Guidelines for Road Markings

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# Guidelines for Road Markings

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1. **Introduction**

Road markings are used as a means of controlling and guiding traffic. They are highly important on urban roads and intersections as they promote road safety and bring out smooth and harmonious flow of traffic along guided paths of travel. They also supplement the messages conveyed by road signals and signs. In some cases, they are used alone to convey certain regulation, information or warning that cannot otherwise be effectively made known to the road users.

Road surface markings are the devices on a road surface in order to convey official information. Road surface markings are used on paved roadways to provide guidance and information to drivers and pedestrians. Uniformity and standardisation of the markings is an important factor in minimizing confusion and uncertainty about their meaning. These do help in reducing the accidents and manpower requirements for regulating traffic.

2. **Functions of Road Markings**

The main functions of the road markings are to guide the safe and smooth flow of traffic in the following ways:

- i) Segregation of traffic
- ii) Stop and go
- iii) Give way instruction
- iv) Overtaking or not
- v) Two lanes to one lane/ lane traffic
- vi) Inter-vehicle distance
- vii) Parking zone or no parking
- viii) Speed indication
- ix) Direction
- x) One way
- xi) Pedestrian crossing
- xii) Type of vehicles allowed

Road markings play a useful role in traffic management. They should convey the required information to the driver without distracting his attention from the carriageway, for which the following rudimentary requirements should be met:

- i) Day visibility i.e. whiteness/contrast
- ii) Night visibility i.e. retroflectivity
- iii) Wet night visibility (humid/rain/ fog)
- iv) Anti-skid
3. Types of Road Markings

Road markings are basically of two types: Carriageway markings and Object markings.

3.1 Carriageway markings

As the name implies, these are the markings applied to the carriageway. Carriageway markings are of the following categories:

i) Center line
ii) Traffic lane lines
iii) No-overtaking zone markings
iv) Pavement edge line (both sides)
v) Carriageway width reduction transition markings
vi) Obstruction approach markings
vii) Stop lines
viii) Pedestrian crossings
ix) Cyclist crossings
x) Route direction arrows etc.
xi) Word message
xii) Markings at approaches to intersections
xiii) Parking space limits
xiv) Bus stops

3.2 Object markings

Object markings are of the following categories:

i) Objects within carriageway
ii) Kerb marking for visibility
iii) Kerb marking for parking restriction
iv) Objects adjacent to the carriageway
v) Median Marking

4. Carriageway marking

Carriageway markings are again classified in two types: Longitudinal Markings & Transverse Markings.
4.1 Longitudinal Markings

Longitudinal markings are placed along the direction of traffic on the roadway surface, for the purpose of indicating to the driver, his proper position on the roadway. Some of the guiding principles in longitudinal markings are given below.

i) The lines can be either broken, solid or double solid. Broken lines are permissive in character and allow crossing with discretion, if traffic situation permits.

ii) Solid lines are restrictive in character and do not allow crossing except for entry or exit from a side road or premises or to avoid a stationary obstruction.

iii) Longitudinal markings are provided for separating traffic flow in the same direction and the predominant colour used is white.

iv) Yellow colour is used to separate the traffic flow in opposite direction and also to separate the pavement edges.

v) Double solid lines indicate severity in restrictions and should not be crossed except in case of emergency. There can also be a combination of solid and broken lines. In such a case, a solid line may be crossed with discretion, if the broken line of the combination is nearer to the direction of travel. Vehicles from the opposite directions are not permitted to cross the line.

Different types of longitudinal markings are centre line, traffic lanes, no passing zone, warning lines, border or edge lines, bus lane markings and cycle lane markings.

4.1.1 Centre Line

Centre line separates the opposing streams of traffic and facilitates their movements. Usually no centre line is provided for roads having width less than 5 m and for roads having more than four lanes with the central verge. The centre line may be marked with single broken line, single solid line, double broken line, or double solid line depending upon the road and traffic requirements. A centre line marking is provided to demarcate the centre of a carriageway and to separate traffic in opposite directions.

4.1.2 Centre line marking for two lane road

On roads with less than four lanes or on those roads having four lanes and on which parking is permitted thus reducing the operational width, the centre lines shall consist of single broken line 150mm wide of 3 m long segments with 4.5 m gaps. On curves and approaches to intersections, the gap shall be 3 meters as shown in Fig.1. The colour of the centre line shall be yellow.
4.1.3 Centre line marking for four lane road

On undivided roads with at least two traffic lanes in each direction, the centre line marking shall consist of a single solid continuous line of 150 mm wide with lane markings of 1.5 m segments and 3 m gaps as shown in Fig 2. and gaps on curved reaches and approaches to intersection shall be 1.5 m long. The colour of the centre line shall be yellow.

4.1.4 Centre line marking for six lane road

On undivided roads with at least three traffic lanes in each direction, the centre line marking shall consist of a double solid continuous line of 150 mm wide separated by a space of 100 mm with lane markings of 1.5 m and 3 m gaps as shown in Fig 2. and gaps on curved reaches and approaches to intersection shall be 1.5 m long. The colour of the centre line shall be yellow.
4.1.5 Traffic Lane Lines

The division of the carriageway into separate lanes for traffic traveling in the same direction on either side of the centre-line or median strip helps to promote travel in proper lanes and curb the meandering tendency of the drivers, thus promoting safety and ensuring maximum capacity. Traffic lane lines are broken lines which permit lane changing with caution.

The traffic lane lines shall be normally be single broken lines. Their width shall be 100 mm, the length of line segment shall be 1.5 m. The gaps on straight reaches shall be 3 m long and gaps on curved reaches and approaches to intersection shall be 1.5 m long (Fig. 1, 2 & 3).

4.1.6 No Overtaking Zone/ Passing Zone

No passing zones are established on the roads where there is no central median and traffic is allowed in both directions and three lane roads where overtaking maneuvers are prohibited because of high volume of traffic on opposite side. It may be marked by a solid yellow line along the centre or a double yellow line. In the case of a double yellow line, the left hand element may be a solid barrier line, the right hand may be either a broken line or a solid line (Fig 4). These solid lines are also called barrier lines. When a solid line is to the right of the broken line, the
passing restriction shall apply only to the opposing traffic. The width of each line should be 100 mm separated by 100 mm.

Fig 4: Barrier line marking at No Passing Zone

Source: IRC 35-1997

4.1.7 Pavement Edge Lines

Pavement edge lines are used to indicate the edges of carriageways which have no curbs. They serve as a visual guidance for the drivers, indicating to them the limits up to which the driver can safely venture. They especially are useful during adverse weather and poor visibility where the paved shoulder is of a lesser structural strength than the main pavement, the edge lines are used to promote travel on the main pavement itself.

Edge lines are in the form of a single continuous line placed about 150 mm from the edge. The width of the line is 150 mm on multi lane roads without median the width may be 200 mm as shown in Fig. 5. Where flush kerbs are provided, the edge lines should be superimposed. The marking should preferably be reflectorised or incorporate crusted calcined flint or other such material.
4.1.8 Bus Lane Marking

The lanes reserved for the buses, without physical separation should be provided with white line as bus-lane markings on the carriageway as shown in Fig 6. Generally a basic width of 3 metres is required for a bus lane. The distance is measured from the edge of the curb to the center of the continuous white line of 250 mm width. A gap in this white line should be left, adjacent to each side road.

The legend **BUS LANE** should be marked on the carriageway across the lane at its commencement and repeated after each junction. Where junctions are more than 300 metres apart, this legend should be repeated between junctions at approximately 150 metres intervals.

A 250 mm wide broken line of 1000 mm length and 1000 mm gap should be laid from the curb to the start to the full width lane to deflect other traffic from the bus lane. The taper of laying this broken line should not normally exceed 1:10.

Where a bus lane commences just beyond an intersection, adequate length should be left for the taper to commence at the intersection so that the inclined line does not extend across the intersection mouth. Similarly to allow traffic to position itself correctly on the carriageway, the continuous bus lane should end in advance of any intersection with major left-turning flow.
4.1.9 Bicycle Lane Marking

Bicycle lane markings should be provided when a portion of the carriageway, being used by motorized vehicles, is earmarked for exclusive use of cyclists.
The bicycle lane marking shall consist of a 150 mm thick solid white line parallel to the curb of the carriageway. The width of the lane shall be determined by the number of bicycles using it and should be in accordance with IRC: 11-1962.

The cycle symbol should be marked on cycle lanes. The size of the symbol can be any of the three sizes mentioned therein (Fig. 7)

**Fig 7: Bicycle Lane Marking**

![Bicycle Lane Marking Diagram](source: IRC 35-1997)

**4.2 Transverse Markings**

Transverse markings are marked across the direction of traffic and width of markings should be more than the longitudinal markings. They are marked at intersections areas and approaches to intersections. The site conditions play a very important role. The type of road marking for a particular intersection depends on several variables such as speed characteristics of traffic, availability of space etc. Stop line markings, give way lines, markings for pedestrian crossing, cyclist crossing, markings on speed change lane, direction arrows and protected right, markings at rotaries and left turn lanes are some of the markings on approaches to intersections.
4.2.1 Stop Line

Stop line indicates the position beyond which the vehicles should not proceed when required to stop by traffic police, traffic signals or other traffic control devices. Stop lines shall not be used unless traffic control by any one of these means exist. Stop lines should either be parallel to the intersecting roadway or at right angles to the direction of approaching vehicles.

Two parallel patterns are prescribed: Single stop line and Double stop line (recommended).

Double stop lines shall consist of two continuous lines each 200 mm wide spaced 300 mm apart and supplemented by a stop sign and a word message “STOP” marking on the carriageway be located so that the top of the word is 2 m to 3 m from the nearest part of the double stop line (Fig 8). As far as possible, stop lines at intersection shall be equidistant from the centre of the intersection.

The double line is used exclusively a junctions controlled by “STOP” signs and in no circumstances should be used merely to give warning of the approach to a major road for which the “GIVE WAY” marking is appropriate (Fig 9).

The “STOP” sign supplemented by the double line requires that (i) every vehicle shall, before entering the major road, stop at the transverse lines and (ii) no vehicle shall proceed past these transverse lines in such a manner or at such a time as it is likely to necessitate any vehicle on the other road to change its speed or course in order to avoid collision with the first mentioned vehicle.

Fig 8: Stop Line Marking

Source: IRC 35-1997
Fig 9: Marking at intersection

Source: IRC 35-1997
4.2.2 Pedestrian Crossings

Crossing of the carriageway by pedestrians, only at the unauthorized places minimizes the confusion. As a result of this, the number of pedestrian casualties is reduced and the tendency to jaywalk is curbed. The success of pedestrian’s crossings in controlling both vehicular and pedestrian’s traffic depends to a greater extent on where and how they are marked.

Pedestrian crossings shall be provided at important intersections where conflict exists between vehicular and pedestrian movements. The site should be so selected that the pedestrians are subjected to minimum inconvenience and the vehicular traffic too is not interrupted very often.

The location of pedestrian crossing at intersections should fulfill the following conditions to ensure safety of traffic.

i) Adequate visibility so that the driver of approaching vehicle has clear view of the persons on the pedestrian crossing and on the pedestrian footpath;

ii) Sufficient space on the footpath for the pedestrians to wait; and

iii) Freedom from obstruction such as trees, sign posts, lamp posts, etc., in the path of pedestrians at either end of the pedestrian crossing.

For dimensions and positioning of pedestrian crossings, IRC: 103-1988 “Guidelines for Pedestrian Facilities”, may be referred.

At intersections, the pedestrian crossings should invariably be preceded by a stop line at a distance of 2 m to 3 m for unsignalised intersections and at a distance of 1m for signalized intersection (Refer Fig.10.)

The width of the pedestrian crossing is governed by the pedestrian volumes crossing the road and by local requirements but in no case should it be less than the width of footpath subject to a minimum of 1.5 m. The width of the crossing generally lies between 2 m and 4 m.

Marking for pedestrian crossing mostly used is the Zebra pattern consisting of equally spaced white stripes generally 500 mm wide and they should be marked. A warning sign to indicate that the pedestrian crossing is ahead should also be installed.

At mid-block pedestrian crossing in urban areas, it may be advantageous to install flashing signals along-with the markings, so that the drivers receive advance warning about the presence of the crossing.
4.2.3 Bicycle Track Crossings

The crossing of the carriageway by cyclists shall be provided at carefully designated locations. Markings for cyclist crossing should be provided wherever a cycle track crosses a road. The cycle track crossing should preferably be adjacent to a pedestrian crossing when such a crossing is also provided. The width of cyclist crossing should be the same as that of the cycle track.

The marking for the cycle track crossing would comprise two white continuous lines across the carriageway to be crossed. These lines would be 100 mm wide, at the spacing equal to the width of the cycle track (1 m to 3 m). Some typical markings are shown in Fig. 11.
Fig 11: Bicycle Track Crossing

At the road with central channeliser

At roundabout

At intersection with roads of divided carriageway

At four-arm intersection

Source: IRC 35-1997
4.2.4 Directional Arrows

In addition to the warning lines on approaches to intersections, directional arrows should be used to guide drivers in advance over the correct lane to be taken when approaching busy intersections whether signal controlled or not. Because, of the low angle at which such markings are viewed, these must be elongated in the direction of the traffic flow to provide adequate legibility. Arrows irrespective of speed to be envisaged. Normally four arrows should be used in sequence in each lane. The direction arrow nearest to the intersection should be 15 m from the stop line or the entrance to the junction. The second arrow should be placed 15 m before the first arrow and similarly for third and forth arrow. Recommended designs of arrow are shown in Fig. 12.

On two lane approaches to an intersection, the arrangement of arrows indicating the lanes for (a) straight ahead, (b) left turn, and (c) right turn movement, the straight ahead and left turn arrow should be combined in the left side lane. Similarly, where there is a left filter lane, the same should be marked with left arrow marking alone, in order to exclude non filtering traffic. (Fig 13)

Fig 12: Arrow marking for route direction near intersection

Source: UN Conference on Road Markings
4.2.5 Marking at Rotaries

Kerbs of the central and channelizing islands should be painted with vertical black and yellow stripes, each 500 mm wide, to improve visibility. The road side kerbs, should be painted with vertical black and white stripes, each 500 mm wide. All pedestrian and cyclist crossings should be provided with suitable pavement markings. (Fig. 14)

Exit roads at rotaries should be indicated by signs and directional arrows placed both at the edge of central island and directional islands or in the absence of the latter, at the corner of the exit roads and facing the approaching vehicles.
Fig 14: Typical road marking at rotaries

Source: IRC 35-1997
5. **Object Marking**

Physical obstructions in a carriageway like traffic island or obstructions near carriageway like signal posts, pier etc. cause serious hazard to the flow of traffic and should be adequately marked. They may be marked on the objects adjacent to the carriageway.

5.1 **Objects within the carriageway**

The obstructions within the carriageway such as traffic islands, raised medians, etc. may be marked by not less than five alternate black and yellow stripes. The stripes should slope forward at an angle of $45^\circ$ with respect to the direction of traffic. These stripes shall be uniform and should not be less than 100 m wide so as to provide sufficient visibility.

5.2 **Objects adjacent to carriageway**

Sometimes objects adjacent to the carriageway may pose danger and obstruction to the flow of traffic. Objects such as subway piers and abutments, culvert head walls etc. are some examples for such obstructions. They should be marked with alternate black and white stripes at a forward angle of $45^\circ$ with respect to the direction of traffic. Poles close to the carriageway should be painted in alternate black and white up to a height of 1.25 m above the road level. Other objects such as guard stones, drums, guard rails etc. where chances of vehicles hitting them are only when vehicle runs off the carriageway should be painted in solid white. Kerbs of all islands located in the line of traffic flow shall be painted with either alternating black and white stripes of 500 mm wide or chequered black and white stripes of same width.

6. **Markings at Hazardous location**

Wherever there is a change in the width of the road, or any hazardous location in the road, the driver should be warned about this situation with the help of suitable road markings. Road markings showing the width transition in the carriageway should be of 100 mm width. Converging lines shall be 150 mm wide and shall have a taper length of not less than twenty times the off-set distance as shown in Fig.15. Throughout the transition area line separating the opposing direction of traffic shall be no-overtaking zone pattern. It should be borne in mind that these lines, in themselves, are not considered to be sufficient warning at such locations. They should always be used to supplement the standard warning strips.

6.1 **Obstruction Approach Marking**

Physical obstructions within the carriageway, such as monuments, transmission poles or towers, trees etc. which constitute a serious hazard to traffic, should not be allowed except under
compelling circumstances. All possible measures should be taken to prevent vehicles from colliding with the obstructions.

The approach marking to obstructions shall be so designed as to deflect the traffic away from the obstruction by diagonal lines or chevron markings. (Fig.16). The immediate approach to channelising and central median islands may be marked by diagonal/chevron marking. When the traffic flow in the two sides of markings is in the same direction, chevron marking is appropriate. The colour of these markings shall be yellow. The total length of marking at channelizing islands shall be variable as per site conditions but the length should be sufficient to include at least two chevron/diagonals.

Printed channelizing can be used to increase efficiency and safety has the advantage of easy modifications, when warranted by the driver behaviour. If a more permanent barrier is required, kerbs and islands may be constructed but the painted channelization will serve initially to establish the best layout arrangements before permanent construction is established.

**Fig 15: Traffic passing on both sides of obstruction**

![Diagram of traffic passing on both sides of obstruction](image)

*Source: IRC 35-1997*

### 6.2 Chevron Marking

The immediate approach to channelizing and central median islands may be marked by diagonal/chevron marking described in Fig. 16. When traffic flow on the two sides of markings is in the same direction, chevron marking is appropriate. The colour of these markings shall be yellow. The total length of marking at channelizing islands shall be variable as per site conditions but the length should be sufficient to include at least two chevron/diagonals.
Painted channelization can be used to increase efficiency and safety and has the advantage of easy modifications, when warranted by the driver behavior. If a more permanent barrier is required, curbs and islands may be constructed but the painted channelization will serve initially to establish the best layout arrangement before permanent construction is established.

Fig 16: Chevron Marking

Source: IRC 35-1997

7. Markings for Parking

The marking of the parking space limits on urban roads promotes more efficient use of the parking spaces and tends to prevent encroachment on places like bus stops, fire hydrant zones etc. where parking is not allowed and is undesirable. Such parking restrictions should be
indicated with markings that are solid white lines 100 mm wide. Words TAXI, CARS, SCOOTERS etc. may also be written if the parking area is specific for any particular type of vehicle.

7.1 Parking Restrictions

Kerb or carriageway marking shall be used to show where parking is prohibited. The parking restriction may be indicated by markings on kerbs or on the carriageway by zig-zag yellow line 100 mm wide covering the top of kerb or carriageway close to it may be used as shown in Fig 17. Parking space limits may be indicated on the surface or the carriageway by these lines. The face of the kerb may also be painted similarly. (refer Fig. 18). The parking sign should be as per IRC: 67:2001.

Fig 17: Parking Restriction

![Fig 17: Parking Restriction](source: UN Conference on Road Markings)

Fig 18: Marking for Parking Spaces

![Fig 18: Marking for Parking Spaces](source: UN Conference on Road Markings)
7.2 Bus Stops

Pavement markings at the bus stops should be provided with the word BUS STOP written prominently on the pavement. Pedestrian crossings should be marked slightly behind the standing position of buses in order to avoid conflicts. Moreover, the curbs should be marked with continuous yellow line to indicate no parking. This marking should be used only to supplement a road side bus stop sign and has no mandatory significance for drivers of other vehicles, unless yellow waiting restrictions marking is provided on curbs.

Fig 19: Marking at Bus Stop

Source: IRC 35-1997
The length of the bay for bus stops shall be 15 m minimum. It may be increased in stages of 2 m up to a maximum of 40 m. The word message “BUS STOP” should be repeated if the bay is over 30 m in length. The line marking for bay shall be in white colour and 100 mm wide (refer Fig. 19).

7.3 Accessible Parking

The parking should be marked for the physically challenged at the ratio of 2:25 of the total number of parking. Two accessible parking lots with overall minimum dimension of 3600 mm wide and 5000 mm long (including aisle space), should be provided. There shall be directional signs guiding people to the accessible parking. (refer Fig. 20).

Fig 20: Accessible Parking

Source: Samarthaym
8. Material and Colour

The material commonly used for pavement, curb object markings is hot applied thermoplastic paints, which are now-a-days specified for roads. Improved night visibility is obtained by the use of minute glass beads incorporated in the markings to produce a "retro-reflective" surface.

Other materials that may also be used include pre-fabricated sheet materials, glue-down plastic stripes, metal and plastic inserts-and road studs. The commonly used colours for road markings are white and yellow. The usage of these colours is summarized below:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>All carriageway markings except those intended for parking restrictions.</td>
</tr>
<tr>
<td>Yellow</td>
<td>i) Markings intended for parking restrictions</td>
</tr>
<tr>
<td>Alternate bands of white and black</td>
<td>ii) Continuous centre and barrier line markings.</td>
</tr>
<tr>
<td></td>
<td>Curb object markings.</td>
</tr>
</tbody>
</table>

Source: Kadiyali LR, (2009), Traffic & Engineering & Transportation Planning, Khanna Publications, Delhi

9. Systematic Maintenance

All road owning/ maintenance agencies shall devise cyclic process for maintenance/ repairing of the road markings. They shall also provide display board giving helpline numbers and responsible officials who could be contacted in case of any complaint.

10. Concluding Recommendations

In Delhi numbers of agencies are involved in bad traffic management. However, due to lack of standardised, proper road markings, there are frequent problems in safe and smooth movement of traffic. It is, therefore, essential to adopt uniform standardised road markings on all the roads. It is also important to devise a system whereby the road markings are regularly maintained or repainted, according to time cycle.

Subject to approval, the guidelines given herein shall be mandatory for all the road owning, development and maintenance agencies in Delhi.

i) The 'Guidelines for Road Markings' were deliberated in the UTTIPEC Working Group III-A meeting held on 19.11.08, 5.12.08, 10.12.08, 7.1.09, 18.3.09, 24.6.09 and 25.9.09

ii) The 'Guidelines for Road Markings' was approved in the 18th UTTIPEC Governing Body meeting held on 30.09.09 under the chairmanship of Lt. Governor, Delhi.
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