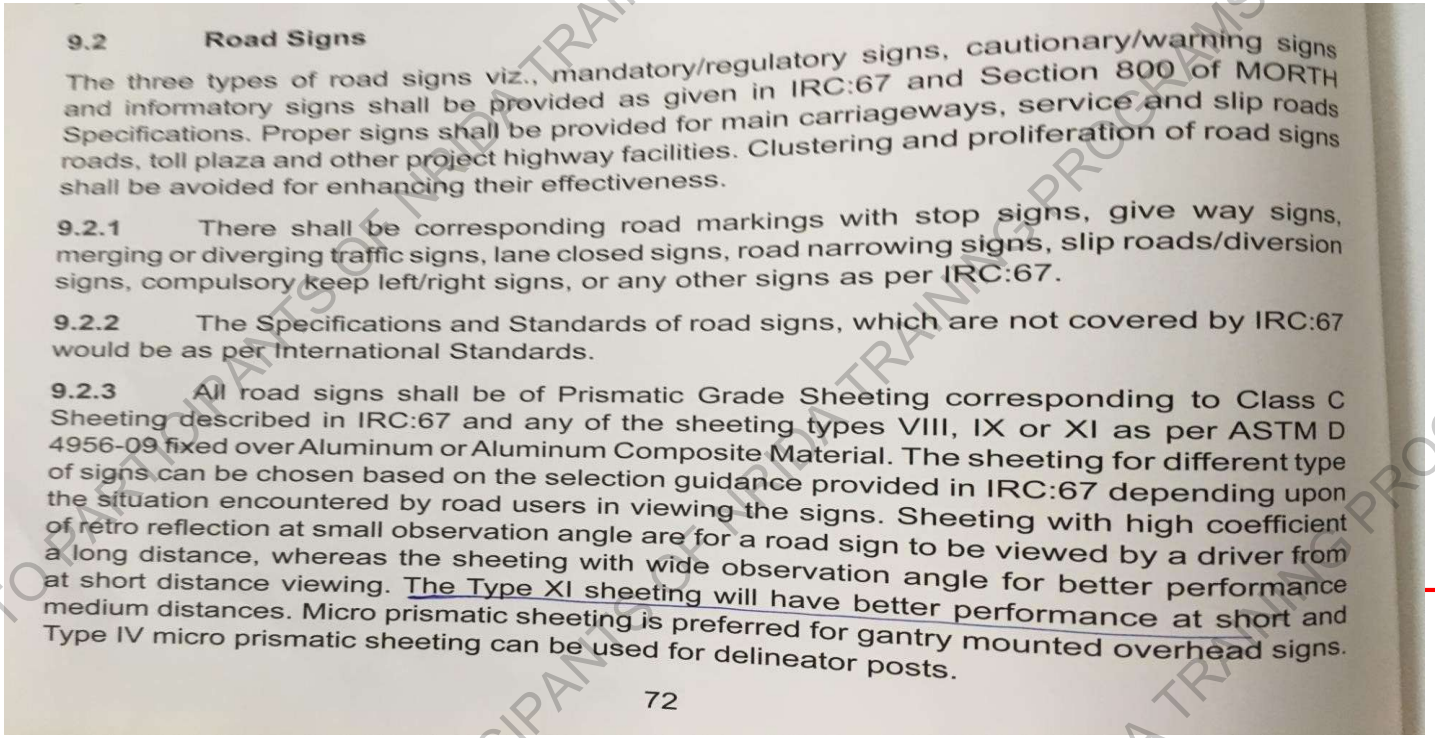
Released in 2014 after IRC 67, 2012 version

Class C sheeting as per IRC 67 is recommended for all road signs

Type XI is preferred for gantry mounted overhead signs

IRC 87





9.2 Road Signs

The three types of road signs viz., mandatory/regulatory signs, cautionary/warning signs and informatory signs shall be provided as given in IRC:67 and Section 800 of MORTH Specifications. Proper signs shall be provided for main carriageways, service and slip roads roads, toll plaza and other project highway facilities. Clustering and proliferation of road signs shall be avoided for enhancing their effectiveness.

9.2.1 There shall be corresponding road markings with stop signs, give way signs, merging or diverging traffic signs, lane closed signs, road narrowing signs, slip roads/diversion signs, compulsory keep left/right signs, or any other signs as per IRC:67.

9.2.2 The Specifications and Standards of road signs, which are not covered by IRC:67 would be as per International Standards.

9.2.3 All road signs shall be of Prismatic Grade Sheeting corresponding to Class C Sheeting described in IRC:67 and any of the sheeting types VIII, IX or XI as per ASTM D 4956-09 fixed over Aluminum or Aluminum Composite Material. The sheeting for different type of signs can be chosen based on the selection guidance provided in IRC:67 depending upon the situation encountered by road users in viewing the signs. Sheeting with high coefficient of retro reflection at small observation angle are for a road sign to be viewed by a driver from a long distance, whereas the sheeting with wide observation angle for better performance at short distance viewing. The Type XI sheeting will have better performance at short and medium distances. Micro prismatic sheeting is preferred for gantry mounted overhead signs. Type IV micro prismatic sheeting can be used for delineator posts.

72

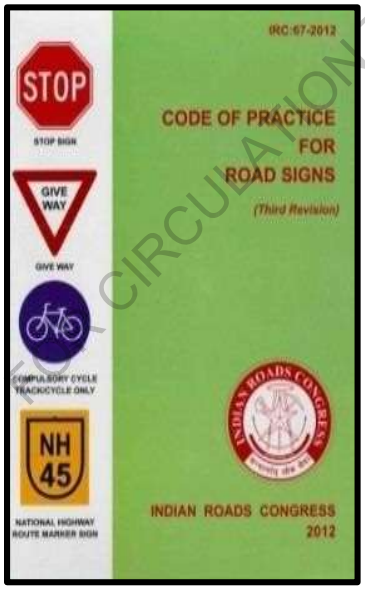
Released in 2013, After IRC67:2012

Class C sheeting as per IRC 67 is recommended for "all road signs"

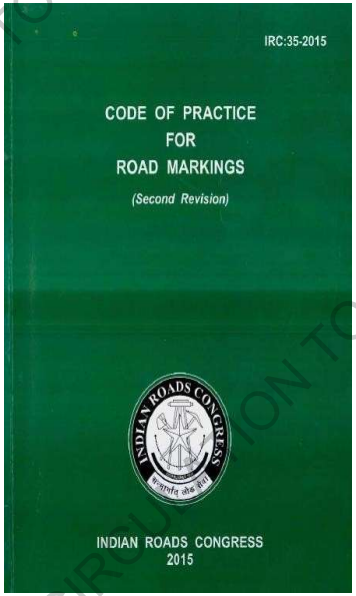
Type XI is preferred for gantry mounted overhead signs

MORTH & IRC Signage Standards

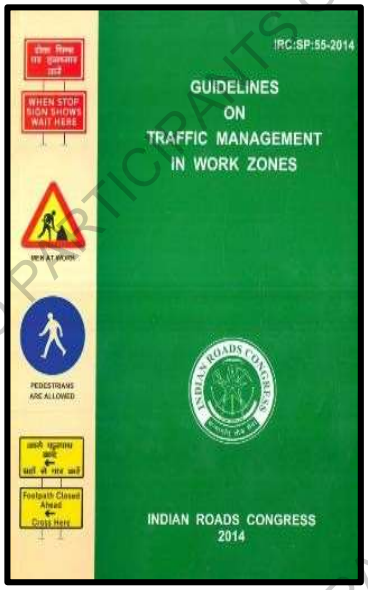
- Code of Practice for Road Signs (IRC 67:2012)
- Code of Practice for Road Marking (IRC 35 – 2015)
- Guidelines on Traffic Management in Work Zone (IRC 55: 2014)
- MORTH 2013 – Specifications for Roads and Bridge work
- Guidelines for road signage under PMGSY



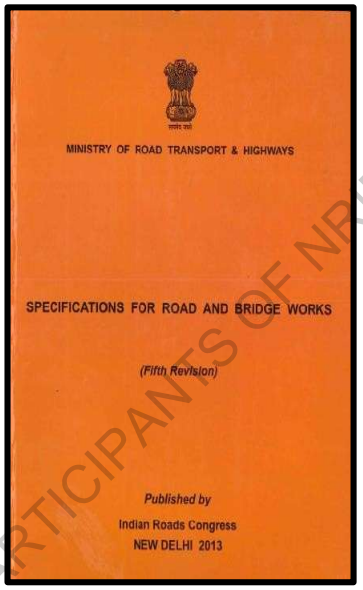
IRC 67-2012



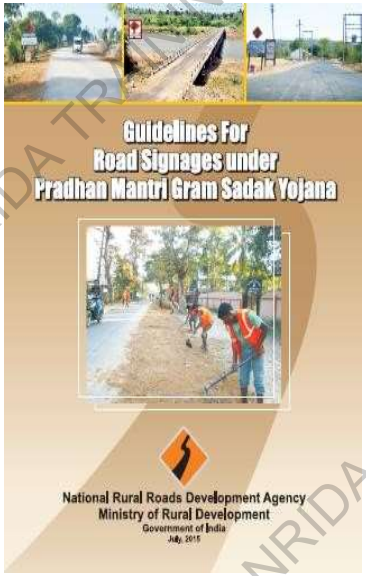
IRC 35-2015



IRC 55-2014



MORTH



PMGSY Signage Guidelines

Traffic Signs

Principles of traffic signs and markings:

Traffic signs and markings are most effective when they satisfy five basic requirements:

- Fulfill a need;
- Command attention;
- Convey a clear, simple meaning;
- Command respect from road users; and
- Give adequate time for proper response.

Traffic Signs and Road Markings **MUST BE** the ***primary***, and ***sole , means of communication*** between Road System and Road User for efficient navigation

Traffic Signs

Function of signs:

Signs shall be defined by their function as follows:

A. Regulatory signs give notice of traffic laws or regulations.

B. Warning signs give notice of a situation that might not be readily apparent.

C. Informative signs show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information.

Classification of Road Signs

- **Regulatory / Mandatory Signs**
  - Prohibitory / Regulatory Sign

  - Compulsory Control Signs

  - STOP & Give Way Signs

- **Cautionary / Warning Sign**

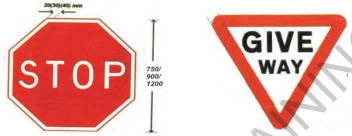
- **Informatory Sign**
  - Direction Information Sign

  - Facility Information Sign

Mandatory / Regulatory Signs

Classified Under Following Sub-heads

i) Stop and Give Way signs (Right of way signs)



ii) Prohibitory signs

iii) No Parking and No Stopping signs

iv) Speed Limit & Vehicle Control signs

v) Restriction Ends sign

vi) Compulsory Direction Control

- All Mandatory or Regulatory signs are **circular** in Shape
- Signs are with **red circular ring** & **diagonal bars** with black symbols or arrow or letters on white background
- **Red Ring** indicates **Prohibitory regulation**
- **Diagonal Red bar** prohibits the **action or movement** indicated by the black symbol
- Mandatory signs giving **positive instructions** are circular with **white symbol** on a **blue** background

Mandatory / Regulatory Signs

Size and Dimensions of Mandatory and Regulatory Signs

Design Speed	Size	Regulatory Signs	Mandatory Signs			
		Diameter (mm)	Diameter (mm)	Border (mm)	Oblique Bar (mm)	Front Size (mm)
Up to 65 kmph	In conjunction with traffic light signal		300	35	35	75
	Small	600	600	50	50	100
66 – 80 kmph	Medium	750	750	60	60	125
81 – 100 kmph	Normal	900	900	75	75	150
> 100 kmph	Large	1200	1200	100	100	225

Source: IRC 67: 2012 “Code of Practice for Road Signs”.

Sign Sizes – Mandatory Signs

IRC – 67 2012

Table 14.4 Size and Dimension of Mandatory and Regulatory Signs

Design Speed	Size	Regulatory Signs	Mandatory Signs			
		Diameter (mm)	Diameter (mm)	Border (mm)	Oblique Bar (mm)	Font Size (mm)
Up to 65 kmph	In conjunction with traffic light signal		300	35	35	75
	Small	600	600	50	50	100
66 - 80 kmph	Medium	750	750	60	60	125
81 - 100 kmph	Normal	900	900	75	75	150
> 100 kmph	Large	1200	1200	100	100	225

IRC – 67 202

Table 14.4: Size and Dimension of Mandatory / Regulatory Signs

Design Speed	Diameter (mm)	Border (mm)	Oblique bar (mm)	Font Size (mm)
Up to 65 Kmph	300*	35	35	75
	600	50	50	100
66 – 80 Kmph	750	60	60	125
81 - 100 Kmph	900	75	75	150
101 - 120 Kmph	1200	100	100	225
120-150 Kmph	1500	120	120	250

**Prohibitory Signs in conjunction with traffic light signal*

Extra Large Size - 1500 mm

Cautionary / Warning Signs

Size and Dimensions of Cautionary Signs and their Siting Distance

Design Speed	Size	Side (mm)	Border (mm)	Clear Visibility Distances (m)	Distance of Sign from Hazard (m)
Up to 50 kmph	Small	600	45	45	45
51 – 65 kmph	Medium	750	60	60	45 – 110
66 – 80 kmph	Normal	900	70	60	110 – 180
> 80 kmph	Large	1200	90	90	180 - 245

Source: IRC 67: 2012 “Code of Practice for Road Signs”.

Sign Sizes – Cautionary Signs

Extra Large Size - 1500 mm

IRC – 67 2012

Table 15.1 The Sizes and Dimensions of Cautionary and their Siting Distances

Design speed	Size	Side (mm)	Border (mm)	Clear Visibility Distances (m)	Distance of sign from hazard (m)
Up to 50 kmph	Small	600	45	45	45
51 - 65 kmph	Medium	750	60	60	45 - 110
66 - 80 kmph	Normal	900	70	60	110 - 180
> 80 kmph	Large	1200	90	90	180 - 245

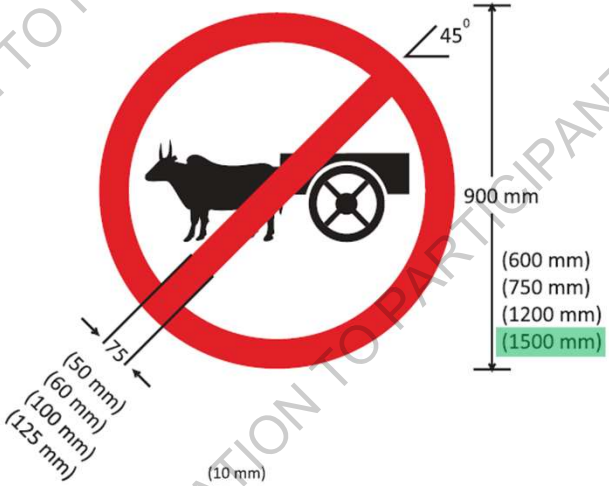
IRC – 67 2022

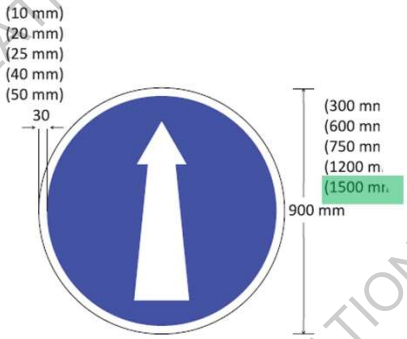
Table 15.1: Sizes and Dimensions of Cautionary / Warning Sign & Siting Distances

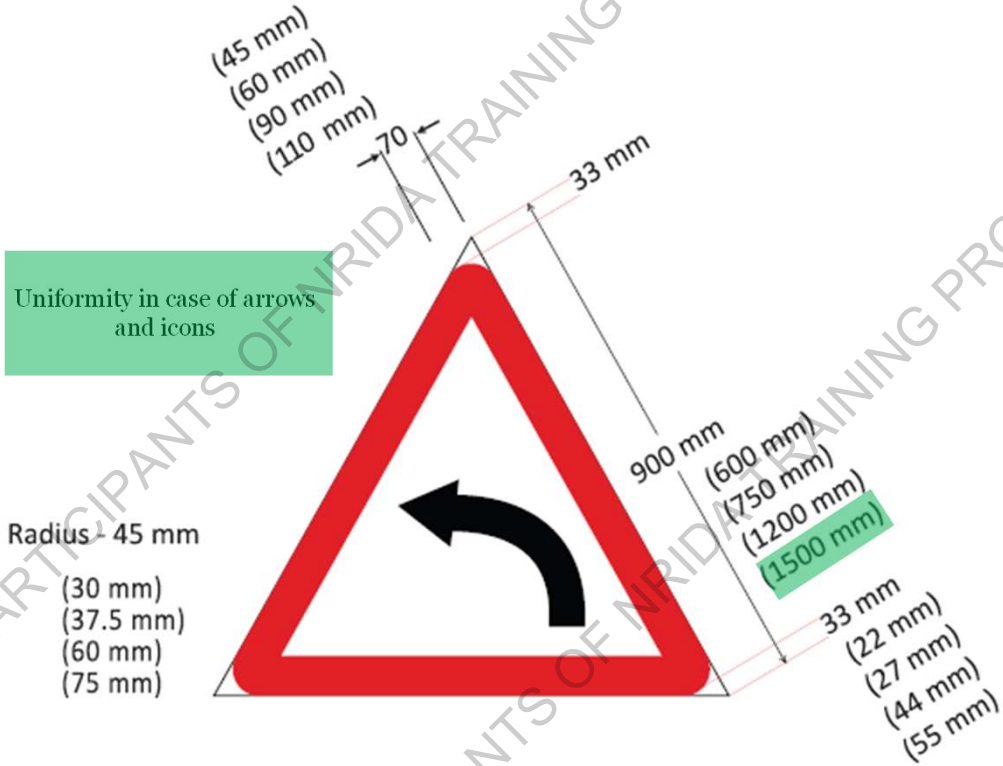
Design speed	Side (mm)	Border (mm)	Clear Visibility Distances (m)	Distance of sign from hazard (m)
Up to 50 Kmph	600	45	45	45
51 - 65 Kmph	750	60	60	45-110
66 - 80 Kmph	900	70	70	110-180
80 - 120 Kmph	1200	90	90	180-245
120 -150 Kmph	1500	110	110	245-305

Sign Sizes – Cautionary and Regulatory Signs

Extra Large Size - 1500 mm







Clarity Regarding Side Dimensions after Smoothening

Yellow Backing Board Concept – Use of fluorescent color

When all other normal treatments have been tried (e.g. larger signs and upgraded delineation) and still a higher-than-expected crash rate is experienced, only then should the use of a yellow backing board be considered. They should be used very sparingly as a special case and not as a matter of routine. It may also be fluorescent; this greatly increases conspicuity in dull weather and at dusk. Fluorescence can be particularly effective in drawing attention to signs mounted in deep shadow, e.g. below overhanging trees or in places affected by dull or foggy weather conditions.

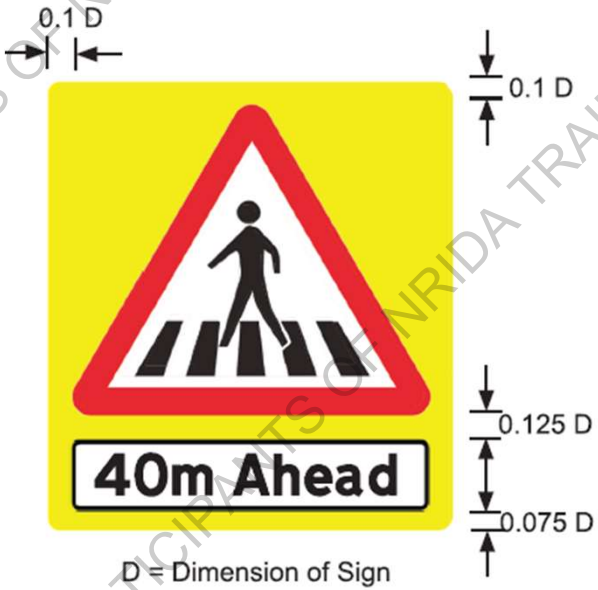


Fig. 11.1 Backing Board with Fluorescent Yellow Colour for Pedestrian Crossing

Fig.14.4 Gateway Signs at the Approach/Entrance to a Town or Village

Facility Information Sign

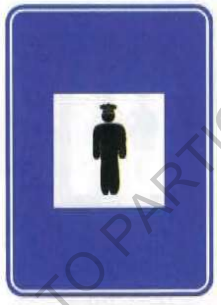
Eating Place

Resting Place

First Aid Post

Filling Station

Public Telephone



Police Station

Toilet

Hospital

Route Marker Signs

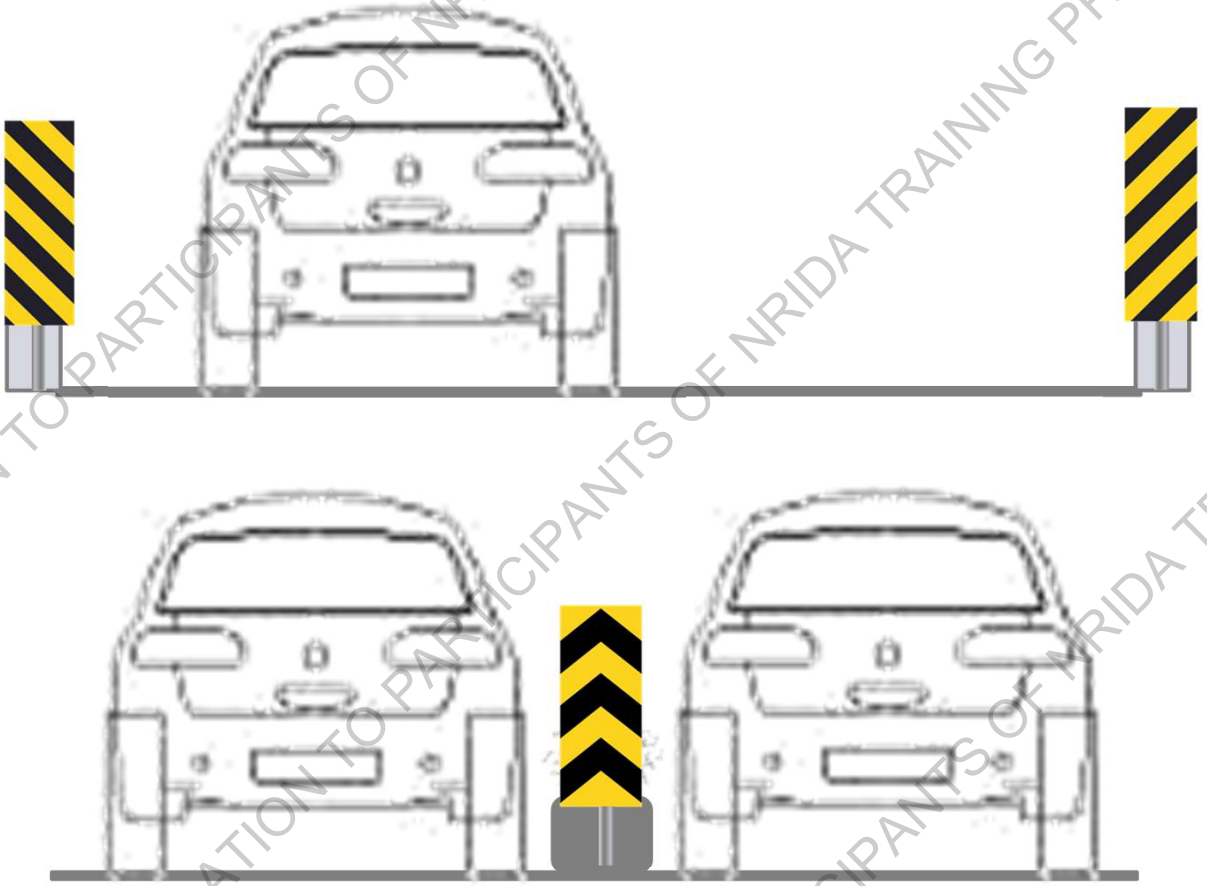
Asian Highway

Expressway

National Highway

State Highway

Object Hazard Marker - Orientation



Source: IRC 67: 2012 “Code of Practice for Road Signs”.

Retro-reflective solutions for Road Safety- ADDITIONAL SIGNS

Accident Zone Ahead Informatory Sign

250 to 500 m ahead of accident prone location

Accident Zone Ahead Cautionary Sign

100 to 200 m ahead of accident prone location

Informatory signs for Speed Cameras

Where camera enforcement is taking place.

Informatory sign on penalty as per Motor Vehicle act on Red light

Supplementary Plate Option

Supplementary Plate Option

Retro-reflective solutions for Road Safety- ADDITIONAL SIGNS

Accident Zone Ahead
Informatory Sign

250 to 500 m ahead of accident prone location

Accident Zone Ahead
Cautionary Sign

100 to 200 m ahead of accident prone location

Informatory signs for Speed Cameras

Where camera enforcement is taking place.

Informatory sign on penalty as per Motor Vehicle act on Red light

Supplementary Plate Option

Supplementary Plate Option

Retro-reflective solutions for Road Safety- ADDITIONAL SIGNS

Accident Zone Ahead
Informatory Sign

250 to 500 m ahead of accident prone location

Accident Zone Ahead
Cautionary Sign

100 to 200 m ahead of accident prone location

Informatory signs for Speed Cameras

Where camera enforcement is taking place.

Informatory sign on penalty as per Motor Vehicle act on Red light

Supplementary Plate Option

Supplementary Plate Option

Retro-reflective solutions for Road Safety– ADDITIONAL SIGNS

Accident Zone Ahead
Informatory Sign

250 to 500 m ahead of accident prone location

Accident Zone Ahead
Cautionary Sign

100 to 200 m ahead of accident prone location

Informatory signs for Speed Cameras

Where camera enforcement is taking place.

Informatory sign on penalty as per Motor Vehicle act on Red light

Supplementary Plate Option

Supplementary Plate Option

Retro-reflective solutions for Road Safety– ADDITIONAL SIGNS

Accident Zone Ahead
Informatory Sign

250 to 500 m ahead of accident prone location

Accident Zone Ahead
Cautionary Sign

100 to 200 m ahead of accident prone location

Informatory signs for Speed Cameras

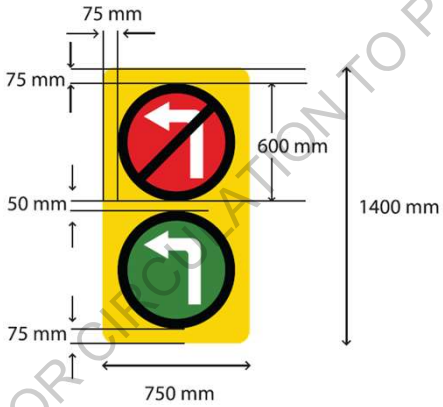
Where camera enforcement is taking place.

Informatory sign on penalty as per Motor Vehicle act on Red light

Supplementary Plate Option

Supplementary Plate Option

New/Revised Signs > 50 Signs



New Signs Contd -Blackspot Related Signs

Fig. 26.1 Crash Prone Area Informatory Sign

Small	: 900 mm x 600 mm,
Medium	: 1200 mm x 900 mm
Large	: 1800 mm x 1200 mm.

New Signs Contd

Fig. 17.43 Emergency Helpline Number

Fig. 17.44 Emergency Lay-by

Fig. 17.45 Fire Extinguisher

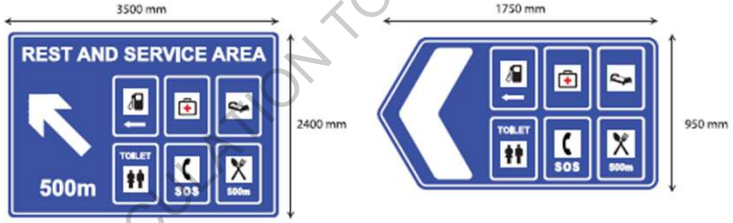


Fig. 17.46 Rest and Service Area Sign

Fig. 17.47 Pedestrian Crossing Informatory Sign

Fig. 17.48 Speed Breaker Informatory Sign

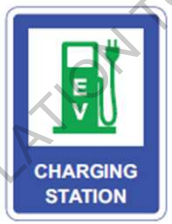


Fig. 17.49 Electric Vehicle Charging Station Informatory Sign

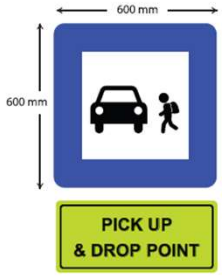


Fig. 22.01 State Highway Route Marker Sign

Fig. 17.16 Public Bike Sharing Stand

Fig. 22.03 Asian Highway Route Marker Sign

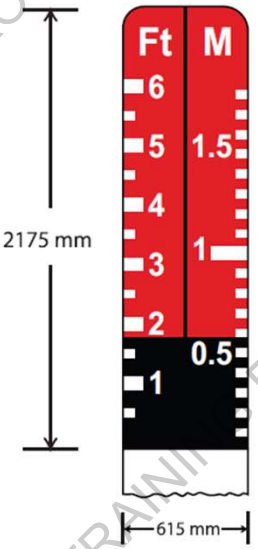


Fig. 18.11 Flood Gauge

Colour Pattern for Direction Information Signs

Green Background

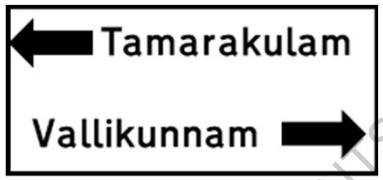
NH,SH & MDR

Blue Background

Expressways & Urban Road

White Background

ODR & Village Road



Color Pattern for Direction Information Signs

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 and VR)	White	Black
Urban/City Road	Blue	White
Other Scenario		
Tourism related Signs	Brown	White
Temporary/ Work zone Signs	Yellow	Black

Road Stud/Raised Pavement Marker/Reflective Pavement Marker/Cat's Eye

Reflective Raised Pavement Markers

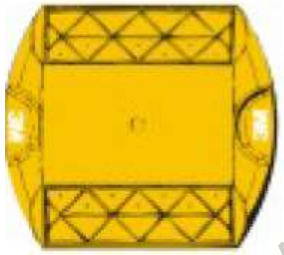
- Raised Pavement Marker (RPM) should be **bright** enough to illuminate road surface.
- RPM should be **tough** enough to bear the load of vehicle when it passes over it.
- Reflection in RPM either occurs by **reflecting lens or** by **beads**.
- LED based **solar RPM** have built in sensor that can automatically turn on LED's when ambient light drops below the preset level.

Safety Benefits of Reflective RPM's

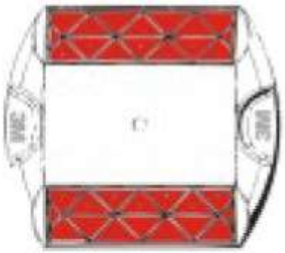
- RPM are placed on **centerline** to provide more guidance to traffic.
- RPM placed on **edge line** warn the driver that they are more nearing the edge.
- Improve the sight distance when placed on **vertical / horizontal curve** on the road or near the **intersection**.
- RPM works as **traffic delineators** to improve drivers sight distance.
- RPM placed on **dangerous curve** are more visible.
- RPM when placed close together in rows form **rumble strip**.

RPM

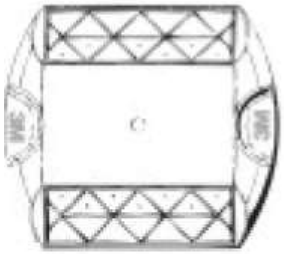
Colour selection



On Median Edge
Pedestrian Crossing
Along with TBM

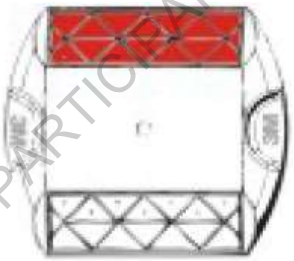


On Shoulder Edge
Stop Line, Diagonal &
Chevron Marking

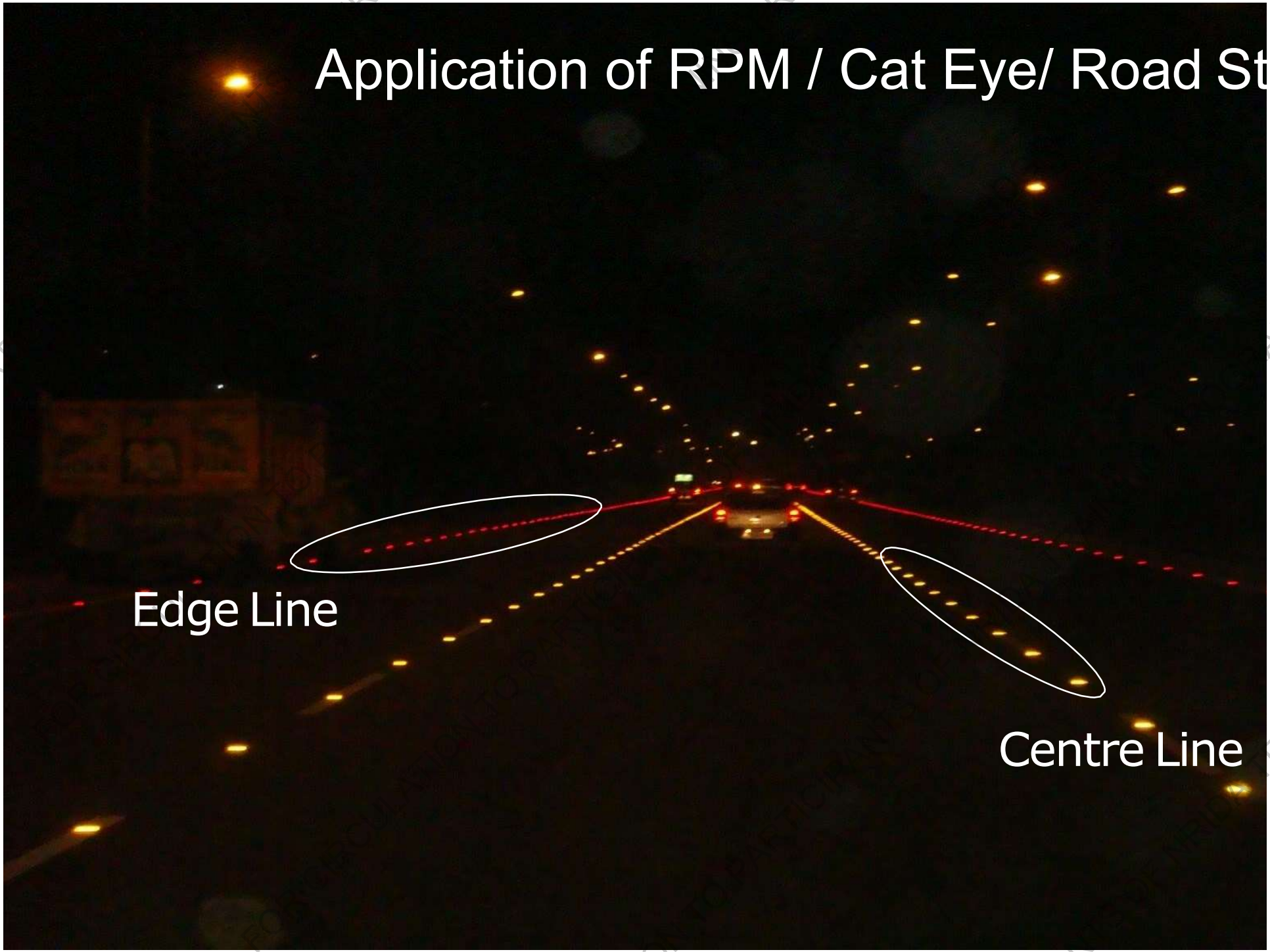


On Traffic Line

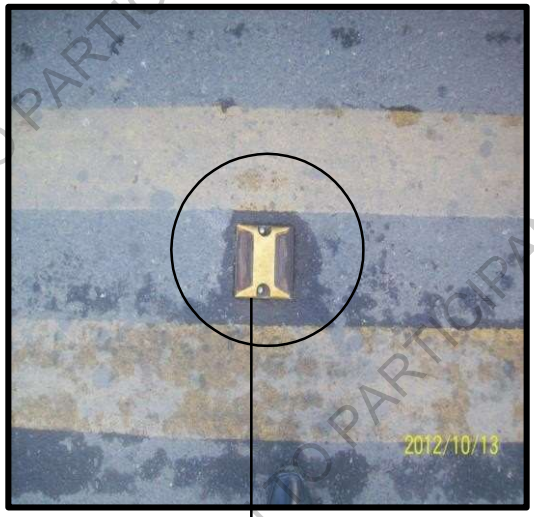
Crossable continuity line
All junctions and median openings-
Across the carriageway



On Shoulder Edge

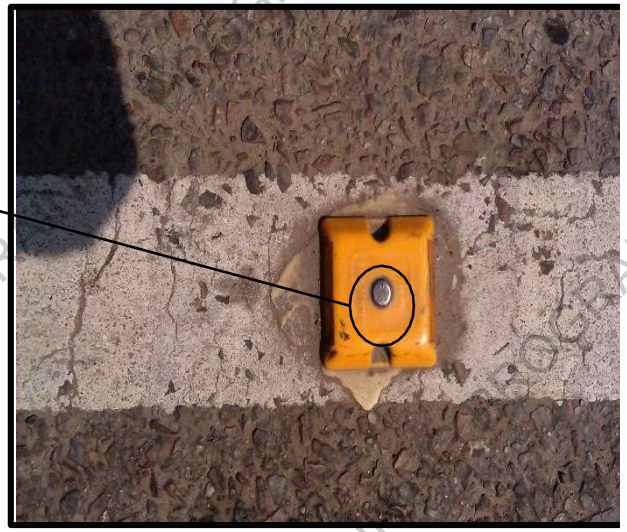

Application of RPM / Cat Eye/ Road St
Edge Line
Centre Line

Common Problems with Local RPM's / Cat Eye / RPM



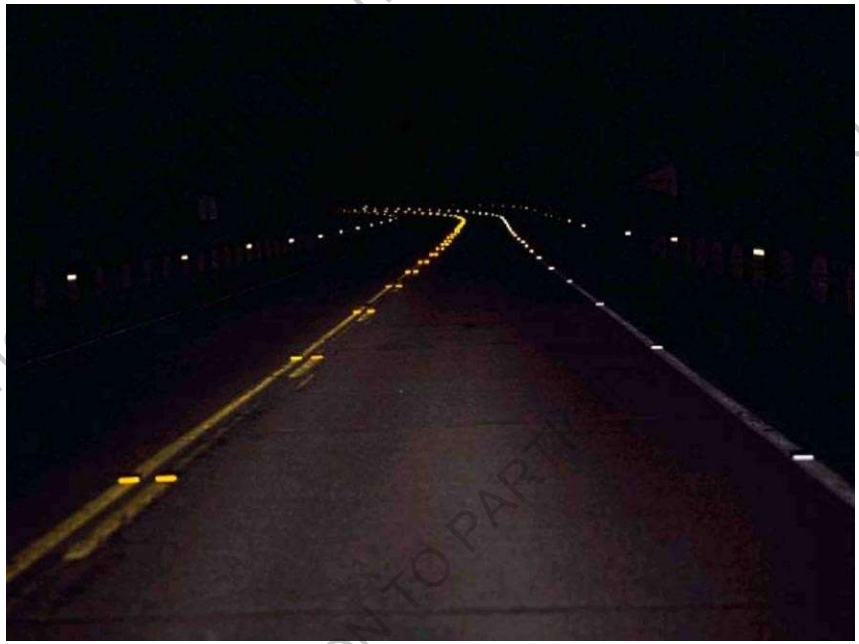
Inferior Plastic Material

Fixed with metal nails



Broken Lens

Non- reflective at Night



MORTH Specification

- Material of Body : Plastic & no metal
- Compressive Strength : Min 13,635 Kg
- Fixed by Using Adhesive : No nails
- Retro Reflective Area : ≤13Sqcm
- Height 20 mm & Width 130mm

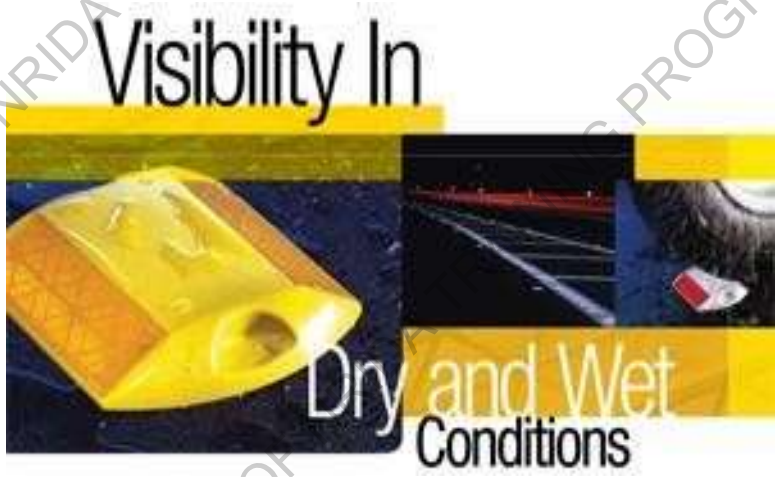


Table 5.1: Road Studs for Undivided Roads

Description			Normal Section			Warning Section			No Overtaking Section			Applicable Figures
Road Category	Traffic Movement	Carriage way	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	<5.5m	NA	Red-White Bi-directional at 18m interval (Optional)	NA	NA	Red-White Bi-directional at 9m interval (Optional)	NA	NA	Red-White Bi-directional at 6m interval (Desirable)	NA	Fig 4.4
Two Lane Road without paved Shoulder	Two way	5.5m to 7m	White-White Bi-directional at 18m interval (Optional)	Red-White Bi-directional at 18m interval (Optional)	NA	White-White Bi-directional at 9m interval (Desirable)	Red-White Bi-directional at 9m interval (Desirable)	NA	Yellow-Yellow Bi-directional at 6m interval (Desirable)	Red-White Bi-directional at 6m interval (Desirable)	NA	Fig 4.5
Two Lane Road with Paved Shoulder	Two way	>7m	White-White Bi-directional at 18m interval (Optional)	Red-White Bi-directional at 18m interval (Optional)	NA	White-White Bi-directional at 9m interval (Desirable)	Red-White Bi-directional at 9m interval (Desirable)	NA	Yellow-Yellow Bi-directional at 6m interval (Desirable)	Red-White Bi-directional at 6m interval (Desirable)	NA	Fig 4.6
Three Lane Undivided Road	Two way	>11m	Yellow-Yellow Bi-directional at 18m interval (Desirable)	Red-White Bi-directional at 18m interval (Optional)	Not Required	Yellow-Yellow Bi-directional at 9m interval (Desirable)	Red-White Bi-directional at 9m interval (Desirable)	Not Required	Yellow-Yellow Bi-directional at 6m interval (Desirable)	Red-White Bi-directional at 6m interval (Desirable)	White-White Bi-directional at 6m interval (Optional)	Fig 4.7
Four Lane Undivided Road	Two way	>14	Yellow-Yellow Bi-directional at 18m interval (Desirable)	Red-White Bi-directional at 18m interval (Optional)	Not Required	Yellow-Yellow Bi-directional at 9m interval (Desirable)	Red-White Bi-directional at 9m interval (Desirable)	Not Required	Yellow-Yellow Bi-directional at 6m interval (Desirable)	Red-White Bi-directional at 6m interval (Desirable)	White-White Bi-directional at 6m interval (Optional)	Fig 4.8

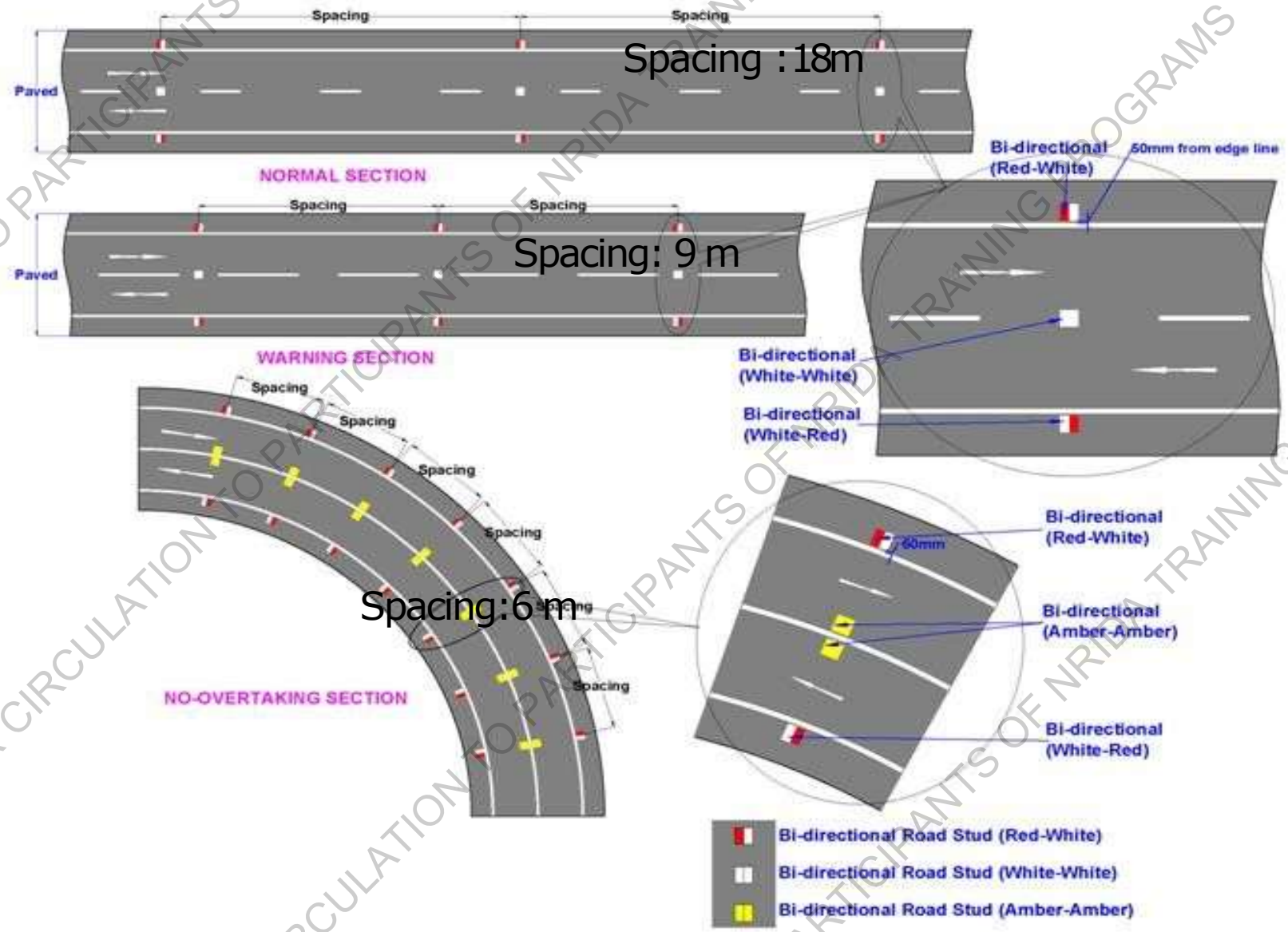
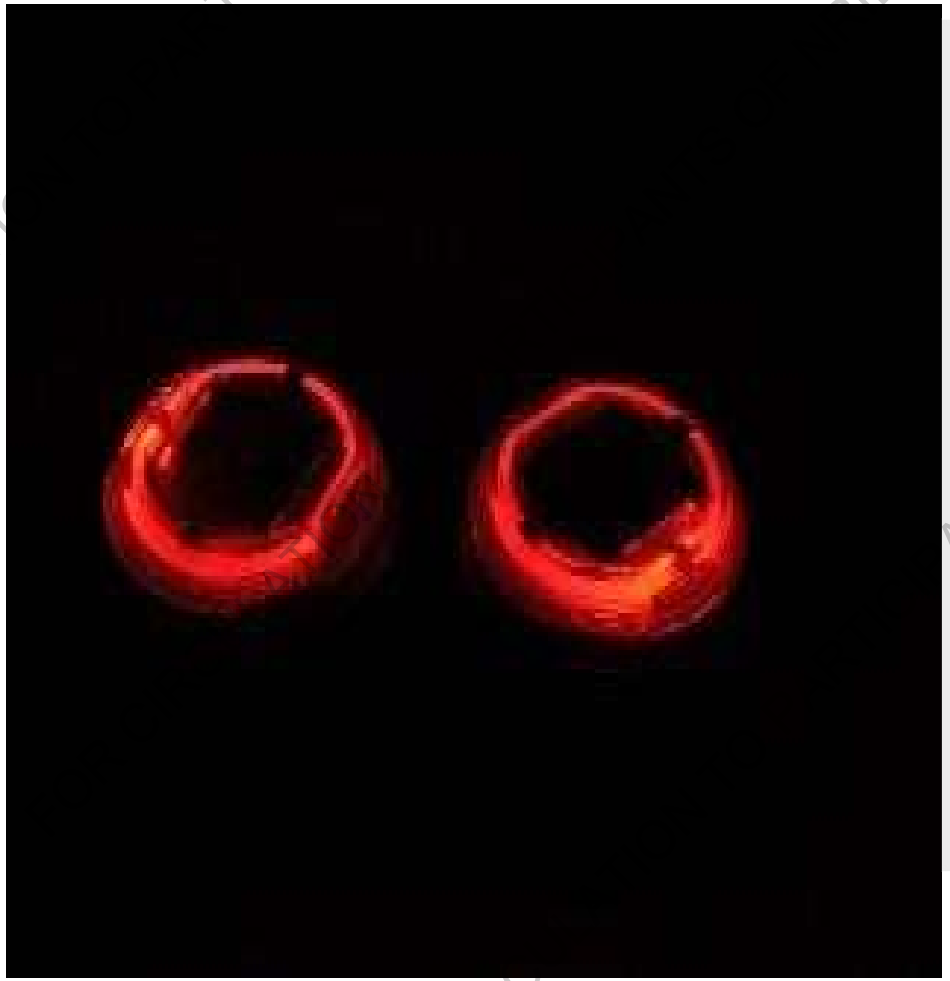


Fig 5.1: Roads Studs for a Two Directional Road

Solar Raised Pavement Marker



Features & Benefits

- LED based solar RPMs are becoming popular in India.
- Solar RPM is designed with highly engineered plastic body and is suitable for Indian road conditions which can take heavy traffic loads of over 20 tons.
- This Solar RPM provides 360 Degree uniform illumination using Light Guide Technology

Latest Median Markers help avert accidents

Night time visibility

Flexible Median marker – The new way of median visibility



Challenges of current Median Marker


Feature	Advantage	Benefits
Innovative Flame like Design structure	Better visual appearance	Increases visibility at night for safe driving
Flexible Thermoplastic Body	Bounce Back on impact	Vandal proof against impact Lesser chances of people tripping over median marker
Vertical design	Increased reflectivity	High reflectivity gives better visual appearance to the driver
Fluorescent Type XI DG3 Reflective sheeting	Long Distance visibility in day & night	Provides longer response time for safer driving
RPM Like Shank	Reduce application time	Increases productivity lead in reduction of labour charge
Shank Based Grouting	Narrow foot print	Easy installation on narrow width medians Reduced epoxy consumption
Edge Sealed Reflective Sheeting	Vandal resistant against sheeting peel off	Longer durability & reflectivity service life
High performance Thermoplastic engineering Grade material	Better performance	Long term durability

Reflective Road Markings

- Most commonly used material is **Thermoplastic material** (TPM).
- It can easily be made reflective either by **pre-mixing** or by **dropping glass beads** with the material.
- The headlight beam penetrates glass beads hits the **pigmented road surface** and reflect the light back to the motorist.
- Visibility is based on the contrast between **illuminated strip** and dark road surface.
- Threshold reflectivity values are 100mcd/sq.m/lux.

Safety Benefits of Reflective Markings

- Reflective markings are **visible all the time** even in worst weather conditions.
- Thicker layer of TPM works as **rumble strip**.
- TPM are more **cost effective** due to longer life, no need to paint the road surface frequently.

Road Marking Material & General Features

Code of Practice for Road Marking

Type of Material for Road Markings

1. **Thermoplastic Markings (**Hot applied thermoplastic compound)
2. **Solvent borne and Waterborne Road Marking Paint**
3. **Cold Applied Plastics**
4. **Preformed Adhesive Tapes**

Thermoplastic Markings

- mixture of plasticizer & resins that serves to hold all of the other ingredients together.

- fast drying time and highly durable

- better retro reflective performance than that of ordinary road marking paint.

- The service life of one application ranges from 2 to 3 years, depending on traffic volumes.

Solvent Borne & Waterborne Road Marking Paints

- Water-based (acrylics) paint is environmentally friendly
- Solvent based (oil, alkyd based), release volatile organic compounds
- Water based is easier to handle compared to solvent-based paints
- Water-based paints can be opened to traffic quicker
- Generally used in construction work zone for temporary marking

Cold Applied Plastics

- Generally Used for Coloured pavement marking.

- best means to provide audible raised pavement marking for edge lines.

- more durable than thermoplastic markings in retaining the original colour and luminance values.

Preformed Adhesive Tapes

- continuous rolls of various lengths and widths.
- Easy to apply and less drying or curing period.
- high initial cost but would offer more service life in locations with high traffic volumes
- suitable for those locations that require frequent replacement of pavement markings.
- Application : They are used for object markings and transverse lines in high-traffic areas.

Glare is sensation caused by bright light in one's own field of view

Glare Issues

- Discomfort by viewing **oncoming vehicle headlamp**
- Discomfort in viewing **rear view mirror**
- Decrease in visibility distance and increase in reaction time and recovery time.

Factors Contributing to Glare

- Head light Intensity (New off the market LED Lights)
- Headlight Mounting Height (High Beam)
- Age of driver
- Two way Highway without median increases glare effect
- Unlit road have more glare effect
- Improper mounting of headlamp (After repairs)
- Absence of Road Marking
- Highway without Median as oncoming vehicle come more closer to driver's line sight
- Dirt on headlamp and wind shield increase scattering of light

ANTI-GLARE DEVICES

- At night, the headlamps of an oncoming vehicle may cause harmful glare that interferes with the sight of drivers.
- Presence of glare leads to a significant reduction in the safety margin and the number of traffic accidents is much higher in the glare conditions than in the non-glare conditions.
- Installing antiglare facilities along the road is an economical and feasible method for solving the glare problem caused by the headlamps of oncoming vehicles

Anti-Glare Screen

AREAS OF APPLICATION

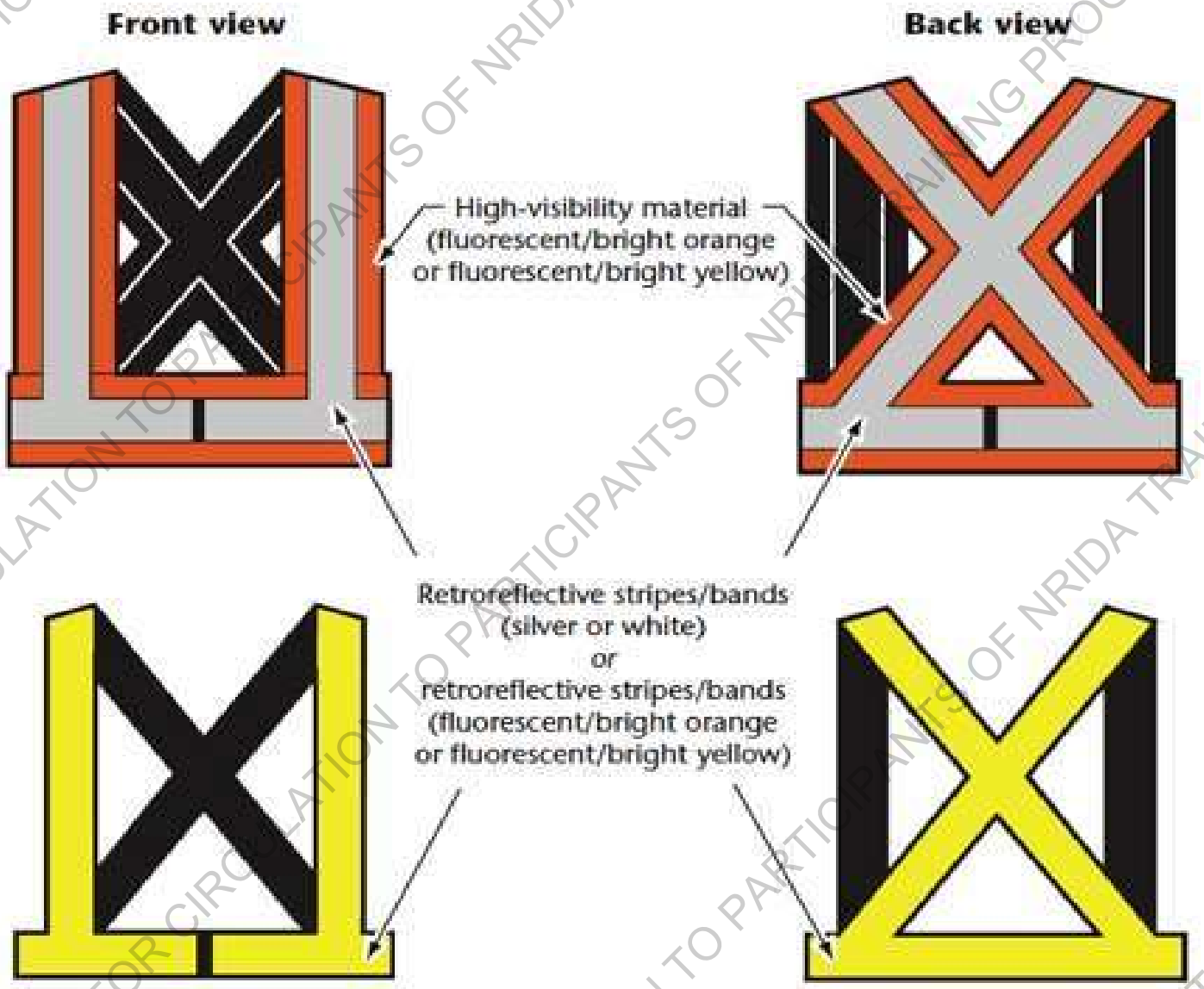
- In the median of streets and motorways with several lanes
- On roads with heavy traffic in dark periods
- Between parallel or approaching roads, when traffic runs in opposite directions
- In areas of humps or other un-favourable topographic conditions
- In long curves and Bridges
- Beside railroad or tram lines running beside roads
- Near buildings which reflect lights towards the road

High Visibility Clothing

- Any clothing worn that has highly reflective properties or a color that is easily discernible from any background.

- It is worn by occupational workers (Traffic police Personals, Construction workers of Highways, Railways etc.) or by the persons moving near the vehicles (Cyclist, Pedestrians). Workers wear to improve how well other people "see" them.

Safety Jackets



Safety Garments

Reflective Tapes

- Reflective tapes are self illuminating and does not power from vehicle like tail lamp. Any light is enough to illuminate the strip make your vehicle more visible and safe.

- Rear end collisions occur when driver could not see a slower vehicle or stopped vehicle in front of it and could not stop the vehicle in time, use of reflective tape in any pattern or color can reduce the chances

Flexible Prismatic Sheeting (FPS)

Roundabout at Haldwani, UP

Round About in Bangalore

Ghat Road, Ooty

Night Visibility of Bullnose after applying AFP Sheeting

Bull Nose at Toll Plaza

Delineators (IRC 79)

- Delineators provide visual assistance to drivers about alignment of road ahead, especially at night.
- Normally, reflectors are used on the delineators for better night time visibility.
- Delineators are driving aids and not be regarded as a substitute for warning signs, road markings, or barriers .

Type I

- These are put-up wherever there are objects so close to the road hazard, e.g. approaches to bridge abutments, guard-rails and culverts
- The markers should be erected immediately ahead of the line of obstruction with sufficient height so that properly visible to the oncoming traffic.

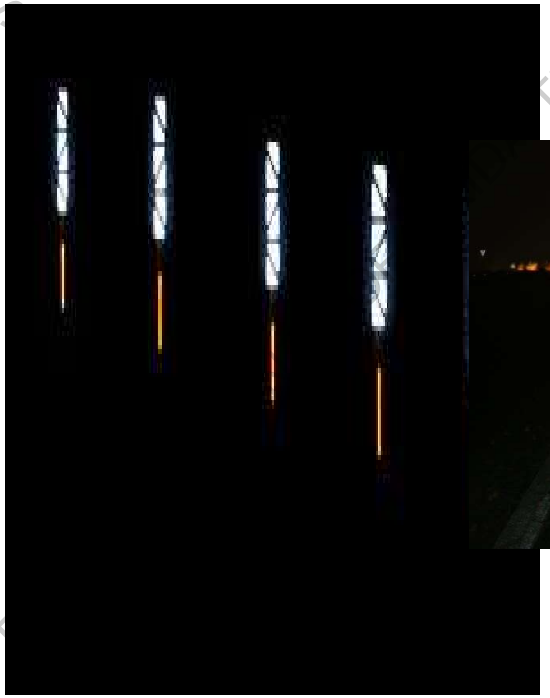

Delineation lacking:
Reflectorized marking, studs,
etc.

Minor Bridge

Type II

- Roadway Indicators
  - Delineate the edge of the roadway to guide drivers about the alignment ahead used in non-urban sections, especially in curved portions and on straight sections at medians or kerb edge.




Night Time Visibility for Work Zone Safety

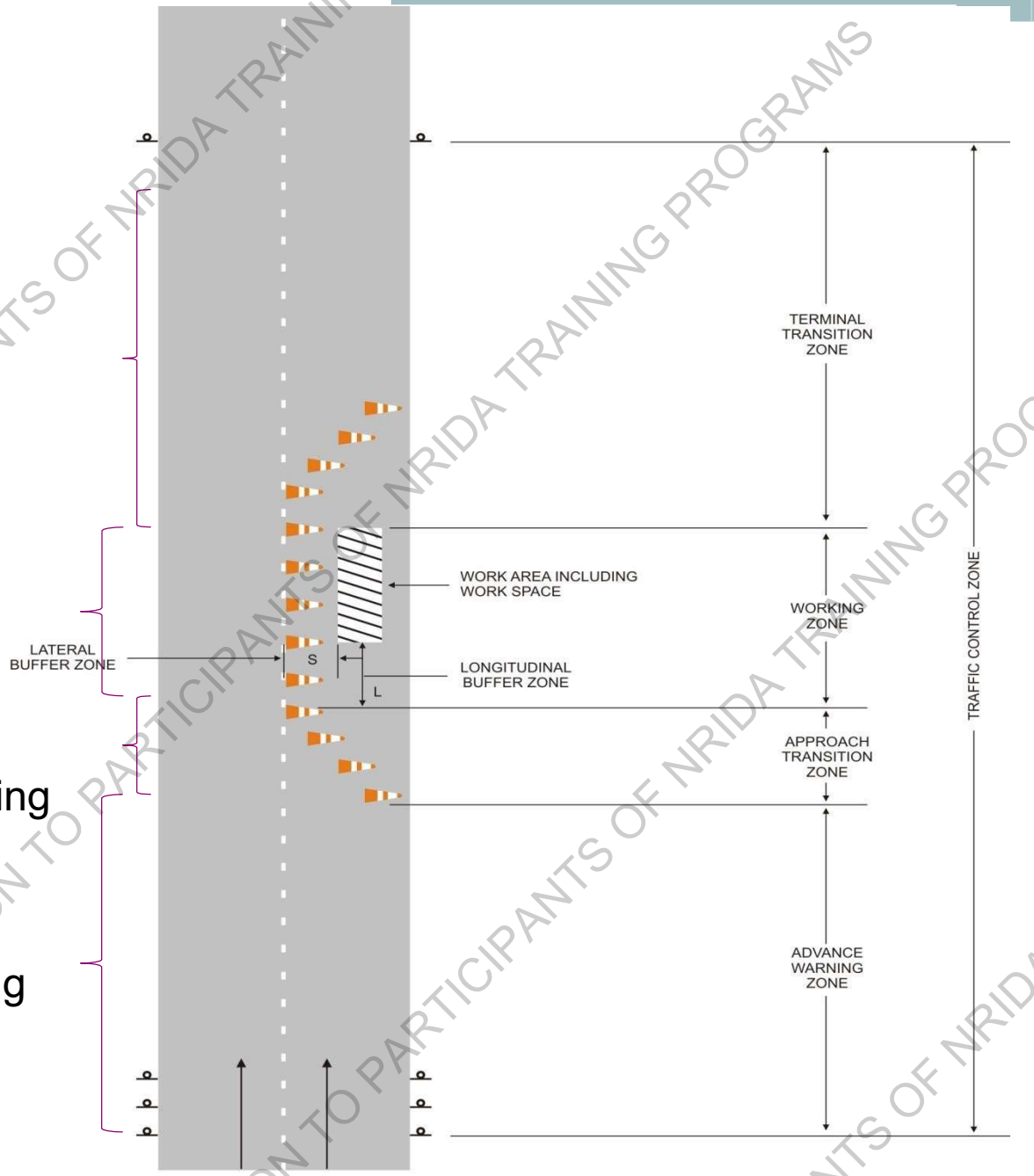
Elements of Traffic Control Zone

Clear work area & return to normal traffic lanes

Actual construction is being undertaken.

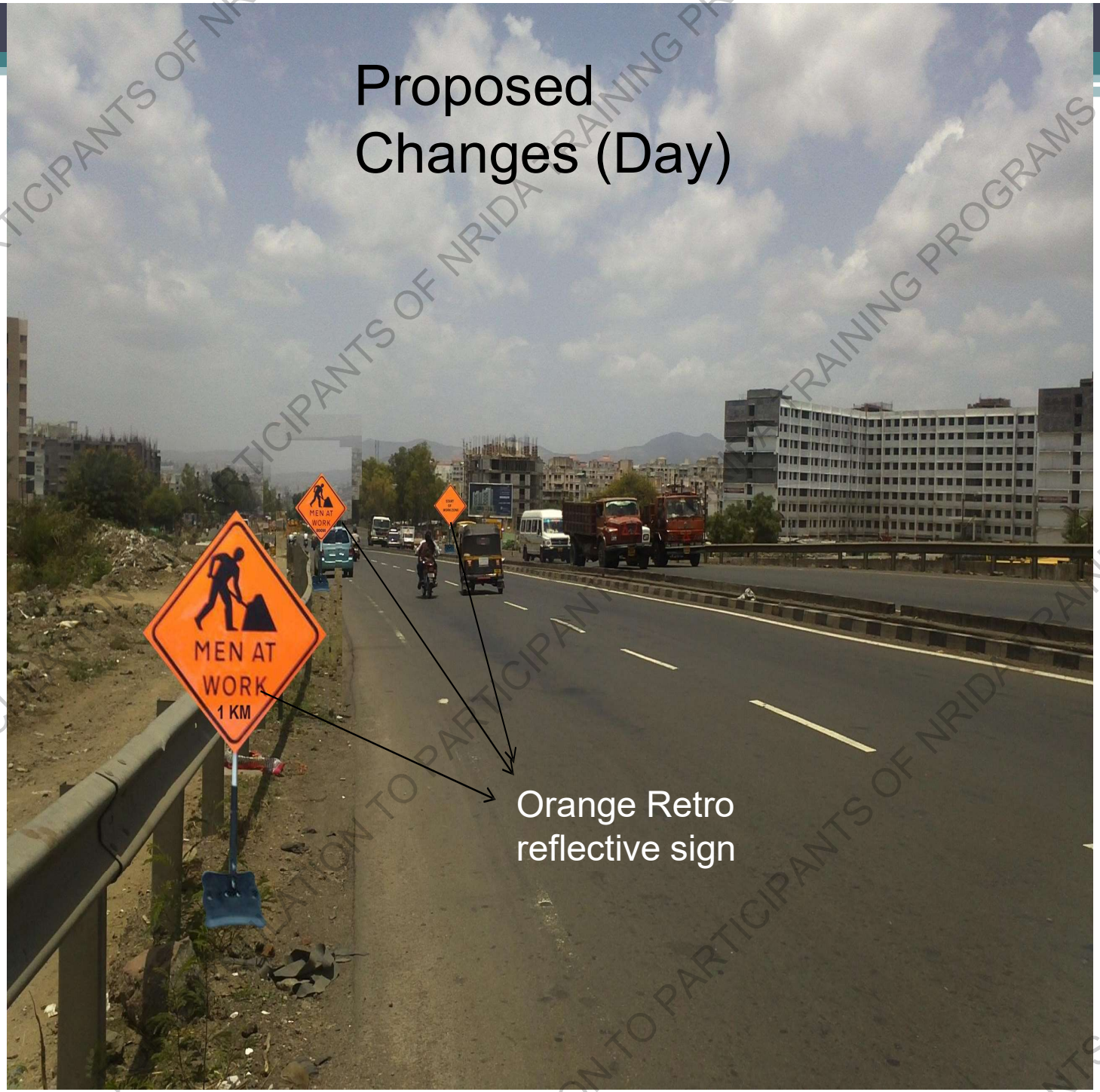
It guides traffic flow into working zone

Warn road user of approaching hazard



Advance Warning Zone

Proposed Changes (Day)



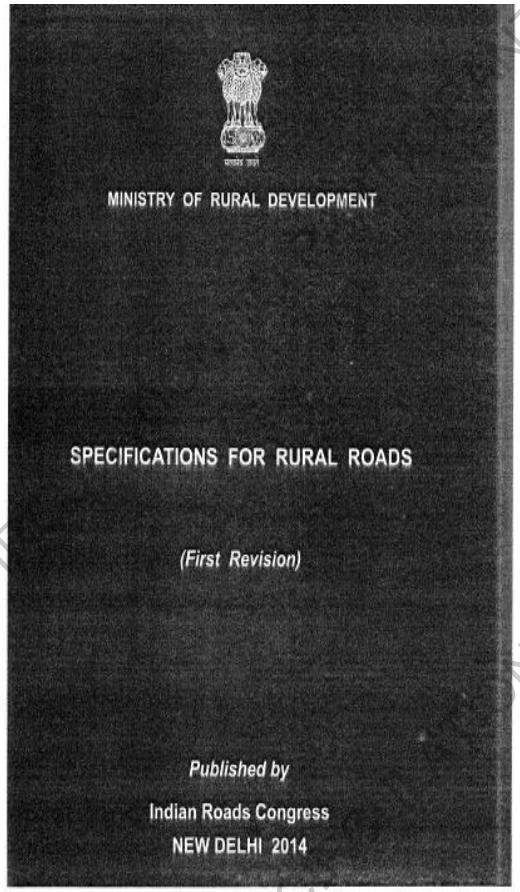
Proposed Changes (Night)

Current Scenario

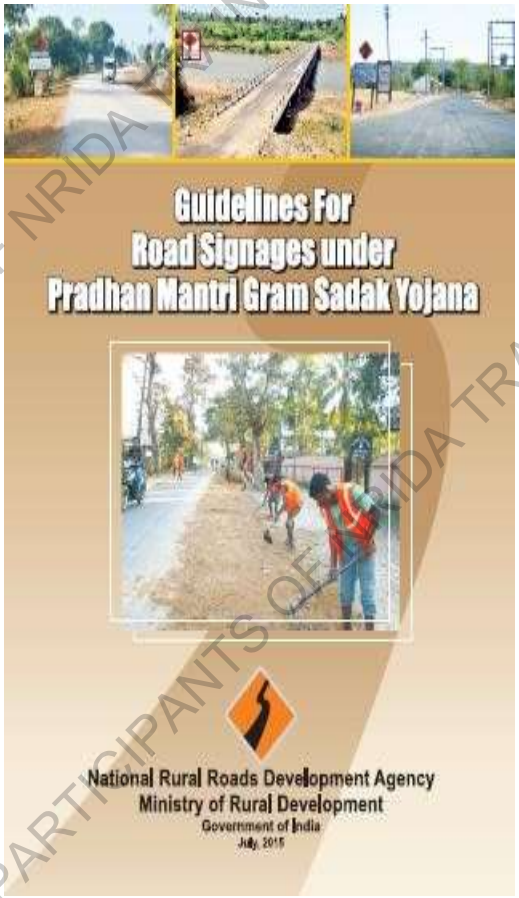
Proposed Changes (Day)

Proposed Changes (Night)

MORD – Specifications for Rural Roads



Guidelines for road signage under PMGSY



Non- IRC Standard Sign Boards

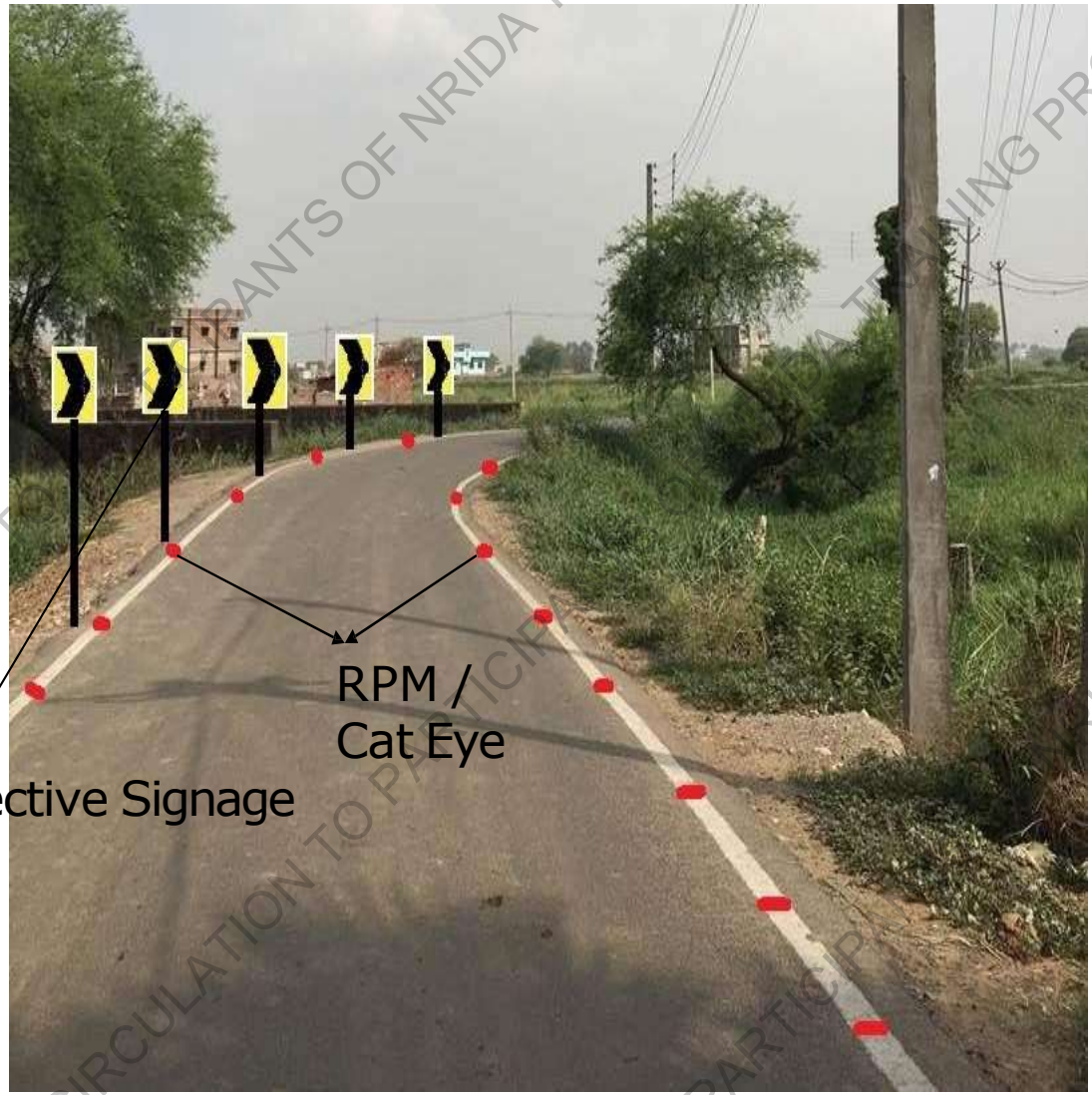
As per IRC -67 Standard Sign Boards

Reflective Sign Board

Curvature section on Road - Class Exercise

Current Situation

Curvature section on Road



Curve Improvement with Reflective solution