

Code of Practice (Part 3) Road Marking



**Institute of Urban
Transport**
**Ministry of Urban
Development**

IUT

This document has been prepared by the Transportation Research and Injury Prevention Programme (TRIPP) for the Institute of Urban Transport (IUT), Ministry of Urban Development. The primary purpose of this document is to provide a code of practice for various Urban Road Components. It has been developed in five parts. This is part three of five, which elaborates various norms and standards for road markings.

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1. INTRODUCTION

Road markings are essential to guide the road users and to ensure a smoother flow of traffic. Markings have to be of standard color and dimensions and should be marked at appropriate places so as to optimize their visibility and effectiveness.

2. SCOPE

This manual is aimed at discussing the standard markings, their purpose and the places where they should be located. Firstly, we discuss general guidelines for the road markings and then later on we discuss the application of these standard markings.

3. 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 Markings are defined as lines, patterns, words or other devices, applied to or attached to the carriageway or kerb or to the objects within as well as the adjacent to the carriageway, for controlling, warning, guiding and informing all the road users.

4. MATERIALS

4.1. NON MECHANICAL MARKERS

Paints used for road markings should be hot applied Thermoplastic paints instead of ordinary paints, feasible for better visibility and long life . Visibility at nights is improved by the use of minute glass beads embedded in pavement marking material to produce a retro reflective surface.¹

Thermoplastics coatings are generally homogeneous dry mixes of binder resins, plasticizers, glass beads (or other optics), pigments and fillers. Their usage has increased over paints

¹ Ref: IRC: 35-1997,Code of Practice for Road Markings , Para 5.2 ,page no 2

mainly due to the performance benefits of increased durability, retro-reflectivity and a lack of VOC solvents.

Plastics :cold rolled or glued down plastic strips with the adhesive in the backing are used for cross walks , commonly referred to as "tape" or "cold plastic," this product is heavy-grade material with reflective beads embedded in the plastic. This method is used to mark the stop lines on bituminous roads in high density urban areas. These should be used in well lit areas so as to maintain the reflectivity of the markings at the desirable level.²

Epoxy technology has become more affordable and reliable. This material competes directly with plastic with respect to usage and cost.

4.2. MECHANICAL MARKERS

The mechanical markers can be used to reduce speed and some of them are listed below:

Cats eye are reflectors which either reflect the light falling on them or can have a blinking mechanism at important locations.

Botts' dots are one type of a mechanical non-reflective raised marker. Generally they are used to mark the edges of traffic lanes, frequently in conjunction with raised reflective markers.

Rumble strips can be a series of simple troughs (typically 1 cm deep and 10 cm wide) that is ground out of the asphalt.

Details of above mentioned mechanical markers are provided in **section 7. Classification of road markings.**

² Ref: IRC: 35-1997, Code of Practice for Road Markings , Para 5.4.2, page no 3

5. COLOR AND SIZES

The general guidelines for the road markings include the description of colors used in the marking, dimensions of the markings and their purpose.

Colors used for markings:

The colors used in the road

- 1) White
- 2) Yellow
- 3) Blue
- 4) Green

1) **White**³:

White color is the general and most widely used color for road markings because of its visibility and good contrast against the road surface. The markings in white color are generally permissive and can be crossed at some times and under certain circumstances.

White color is used for longitudinal markings to delineate:

- A.** The separation of traffic flows in the same direction.
- B.** The left edge of the roadway. Most of the transverse markings like word and symbol markings, stop lines, yield lines, pedestrian crossings, and others, shall be white unless otherwise specified herein.

2) **Yellow**⁴:

³ Ref: MUTCD 2003 edition, part 3 Markings, Section 3A.04

⁴ Ref: MUTCD 2003 edition, part 3 Markings, Section 3A.05

Yellow color is used to indicate that it is not permitted to cross the markings under any circumstances. Yellow longitudinal markings are used to delineate:

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

According to the new and conventional practices in other countries, some more colours are used for new and not conventional markings on urban roads .

These are as follows,

3) Blue:

The blue color is being used to indicate new and special markings which are not conventional and common on the Indian roads.

In the Bus Rapid Transit corridor, on urban streets blue color is being used to indicate central/dedicated bus lanes and the three wheeler Scooter Rickshaw (TSR) parking zones (special marking)

In case of bus lanes it is being marked across the intersection so as to inform road users that this is a lane specifically to be meant for buses and no other vehicle should enter this lane.

4) Green:

A special cycle box with a green color background is marked at the intersection and past the pedestrian crossing. It covers the whole width of MV lanes in length and has a minimum width of 2m. It gives priority to the cyclists crossing the road.

BRT has got a provision for a separate track for NMVs and to indicate this segregation especially at the locations where MVs are going to cross over or mingle with the NMVs i.e. at the intersections and at locations where NMVs share the space with the MVs on the MV lane, the green color is used for the cycle track.

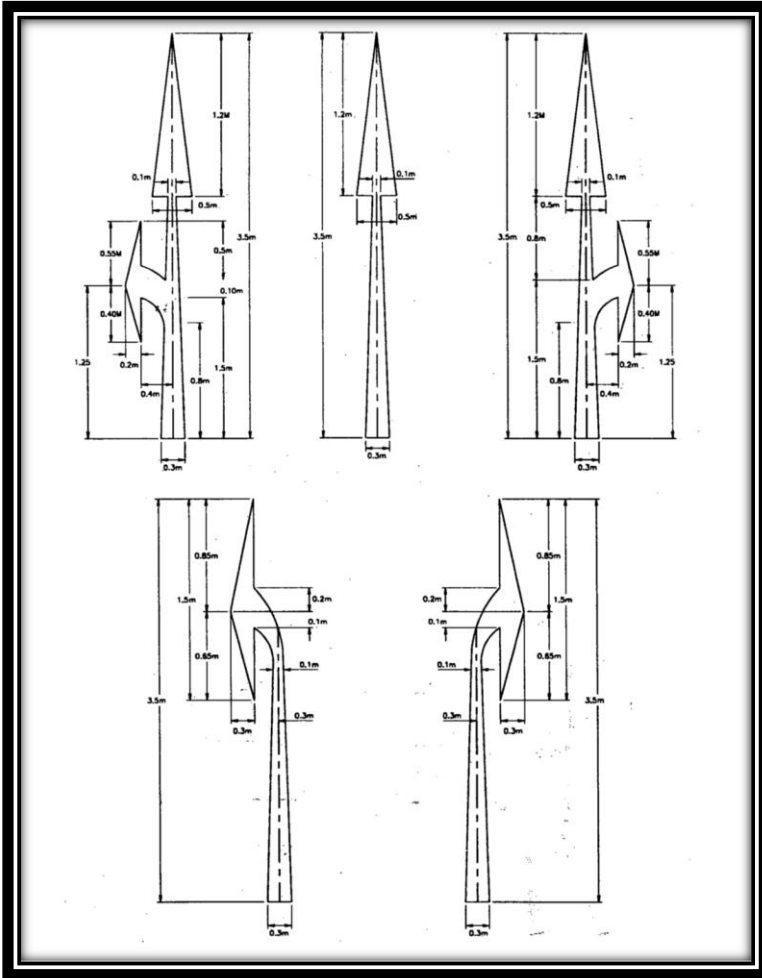


Figure 5-1 Arrow markings for route direction for speed design of 50km/hr or less

6. WORD MESSAGES

Information to guide, warn and regulate traffic may also be conveyed by inscription of word messages on road surface .These signs indicate the areas intended for a particular function. (Refer plate B for details)

The basic character of word messages are capital. The size of basic alphabets and numerals as shown in the figure below

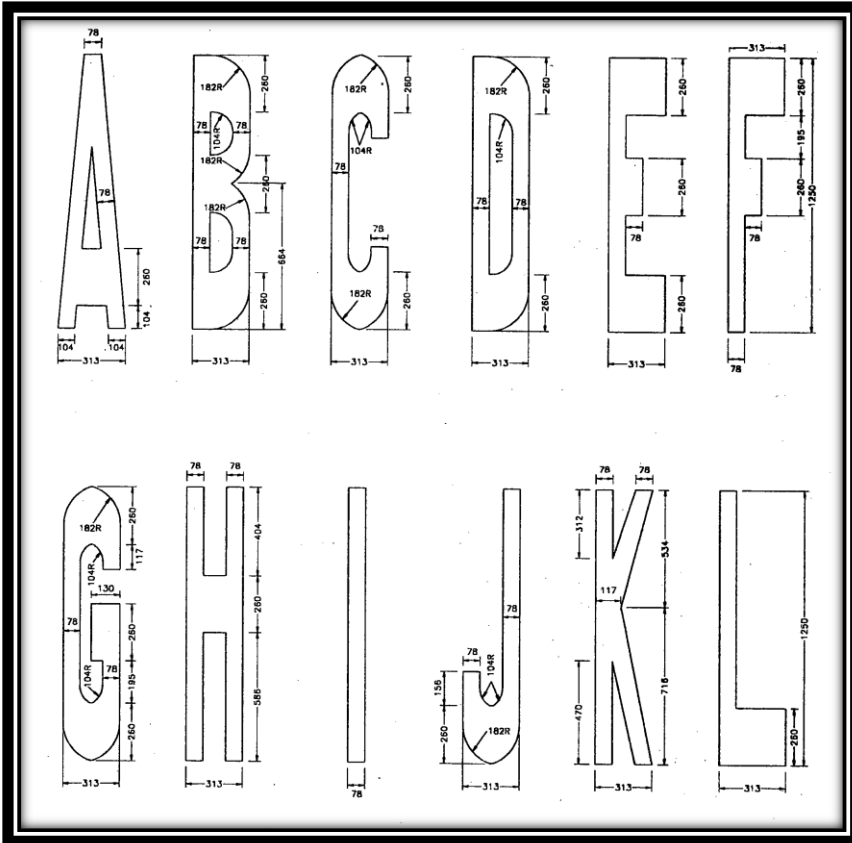


Figure 6-1 Size of the letters for word messages (speed 50 km/h or less)⁵

⁵ Ref: IRC: 35-1997, Plate 2 (1/3), page 61

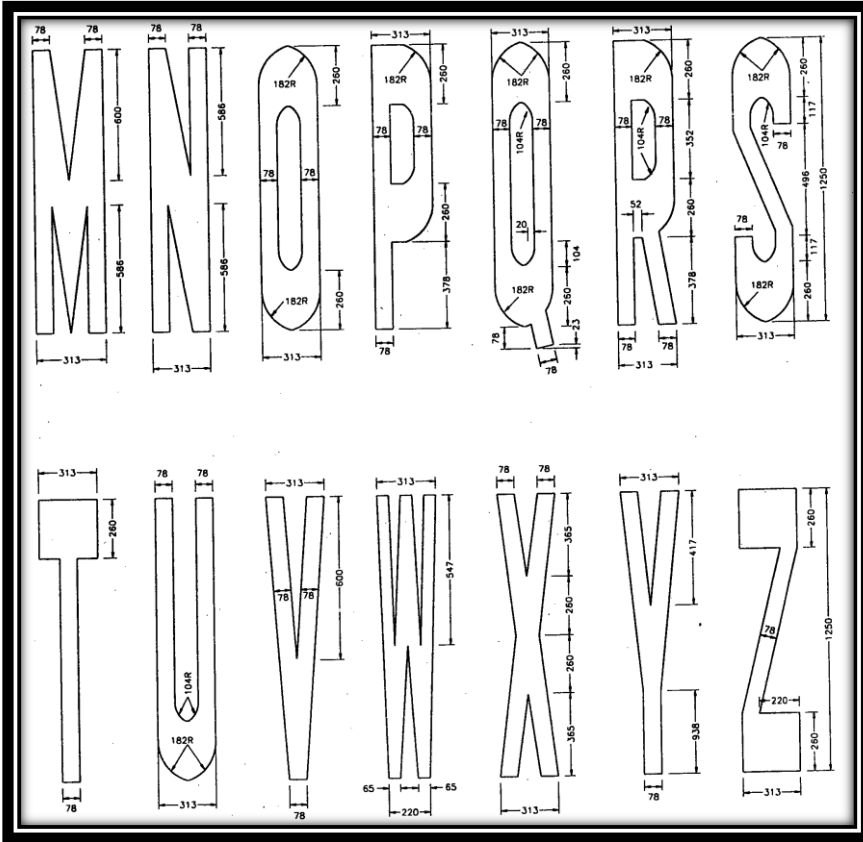


Figure 6-2 Size of the letters for word messages (speed 50 km/h or less)⁶

7. CLASSIFICATION OF ROAD MARKINGS

Road markings are complementary to physical segregation. There are some general types of road markings, which help the road users in using the road space effectively without causing inconvenience to others. Each of these markings has got a unique specification and purpose.

⁶ Ref: IRC: 35-1997, Plate 2 (2/3), page 62

The road markings in general are as follows:

1) **White Broken Line**⁷: The white broken line represents the traffic lane line, for traffic in same direction, and helps to regulate traffic into proper lanes and also to separate one lane from the other. These are permissive in character and may be crossed with discretion, if traffic permits. The length of each line segment and the distance between two consecutive marking segments are 1500mm and 3000mm respectively. The width of the white broken line is 100mm.

White solid line on the left edge of MV carriageway becomes white broken line whenever it encounters a parking space or raised crossing. In case of TSR parking it has got a width of 100mm and the length of each marking is 750mm. The center to center distance of two consecutive markings is 1750mm. In case of raised crossing the width of the marking is same as 100mm but the length of a line segment is 1000mm and with a distance of 1000mm C/C between any two consecutive markings.

The white broken line is also used all along the cycle track to indicate two lanes. The length of each marking in this case is 750mm and is spaced at a distance of 2100mm from C/C.

2) **White Solid Line**⁸: White solid line marks the left edge of roadway. These solid lines are restrictive in character and indicate that crossing is not permitted except for entry or exit from the premises or a side road or to avoid a stationary obstruction. The width of the marking is 100mm. For the MV lanes it is kept at 100mm from the kerb on the left edge and for the bus lane it is kept at 150mm from the kerb on the left edge. It is continuous throughout except when it encounters an intersection or a side road meeting the main corridor or TSR parking spaces. In case of intersections it ends at the Stop line and then resumes after the intersection. In case of arterial roads it goes along the approach of arterial road marking the edges of its approach. In case of TSR parking it ends at the starting of TSR parking and resumes after the TSR parking area ends.

⁷ Ref: IRC: 35-1997, para 8.3 & Fig. 2(b) or (c) or (d).

⁸ Ref: IRC: 35-1997, para 8.6.3 and 8.6.4

3) **Yellow Solid Line**⁹: The yellow solid line marks the right edge of the roadway. Its width is 100mm and is kept at 100mm from the kerb on the right side in the case of MV carriageway and at 150mm from the right side kerb in the case of the bus lane. When it is marked on the MV lanes its width is 100mm and it is marked at a distance of 100 mm from the median and when it is marked on the bus lane it has a width of 100mm but is marked at a distance of 150mm from the median.

4) **Directional Arrow**¹⁰: Directional arrows are used to guide drivers in advance, over the correct lane to be taken when approaching intersections whether signal controlled or not. The length of these arrows is kept at 3500mm for design speed of 50 km/hr.

5) **Channelizing lines and Chevron Marking**¹¹: Channelizing lines are two wide solid lines either diverging or converging depending upon the application whether they are used for diverging traffic or merging traffic respectively. These lines ensure a smooth merging or diverging of traffic. The neutral area enclosed between channelizing lines is marked with chevron marking to enhance the functionality of channelizing lines. The length of these channelizing lines is sufficient enough so as to ensure smooth merging or diversion of traffic. The thickness of these channelizing lines is 150mm and the thickness at the vertex tip is 100mm.

In case of NMVs a single tapering solid patch is used to act as a channelizing line to guide the cyclists to enter or leave a cycle track.

6) **Stop Line**¹²: Stop lines should be placed to allow sufficient sight distance to all other approaches to an intersection.

⁹ Ref: MUTCD 2003 edition, part 3 Markings, Section 3A.05 and 3B.06

¹⁰ Ref IRC: 35-1997, para 9.9.1 to 9.9.3 & Fig. 21

¹¹ Ref IRC: 35-1997, para 9.8.1 to 9.8.2 & Fig. 17 & 18

¹² Ref: MUTCD 2003 edition, part 3 Markings, Section 3B.16:

A stop Line is marked at a minimum of 1.2m in advance of the nearest boundary of the pedestrian crossing marking at the controlled intersection and has a width of 600mm.

7) **Spring Post:** Spring posts are very useful delineators and can serve several purposes. They provide the physical segregation on roads and yet are not dangerous even if a vehicle hits them. Spring posts are used to delineate lanes going in different directions. They are used at locations such as in between the pedestrian crossing if the length of the pedestrian crossing is such that pedestrians need to stop in between. They are used on the channelizing lines and thus provide a physical diversion as well. The spring posts have a 200mm square base and a diameter of 150mm at the root which goes on reducing with the height.

8) **Cats eye:** Cats eye are reflectors which either reflect the light falling on them or can have a blinking mechanism at important locations. The face facing the traffic has inner and outer dimension of 100 and 130mm respectively and the surface along the traffic movement has got inner and outer dimensions as 80 and 110mm. Cats eye or reflector studs are to be placed on both the edges of the MV carriageway and the bus lane all along the corridor. The spacing between two consecutive reflector studs is 4000mm centre to centre (C/C) for straight stretches and 2000mm C/C for bends. They are placed so that they either touch the curb or the median near which they are placed.

Apart from the edges cats eye are also placed before the stop line for the bus lane, along the white broken line for the TSR parking and on channelizing lines to enhance the visibility during night time.

8) **Botts' dots:** (low rounded white dots), (the epoxy that keeps them glued down), are one type of a mechanical non-reflective raised marker. Generally they are used to mark the edges of traffic lanes, frequently in conjunction with raised reflective markers. Botts' dots are also used across a travel lane to draw the drivers attention to the road. They are frequently used in this way to alert drivers to toll booths, school zones or other significant slow speed areas.

9) **Rumble strips:** These are commonly used for the same purpose. A rumble strip can be a series of simple troughs (typically 1 cm deep and 10 cm wide) that is ground out of the asphalt. Other alternatives, similar to the Botts' dots, use raised strips, painted or

glued to the surface. Uses can be across the travel direction (to warn of hazards ahead) or along the travel direction (to warn of hazards of not staying within a specific lane) Their main way of functioning is to create a strong vibration when driven over that will alert a driver to various upcoming hazards both by sound and the physical vibration of his vehicle.

10) **Road Delineators:** Road delineators are reflectors studded on a small post to make them more visible. Road delineators are to be used on the bends to enhance the visibility of curvature of bends. They are to be placed on the kerb stones at a center to center spacing of 4000mm.

11) **Bus Boxes:** Bus boxes are the markings on the bus lane at the bus shelters where the buses will stop for boarding and alighting of passengers. The color used for this marking is white. It's a rectangle with diagonals marked and the edges in the longitudinal direction coincide with the continuous white lines and the transverse and diagonal markings are 100mm thick. The outer dimension of the marking in the longitudinal direction is 12000mm and the clear distance between two consecutive bus boxes is 1800mm.

12) **Word Markings and Symbol¹³:** Word markings and symbols are used to clarify specifically to the road users about the road space. The bus lane has word "BUS" written in capitals 500mm before the stop line. The height of the letters is 1500mm and is written in white color.

The TSR parking also has word marking TSR written on the special blue marking. The height of letters in "TSR" is 600mm and is written 500mm after the special marking starts. 500mm after the TSR word marking there is a standard symbol of Three wheeler Scooter Rickshaw of height 1000mm.

The Cycle lanes have a standard symbol of cycle in white color. The pedestrian box at the pedestrian crossing has got a symbol of a man to indicate the priority for pedestrians to cross the road

¹³ Ref: MUTCD 2003 edition, part 3 Markings, Section 3B.22

8. APPLICATION OF ROAD MARKINGS

The application of road markings is classified under the category of different users. The road space has been divided for different road users depending upon their respective design speeds. The different users of the road space are:-

- Motorized Vehicles (MV)
- Buses
- Cycles
- Pedestrians

8.1. LONGITUDINAL MARKING(BEFORE THE JUNCTION)

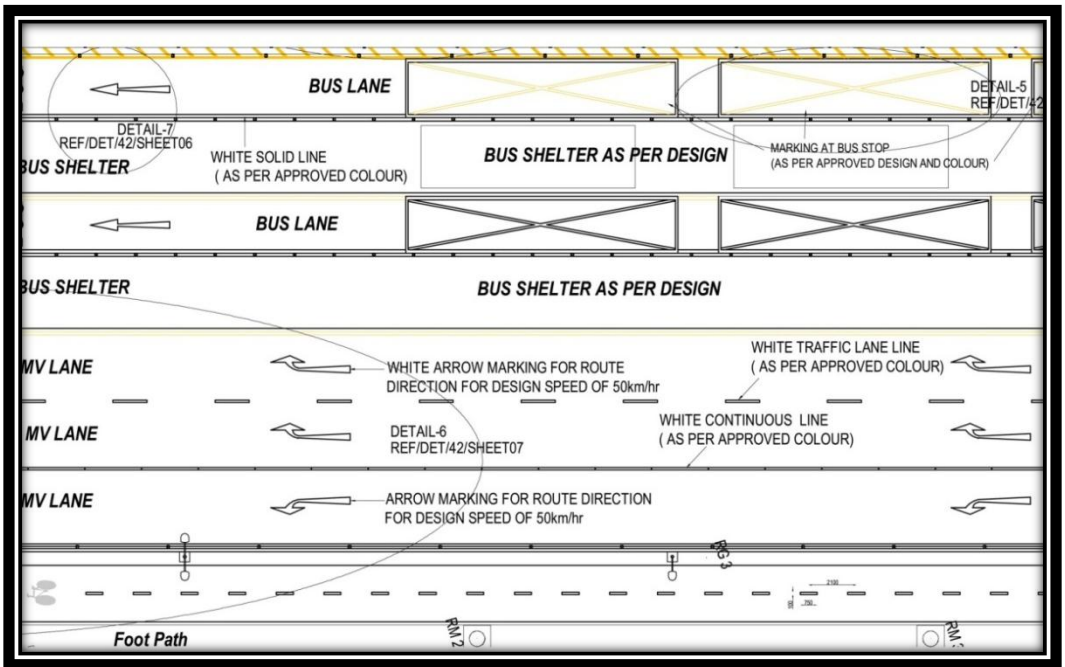


Figure 8-1 : Typical marking before the junction for all road users

Motorized Vehicles (MV) or Carriageway

Motorized vehicles include all types of motorized vehicles but buses. They mainly comprise of cars and two wheelers. Two lanes next to the central bus lane are designed for these vehicles.

Following types of markings are used for the MV lanes: -

- Solid Lines (Yellow or White)
- Broken Lines (White)
- Directional Arrows
- Spring Posts
- Stop Line (White)
- Catseye
- Special Marking (TSR Parking)

The above markings appear either before or after the junction or in both the cases. These are discussed in detail under the following headings: -

- 1) **White Broken Lines:** White broken lines are used on the MV lanes to guide the road users into proper lanes. At a mid block section there are two lanes for MVs, which are distinguished by a 100mm white broken line. At junctions the lane increases from two to three or five with respect to the Right of Way (ROW) available. In such cases the left or right turning traffic is segregated by white solid marking, complemented with spring posts, starting at 48m before the stop line.

The white solid line on the left edge of the carriageway becomes white broken line in front of the TSR parking. The width of it is 100mm while the length of each segment is 750mm and the centre-to-centre distance between two segments is 1750mm.

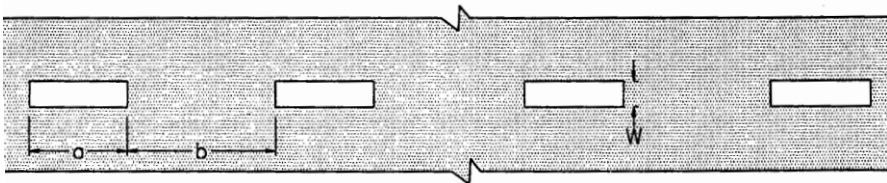


Figure 8-2 - Centre line where a and b depends upon the no. of lanes of carriageway

On undivided two way roads , centre line separates the opposing streams of the traffic and facilitates their movement .

- 2) **White Solid Lines:** White solid line is used to mark the left edge of carriageway for buses and MVs. White solid line is also marked 48m ahead of the stop line to indicate that the intersection is approaching and left turning MVs should keep to the left of this white solid line.

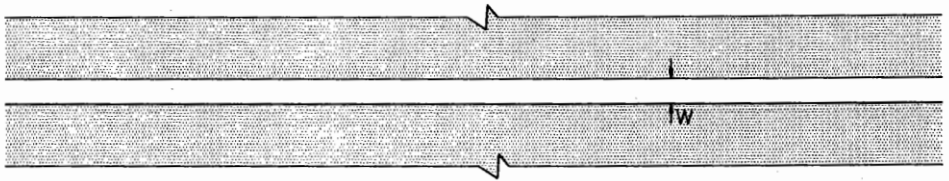


Figure 8-3 Centre line

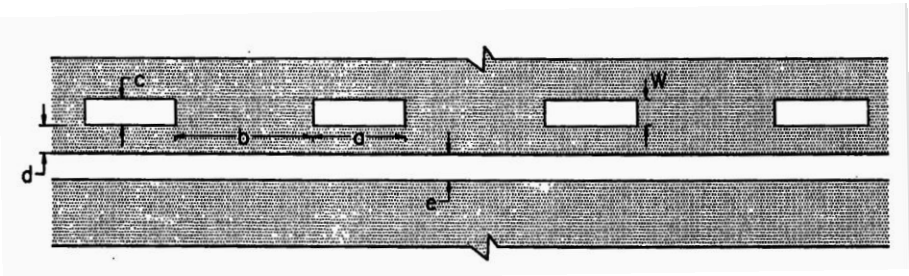


Figure 8-4 centre line

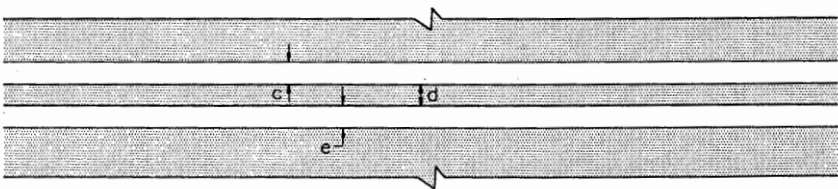


Figure 8-5 centre line

Note- In Figure 5, 6, 7, 8: a and b depends upon the category of road

c, d, e = 100 mm , w=150 mm

- 3) **Directional Arrow:** Directional arrows are used to guide drivers in advance over the correct lane to be taken when approaching the intersection whether signal controlled or not. The length of these arrows is kept at 3500mm for a design speed of 50 km/hr. The direction arrow nearest to the intersection is 15m from the stop line or the entrance to the junction. The second set of arrows is placed at 30m before the first set of arrows.

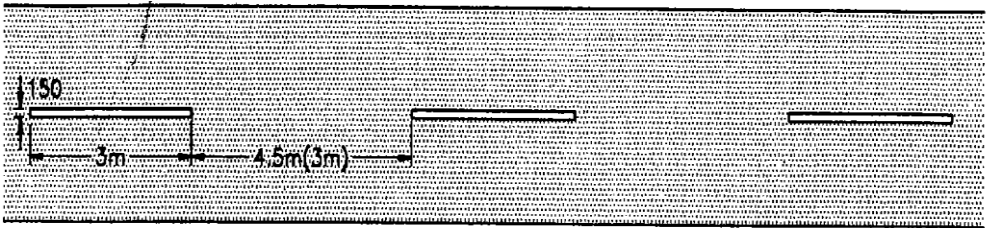


Figure 8-6 Lane line markings for urban roads -

On urban roads with less than 4 lanes or roads having 4 lanes (arterial or Sub arterial roads), and on which parking is permitted the centre line shall consist of single broken of 150 mm wide of 3 m segments with 4,5 m gaps in between .

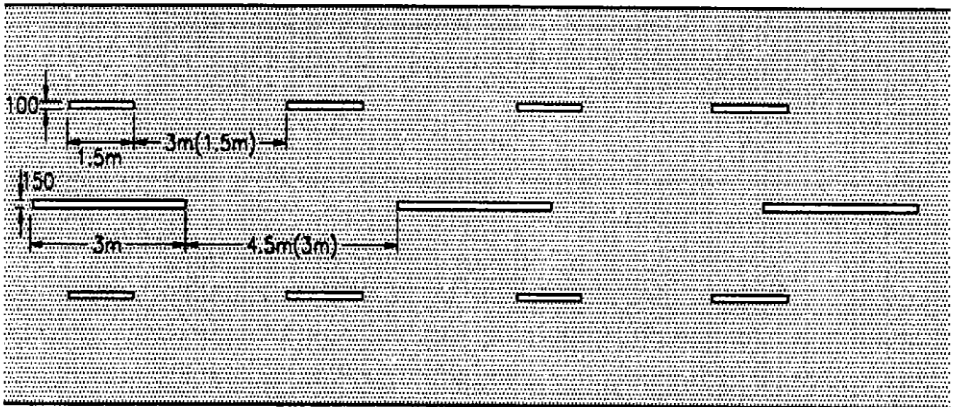


Figure 8-7 Lane line markings for urban roads

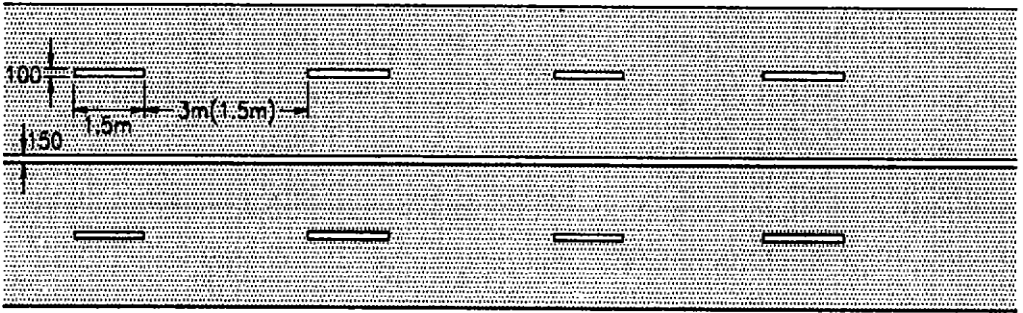


Figure 8-8 Lane line markings for urban roads

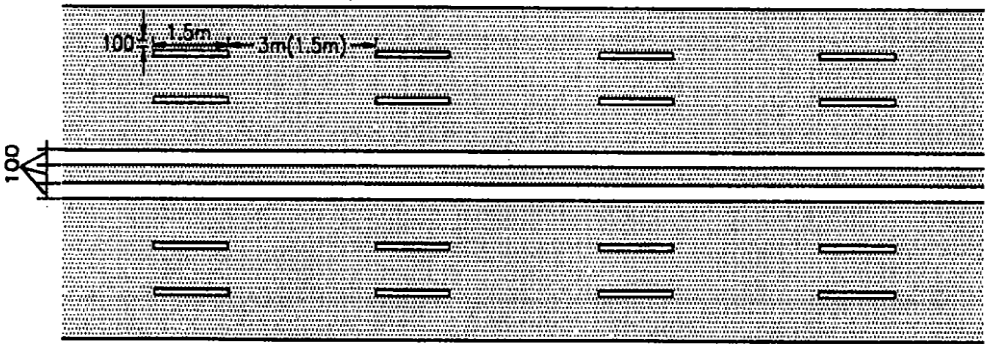


Figure 8-9 Lane line markings for urban roads

Note - On undivided urban roads with at least two traffic lanes in each direction , the centre line marking shall consist of either a single solid line 150 mm wide or a double solid line marking with 100 mm wide separated by a space of 100 mm gap in between .

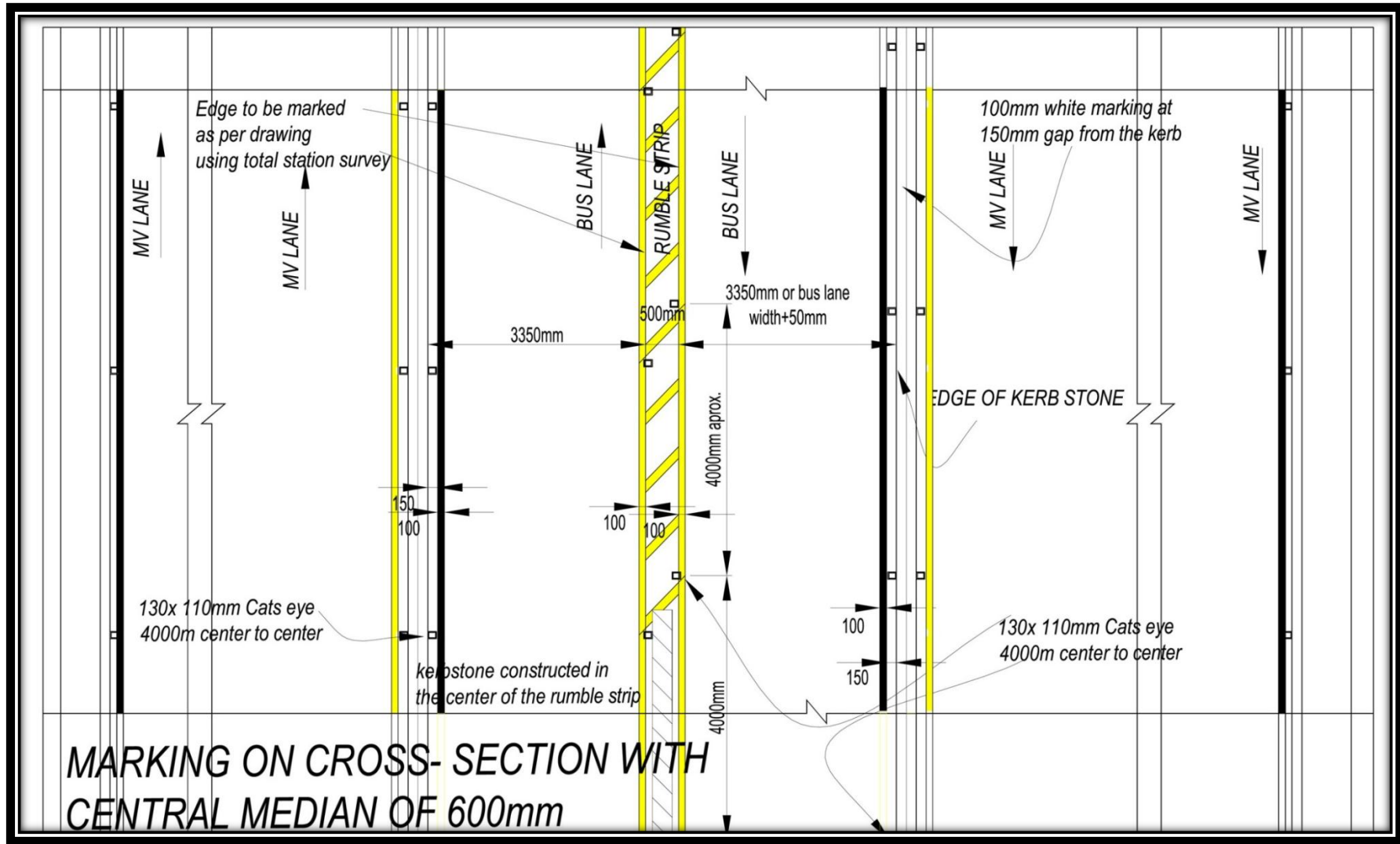


Figure 8-10 Typical longitudinal marking (centre line) on cross section for dedicated bus lanes

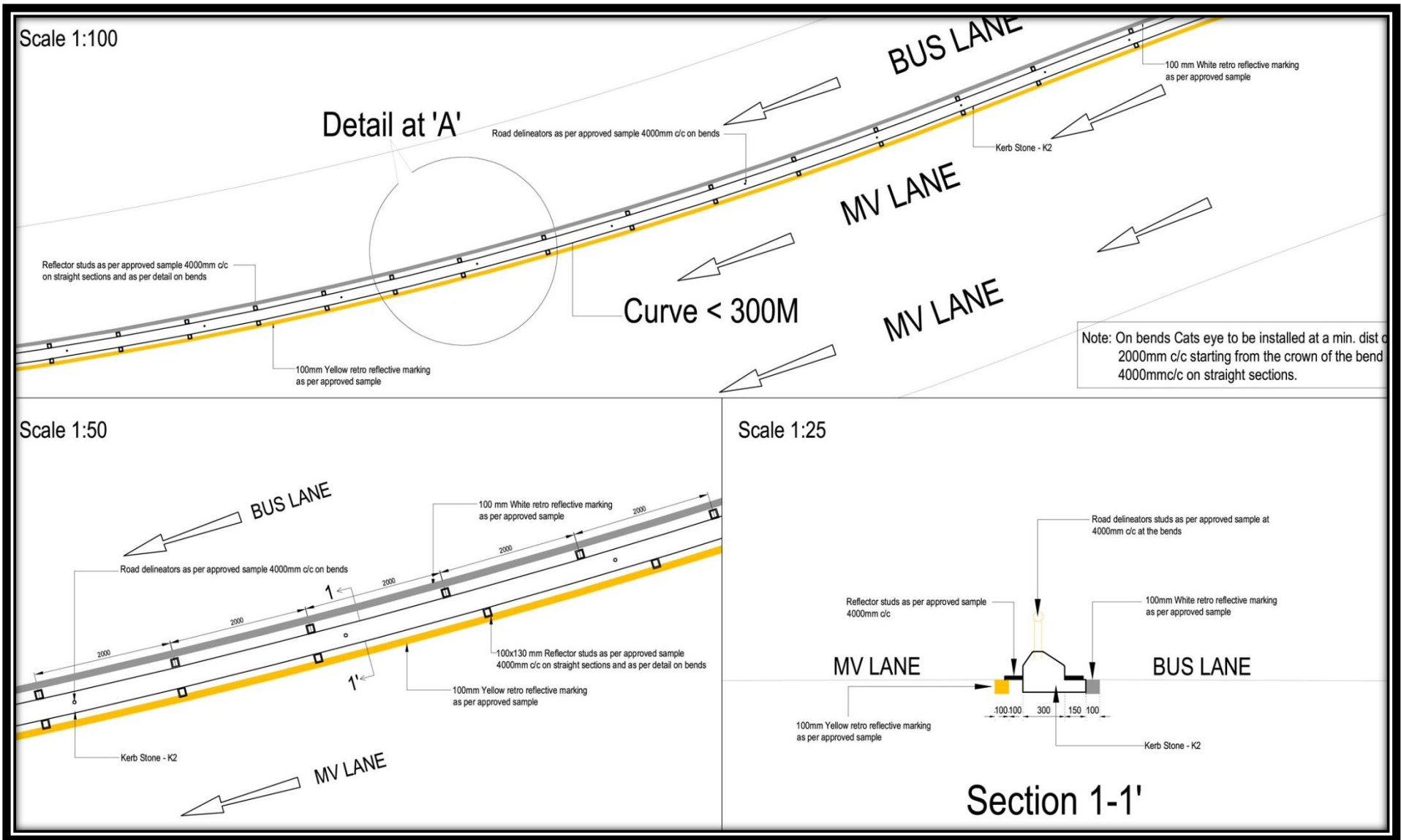


Figure 8-11 Longitudinal markings on curves

Note - The centre line on the curves should be placed in such a way that the width of the traffic lanes on both the approaches of the curve will be maintained around the outside of the curve this will bring the centre line, somewhat off centre of the total width at the same time it giving it the needed maneuvering width for the traffic using inside lanes.

- 4) **Spring Post:** Spring posts are placed on the white continuous line used to segregate the left turning MV traffic from the straight and right turning MV traffic. The centre to centre distance between two consecutive spring posts is 2500mm.

- 5) **Stop line:** A single solid white transverse line, extending for all MV lanes approaching the intersection, is marked to serve the purpose of a stop line. It is marked at a distance of 1200mm from the nearest pedestrian crossing.

- 6) **Special Marking (TSR Parking):** TSR parking are situated on to the left side of MV lanes. The MV lane widths are not affected by the TSR parking as separate pockets are being created for them. The TSR parking has special marking in blue paint and with TSR written on it along with a symbol of an auto rickshaw. Dimensions for this symbol marking box are 2000mm perpendicular to the lane and 3100mm along the lane. This place is the temporary parking place for the three wheeler scooter rickshaws (TSR). No other vehicle except TSR is allowed to park in the TSR parking. *(For specific details of paint and applying procedure refer to Note in Appendix)*

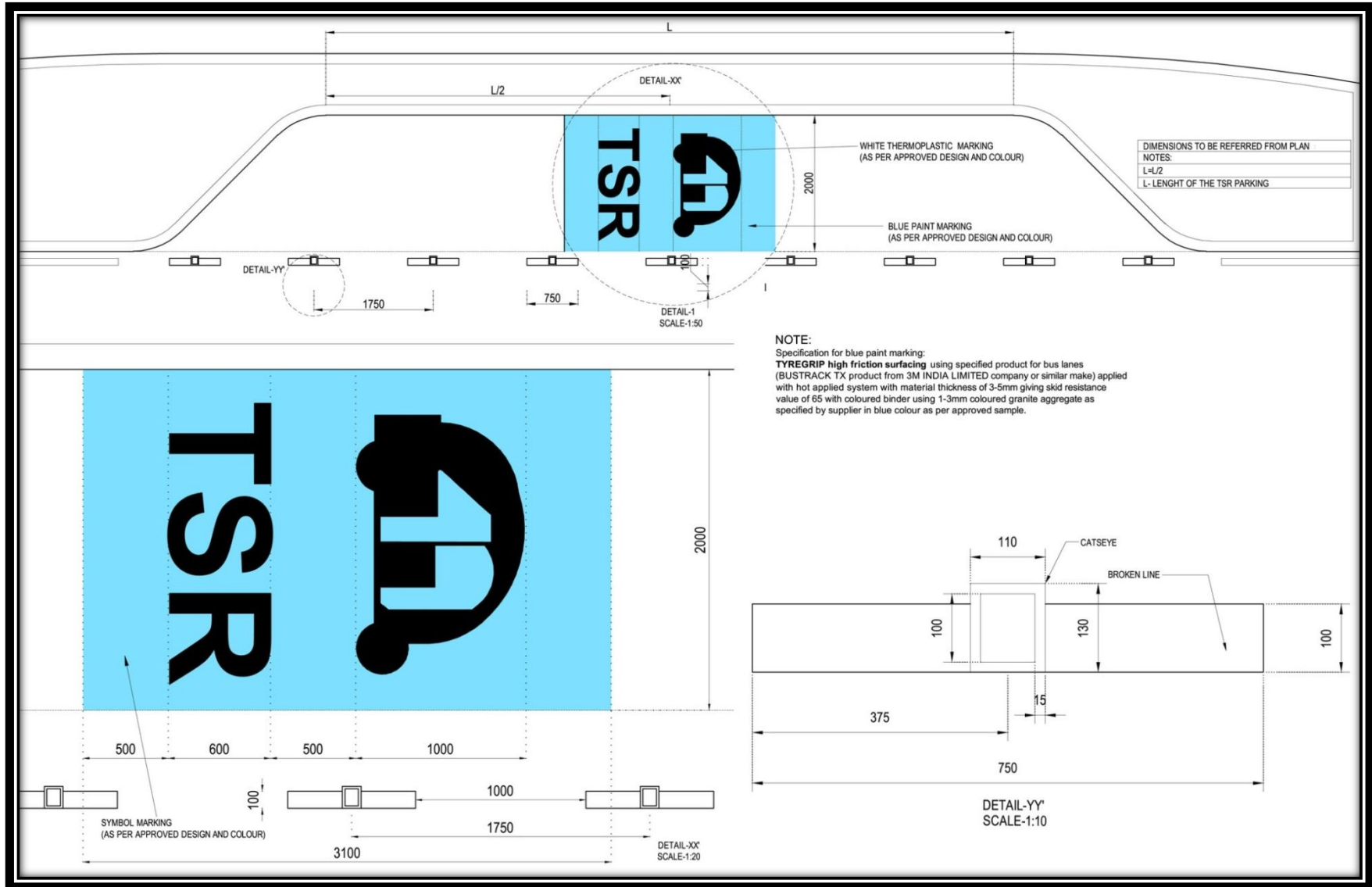


Figure 8-12 Marking with cats eye and spring post to segregate bus from vehicular traffic.

Buses:

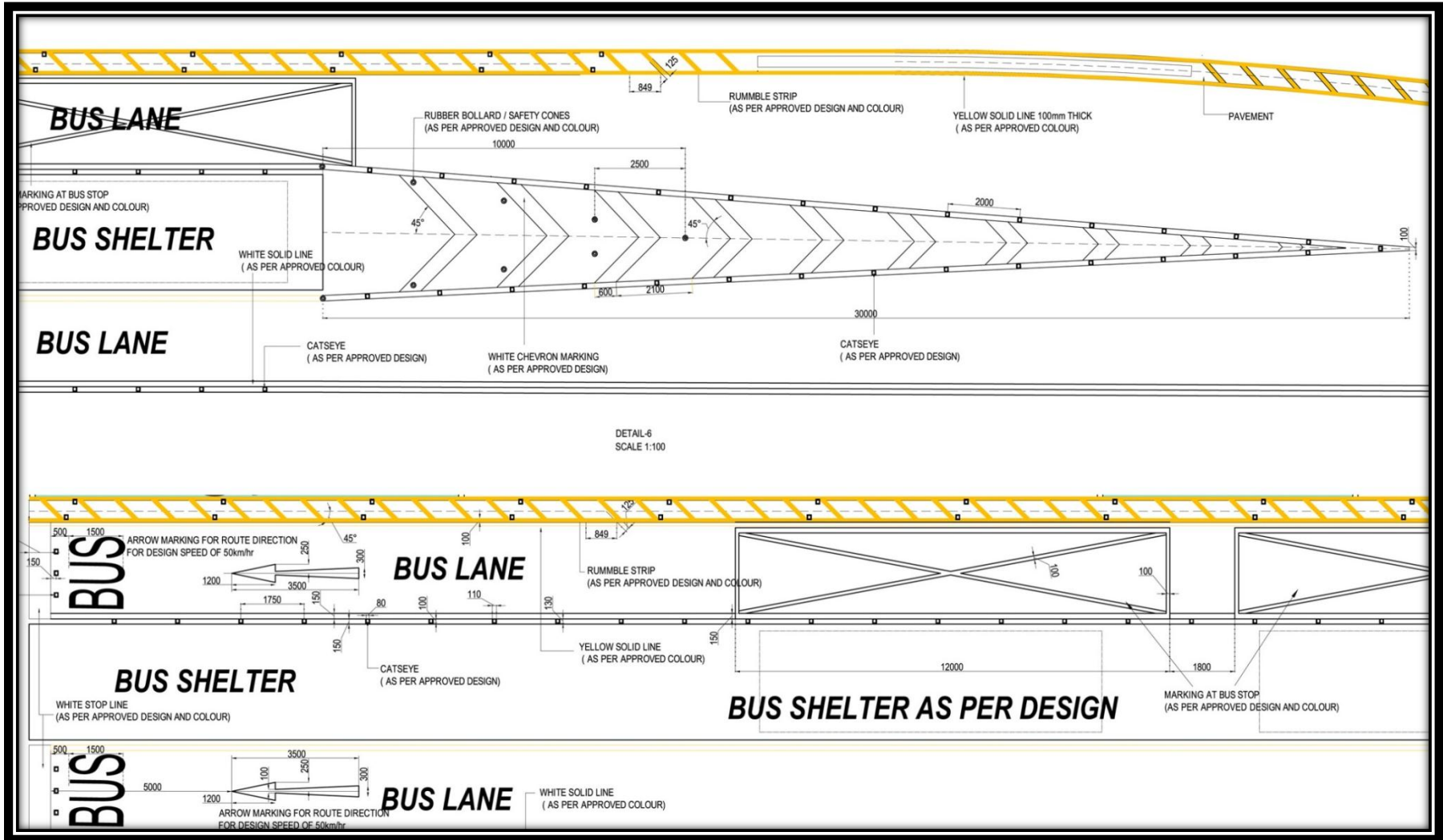


Figure 8-13 : Bus marking – along the carriageway

Buses, which are the most efficient means of public transport on road are given the right to the central lane. A separate lane specifically meant for buses means a whole set of new markings along with the conventional ones.

The markings on the bus lane are as follows:

- Solid Line (Yellow/ White)
- Cats eye
- Directional Arrow
- Stop Line (White)
- Special Marking (blue)
- Bus box (blue)
- Chevron marking
- Spring Post

Note – The *border and edge lines* are not included as they represent the carriageway width of rural roads which have no kerbs (which is not desirable on urban roads)

Marking for *no overtaking* zones is not included as it shall be established on two or three lane highways

8.2. CYCLE MARKING AT THE JUNCTION:

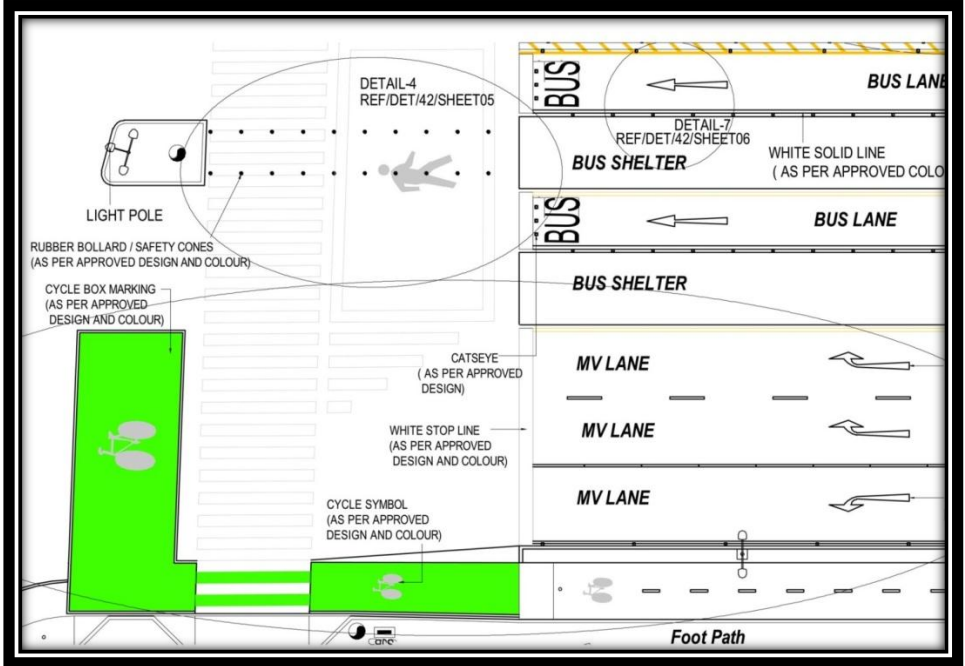


Figure 8-14: Typical marking at junctions for different road users

- 1) **White Solid Lines:** White Solid Lines are marked at the left edge of the bus lane. The width of marking is 100mm and is marked at a distance of 150mm from the curb on the left edge.
- 2) **Cats eye:** Catseye are fitted on both sides of the bus lane in between the space of median or curb and the white solid line or the yellow solid line as per the left or right edge. The purpose of these catseye is to enhance the visibility during night time and also to help the buses to align along the platform for proper alighting and boarding of passengers. The centre to centre distance between two consecutive catseye is 4000mm.

Catseye are also fitted on the channelizing lines indicating the splitting of the bus lane into two before the bus shelters. The spacing between any two consecutive catseye on channelizing lines is 2000mm centre to centre.

Catseye can also be observed on both sides, but on opposite sides, of each rumble strip. Cats eye are fitted before the stop line at regular intervals to enhance the functionality of the stop line during the night. The distance of the centre of the cats eye from the starting of the stop line is kept as 150mm.

- 3) **Yellow Solid Line:** Yellow solid line is marked on the right side of the bus lane at a distance of 150 mm from the median. The width of the yellow line is 100mm.
- 4) **Directional Arrow:** A single directional arrow is marked for the bus lane. It is marked at a distance of 5000mm before the stop line.
- 5) **Stop Line:** A single Stop Line should be marked in front of all the approaching bus lanes. The stop line marks the limit up to which you have to stop before the traffic signal turns green. The width of the stop line is 600mm.
- 6) **Bus Boxes:** Bus boxes are marked on the bus lane where the buses will stop for boarding and alighting of passengers. The number of bus boxes depends upon the number of bus shelters, which in turn depends upon the number of people using the buses as a means of public transport. Generally three bus shelters for one lane of bus are made so three bus boxes on each of the bus lanes are marked.
- 7) **Word Markings:** The bus lane has word "BUS" written in capitals 500mm before the stop line. The height of the letters is 150mm and is written in white color. It is meant to clearly specify that the lane is dedicated to buses only.

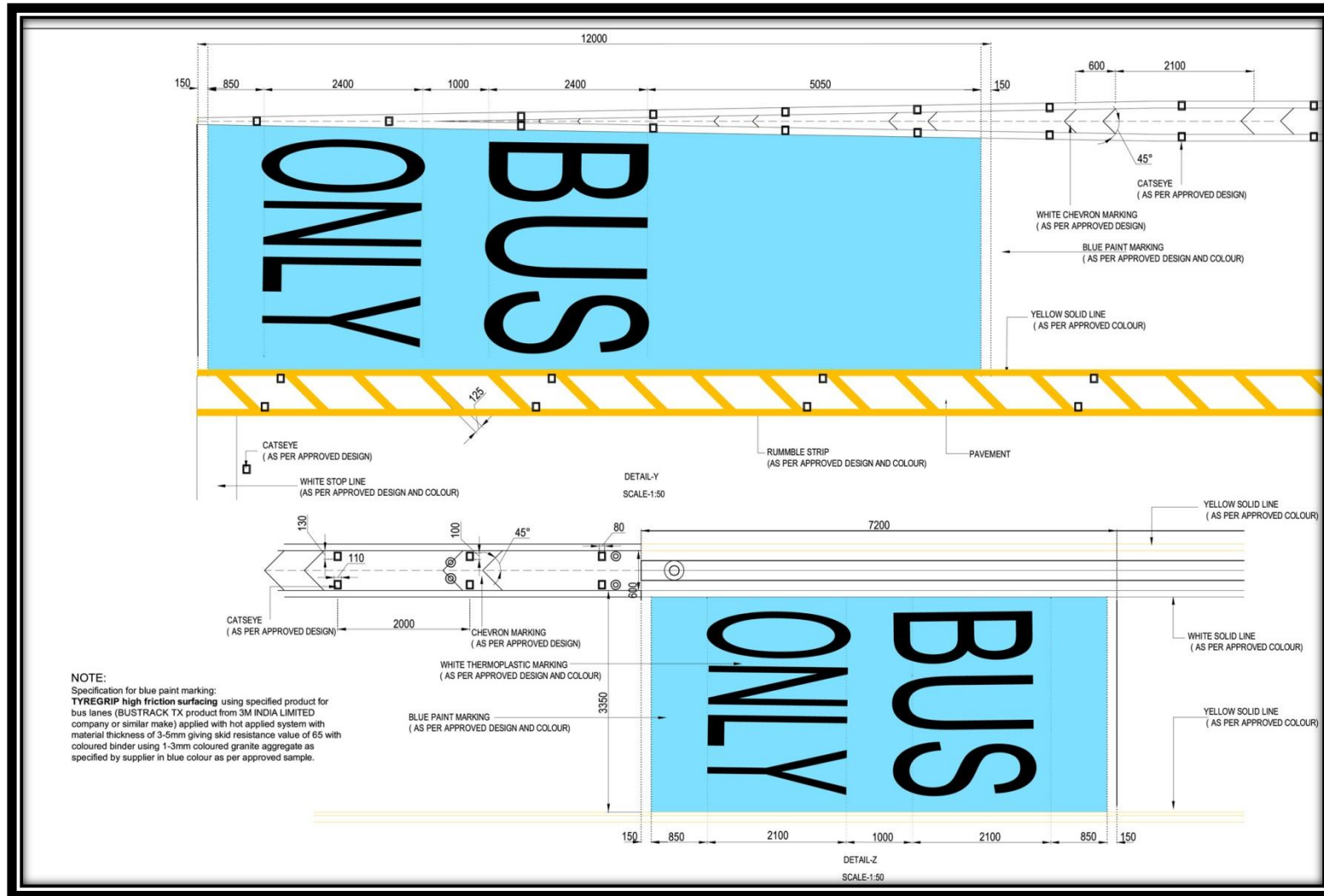


Figure 8-15 Typical marking at junctions for Buses

- 8) **Channelizing Lines with Chevron Marking:** The channelizing lines along with chevron marking are used to indicate the splitting of the bus lane into two separate lanes as they approach the bus shelter at the intersection. The channelizing lines start with the tip 30m before the bus shelter. Chevron marking is to be marked in the neutral region between channelizing lines. Chevron markings used are 'V' shaped markings with the arms at 90 degrees to each other. The color used for these markings is white.

In the same way channelizing lines and chevron markings are used just after the intersection and goes until the starting of the kerbstone which segregates the bus lane from the MV lanes.

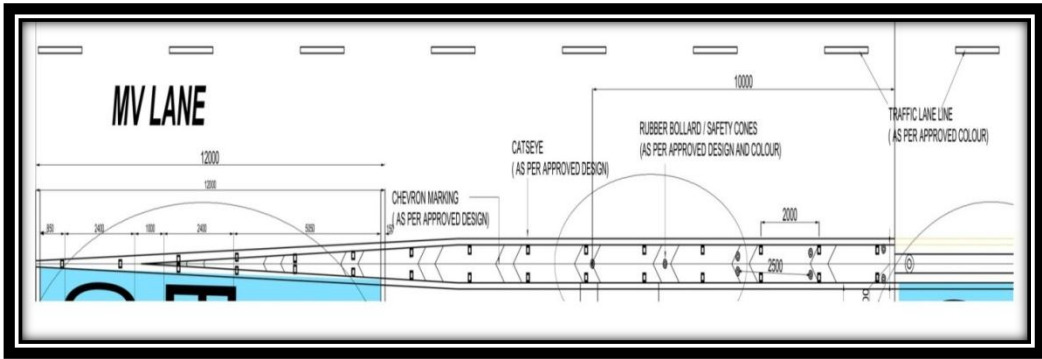


Figure 8-16 chevron marking for channelizing

- 9) **Spring Post:** The first spring post is observed 10m before the first bus shelter and then every next set of spring posts is separated from the previous one by 2500mm along the longitudinal direction. All the spring posts taken together form a symbol 'V' with the first spring post as the vertex of it.

In a similar fashion spring posts are used on the channelizing lines post the intersection. (*For more details on dimensions of chevron marking and arrangement of cats eye and spring posts refer to Detail 6 in Appendix*)

10) **Rumble Strip:** Rumble strips have a width of 125mm. These are placed at 45 degrees from the transverse direction. The perpendicular distance between two consecutive rumble strips is 600mm. They are placed on the pavement where the median separates the bus traffic in two opposite directions. These are fitted in the gap between two consecutive curb stones. This gap is 18m in length whereas the length of a single curbstone is 12m.

The rumble strips produce vibrations in the vehicle and thus can alert a bus going off the track and also if a fault develops in a bus then it can be removed from the bus lane through the gap.

11) **Special Marking:** Special Marking for the Bus lanes are marked with blue paint and with the word marking “BUS ONLY” in white color. The first special marking starts just after crossing the intersection and covers the whole lane in width i.e. 3.85m. The length of the marking is 12m. The second special marking starts 30m onwards the intersection and coincides with the starting of kerb stone. The width of second marking is 3.1m and the length is 7.2m. *(For specific details of paint and applying procedure refer to Note in Appendix and Detail Y & Detail Z in Appendix)*

Cycle lanes

The non-motorized Vehicles (NMVs) have low speeds and thus it is unsafe for them to share the road space with MVs, which move at high speeds. Moreover they offer a lot of resistance to the MVs and thus a separate track has been laid for the NMVs. The different types of markings that are used to guide the Non- Motorised Vehicles (NMV) are as follows:

- Broken Line (White)
- Solid Line (White)
- Channelizing Line
- Cycle Symbol (White)

- Cycle Box Marking (Green)
- Special Marking (Green)
- Spring Post

1) **White Broken Line:** The white broken line is marked at the center all along the cycle track to indicate two lanes. The length and width of the segment are 750mm and 100mm respectively. The centre to centre spacing between two consecutive segment markings is 2100mm.

2) **White Solid Line:** The white solid line is marked on the right edge of the left turning cycle track. It demarcates the cycle track and goes up till it intersects the wide broken line, meant for the NMVs only, coming straight through the intersection. The width of this marking is 100mm.

3) **Channelizing Line:** A tapering white solid line serves the purpose of the channelizing line. It is used on the right edge of the special green marking for the NMVs just before the intersection while exiting the cycle track and just after the intersection while entering the cycle track. It guides the cyclists to enter or exit the cycle track. The width of this marking at the tip is 100mm and the maximum width and the length depends upon the location and application.

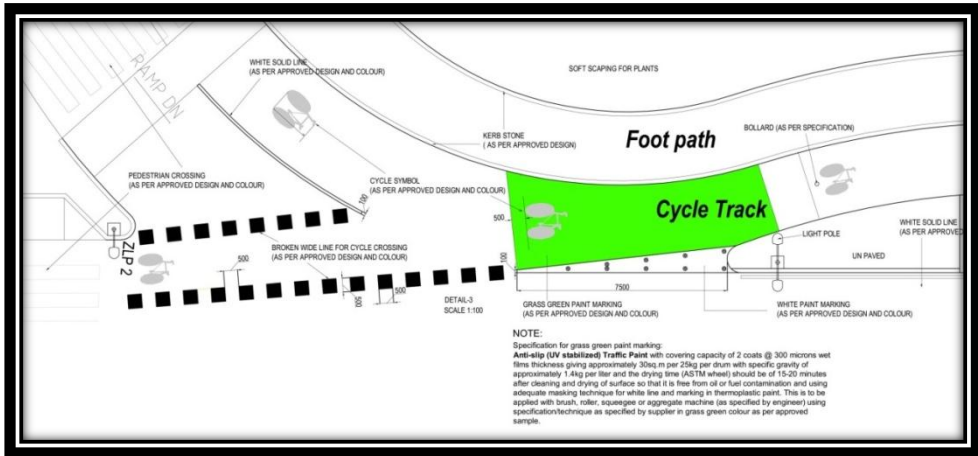


Figure 8-17 : Cycle Marking on Junctions

4) **Cycle Symbol:** Cycle symbols are marked just before the special marking, within the special markings, in between the wide broken line, on the left turning cycle track and just after the special marking after the intersection as per the approved design and color. *(For details, see Detail M in Appendix)*

5) **Special Marking:** A grass green colored special marking is present just after the stop line. The width of the marking is equal to the width of the cycle track and the length depends on the location. It is marked at the intersection before and after crossing it to prioritize the road space for the cycle users and to guide them to the cycle track. In the mid block section also this special grass green colored marking is used whenever the cycle users share the road space with the MVs.

6) **Cycle Box Marking:** Cycle Box Marking is a special marking and is also of grass green color. It is marked parallel to the pedestrian crossing on the main intersection. The length of this box covers all the MV lanes and the cycle track in width. The width of this marking is 4700mm. It is outlined by a white colored boundary of 100mm thickness. It also contains a symbol of the cycle in the center.

This cycle box gives priority to the cyclists to use this road space when the signal for turning right is red. *(For details of special marking and the cycle box marking refer to Detail M in Appendix)*

7) **Broken Wide Line:** A broken line is used to indicate the cycle crossing across the intersection. Squares of side 500mm are used to indicate the crossing. The squares are evenly spaced with a spacing of 500mm. The color of the marking is white. *(For details refer to Detail 3 of sheet 05 of Appendix)*

8) **Spring Post:** Spring posts are used on the edges of the tapering white solid line or the channelizing line at the entrance to the cycle track and just after the intersection. A single spring post is also used just before and after the intersection on the cycle track to guide the cyclists.

9) **Special Marking:** A grass green colored special marking is present after the intersection. The length of the special marking is 9.1m. On the right edge of the marking there is a white line of varying width starting with a width of 100mm at the starting point of special marking. There is a Cycle Symbol in the special marking and after the special marking as well.

8.3. MARKING: RAISED CROSSING

Raised crossing is provided at points where there are roads entering into the public property or markets from the main road. At these crossings the central part of the crossing is raised. The vehicles, which are about to cross face a ramp up and thus slow down and after crossing a down ramp is provided so as to bring the road to its normal level.

The slope provided is 1:50 for the raised crossing and it is raised in such a manner that its level is at par with the footpath and thus the footpath level need not to be changed.

There are typical markings to be provided at such a raised crossing. These are mentioned below.

- 1) Broken wide line
- 2) Cycle symbol
- 3) Yield Marking
- 4) White Solid Line
- 5) Yellow Solid Line
- 6) Spring Post

Figure 8-18 : Making at raised crossings

1) Broken Wide Line: A broken wide line is used for cycle crossing. It is marked with two lines of white squares coinciding with the outer edges of the cycle track. The side of the square box is of 500mm and the clear distance between two consecutive square markings in a line is 500mm.

2) Cycle Symbol: Cycle symbols are marked just before the ramp up and after the ramp down to make the cycle track clearly visible to road users. *(For details, see Detail M in sheet 07)*

3) Yield Marking: It is a triangular marking with equilateral triangles of side 500mm and the distance between the two nearest vertices of two consecutive triangles is 500mm. The purpose of yield marking is to indicate that the traffic towards which the vertex of the triangle points should slow down or give preference to the traffic coming from the opposite side. These are marked in white and at a distance of 500 before or after the ramp up or down respectively.

Three cases are considered for the yield marking.

Case 1: Two way movement in side road

Yield marking is to be marked for the traffic which is coming towards the raised crossing; that is, it is coming out of the side road. The traffic entering the side road doesn't face any yield marking and has to be given preference over the traffic leaving the side road.

Case 2: One way exit in service lane

The traffic exiting a service lane is entering the raised crossing area to be shared by traffic from all directions thus yield marking is used for this traffic so as to give preference to traffic entering the side road.

Case 3: One way entry in service lane:

Traffic entering a service lane doesn't have to face any yield marking as its one way and it has already crossed the raised crossing.

4) White Solid Line: The white solid line is marked at the left side of the moving traffic direction on the service lanes and on the left side of the side road for the traffic entering the raised crossing. It simply defines the edge of the road and is of 150mm in width.

5) Yellow Solid Line: The yellow solid line is used on the right side edge of the service lanes and left side for the traffic entering the side road. The width of the line is 150mm and the purpose is again to define the edge as well as to demarcate it from the footpath so as to avoid crossing it in any case.

6) Spring Post: Spring posts are used at each of the four rounded corners of the raised crossing. The base of these posts is a square of 200mm and the diameter at the bottom is 150mm.

8.4. MARKING: TYPICAL FLYOVER

Apart from markings at intersections and raised crossings there is one more important area which is of consideration and is critical from the point of view of the safety of commuters. It is a stretch from the end of the flyover up to few hundred meters where traffic is going to merge. The markings used in this critical zone are discussed below.

- 1) Special Marking
- 2) Directional Arrow
- 3) Broken White Line
- 4) Yellow Solid Line
- 5) Yellow Broken Wide Line
- 6) Barrier Line
- 7) Chevron Marking
- 8) Spring Post
- 9) Bull Nose
- 10) Rumble Strip

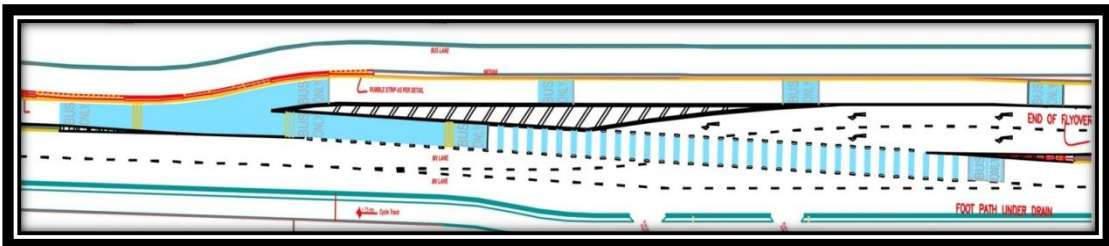


Figure 8-19 Typical Marking – weaving at the foot of the flyover

1) Special Marking: Special marking is used for the bus lane on the fly over as well as the one below which runs parallel to the fly over. It is marked with a blue color to make the bus lane clearly visible.

a) Bus lane coming from over the fly over: For the bus lane coming over the flyover the length of this special marking is 7200mm and the width is equal to the bus lane. Just before every special marking there is a 150mm thick white colored line which is known as white border line. On this special marking there is a word message “BUS ONLY” with height of each letter 2000mm (*For details refer to Detail- A of Sheet No. 04 of Appendix*). There are three such special markings before the bus lane above the flyover and the one coming from under merges into one.

b) Bus lane coming under and parallel to the fly over: It is a special marking marked with same blue color and is meant to make it clearly visible to the MVs coming over the fly over. It starts at the end of fly over and goes till it merges with the bus lane coming over flyover and becomes the central lane. It also has the word message “BUS ONLY” written over it (*For details refer to Detail-YY’ of Sheet No. 03 of Appendix*) and has a 150mm thick white colored line known as white border line to indicate the starting of special marking. It is marked so as to give priority to the buses to cross over the MV lanes coming over from the flyover and to take the center lane meant for buses only.

2) Directional Arrow: Directional arrow markings are used to give the route direction and to indicate the MV lane commuters that they have to keep left and have to take the side lanes after getting off the fly over. The dimension of this arrow marking along the length is 2400mm and the width at the tail is 300mm. The tip to tip distance between two consecutive arrows along the length is equal to 15000mm.

3) Broken White Line: White broken lines are used over the flyover to segregate the MV lanes. Similarly white broken lines are used for the

lanes running under and parallel to the flyover. This marking bifurcates just before the special marking for bus so as to segregate the bus lane from MV lanes.

4) Yellow Solid Line: Yellow solid line is used on both sides of the bus lane coming over the flyover. The purpose of it is again is to demarcate the bus lane. It is also marked on the leftmost edge of the MV lanes over the flyover. It is on both sides of the flyover hand wall and later on merges with the barrier lines.

5) Yellow Broken Wide Line: Yellow broken wide line for bus crossing is used at the edges of the special marking for the bus lane below the flyover and running parallel to it. These are marked to indicate that the bus is going to cross the MV lane to take the center bus lane. The length and width of this marking are 1000mm and 300mm respectively. The clear distance between any two markings is 2000mm.

6) Barrier Line: These are marked at the end of the flyover where kerb stone ends. These are basically the yellow solid line coming over and below the flyover and then taper down to merge into one. The width of these lines is 100mm and they run 30000mm along the traffic before merging. The width of the tip after merging is again 100mm. Catseye are fitted along these barrier lines at a regular interval of 2000mm. (*For details of catseye dimensions refer to Detail- YY' of Sheet No. 03 of Appendix*)

Barrier lines are also used to enclose the zone after the flyover where there is no traffic usually, as the weaving of MV lanes and bus lane is taking place. The width of these lines is again 100mm.

7) Chevron Marking: Chevron markings are to be marked in between the barrier lines. These markings give the visual effect of merging. The width of a chevron marking along the traffic direction is 600mm and the clear distance between two chevron markings is 2100mm.

Special kind of chevron markings (hash bars) are used for the weaving zone for bus lane and MV lanes where there would be no traffic. These are hash bars marked in this zone which is enclosed by barrier lines and are marked at 45 degrees from the barrier line. The perpendicular width of these marking is equal to 500mm and the clear distance along the movement of traffic is 3200mm.

8) Spring Post: Spring posts are placed at the end of the fly over to physically segregate the bus lane from the MV lane. These are also to be used before the physically segregated bus lane starts after the weaving zone. The first bollard to be installed at around 30000mm before the kerb stone used for physical segregation of bus lane.

9) Bull Nose: The Bull Nose marking starts 2000mm after the kerb stone and is marked between the barrier lines. The length and width of Bull Nose marking are 1000mm and 600mm respectively. The centre to centre distance between two Bull Nose markings is 2500mm and the Bull Nose markings end at a distance of 5500mm from the kerb stone.

10) Rumble Strip: Rumble strips are used on the special marking for the bus lane coming under the flyover. The first series of rumble strips comes 1000mm beyond the second last word marking. These are a series of 3 parallel lines each of 125mm width and separated by a distance of 600mm. The distance between rumble strips in transverse direction is 600mm. The second set of rumble strips appears just before the final merging of the two bus lanes take place (*See Detail-C on Sheet No. 5 of*

Appendix). The rumble strips generate a vibration when the bus goes over it and thus gives an indication that very soon the two bus lanes are going to merge into one.

The rumble strips are also present on the right edge of the bus lane coming over the fly over just before the merging and then it becomes continuous once the bus lane is physically segregated.

9. OBJECT MARKINGS

Physical obstructions within the roads or near the roads constitute a serious hazard and shall be marked for the safety of each road user.

Typical obstruction of this type are underpasses, piers and abutments , monuments traffic islands, median channeliser ends , signs , signal supports , post of narrow bridges , subway piers and abutments , culvert head walls, poles, trees and structures having restricted vertical clearances¹⁴ .

Obstructions are marked with not less than 5 stripes of black and yellow color, with an angle of 45 towards the side of the obstruction on which the traffic passes. , with the minimum width of 100 mm. on the vertical clearances the paint markings are placed on the independent surface mounted in front of the object.

¹⁴ Ref IRC: 35-1997, para 13.1.1, page no 51

Kerbs of all islands adjacent to the carriageway shall be painted with black and white stripes of 500 mm wide or chequered black and white design.

10. TOLERANCES¹⁵

Maximum projections above the level of the carriageway surface for markings is prescribed as minimum of 6mm and the maximum of 25 mm (rumble strips etc).

Prescribed tolerances for markings:

Specified dimensions	Tolerances
For 3 m and more	±5%
For 0.3 m to 3 m	±10%
Less than 0.3 m	-10 % to + 10 %

11. MAINTENANCE¹⁶

Markings are the integral part of the road design and so it shall be maintained in accordance with the other road elements.

¹⁵ Ref IRC: 35-1997, page 55, para 14.1 and 14.2

¹⁶ Ref IRC: 35-1997, page 55, section 15

All the markings shall be maintained in effective conditions; also the markings which are not properly visible shall be removed immediately.

Permanent markings should be made obligatory under the terms of contract for road works.

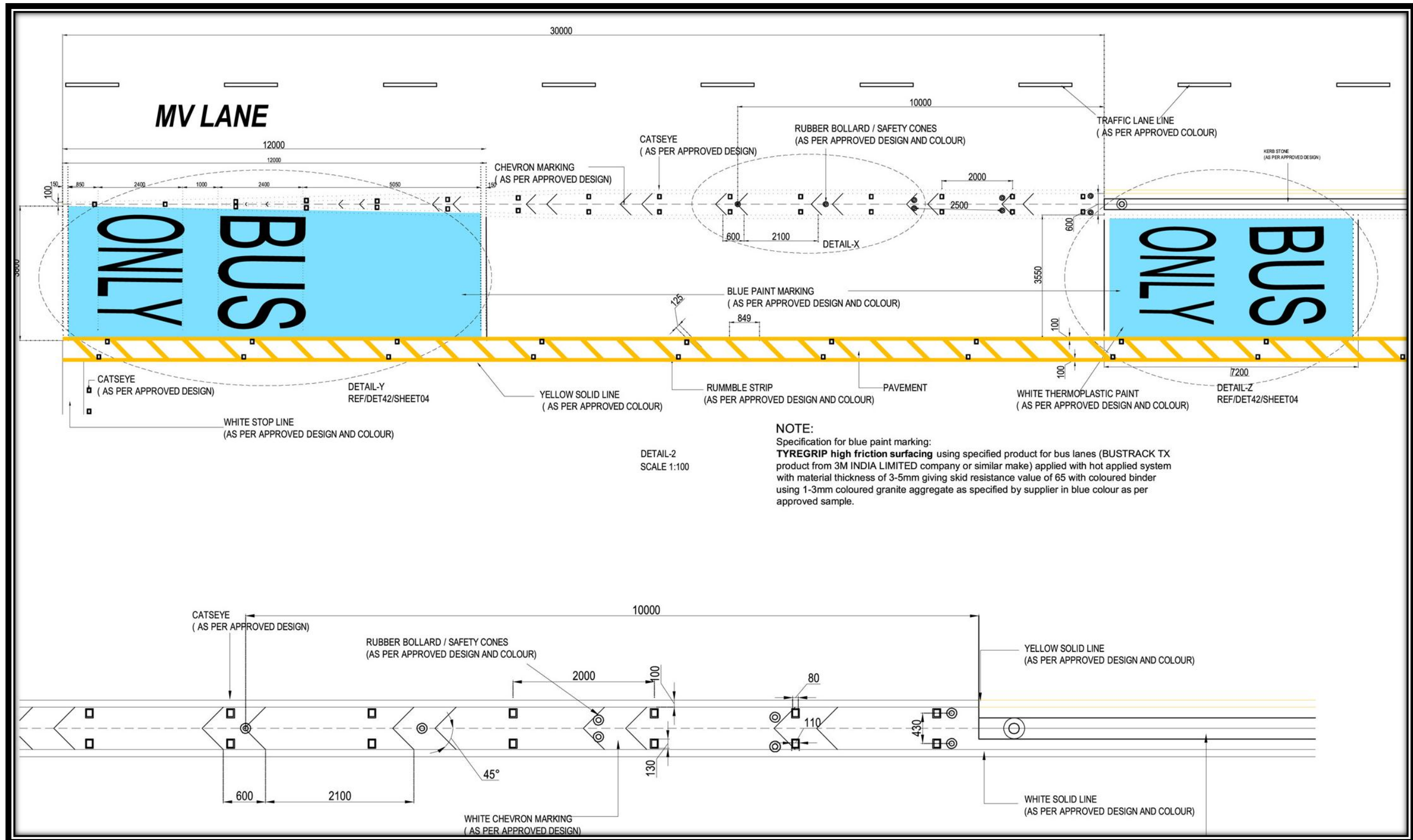


Figure 12-2 Plate B

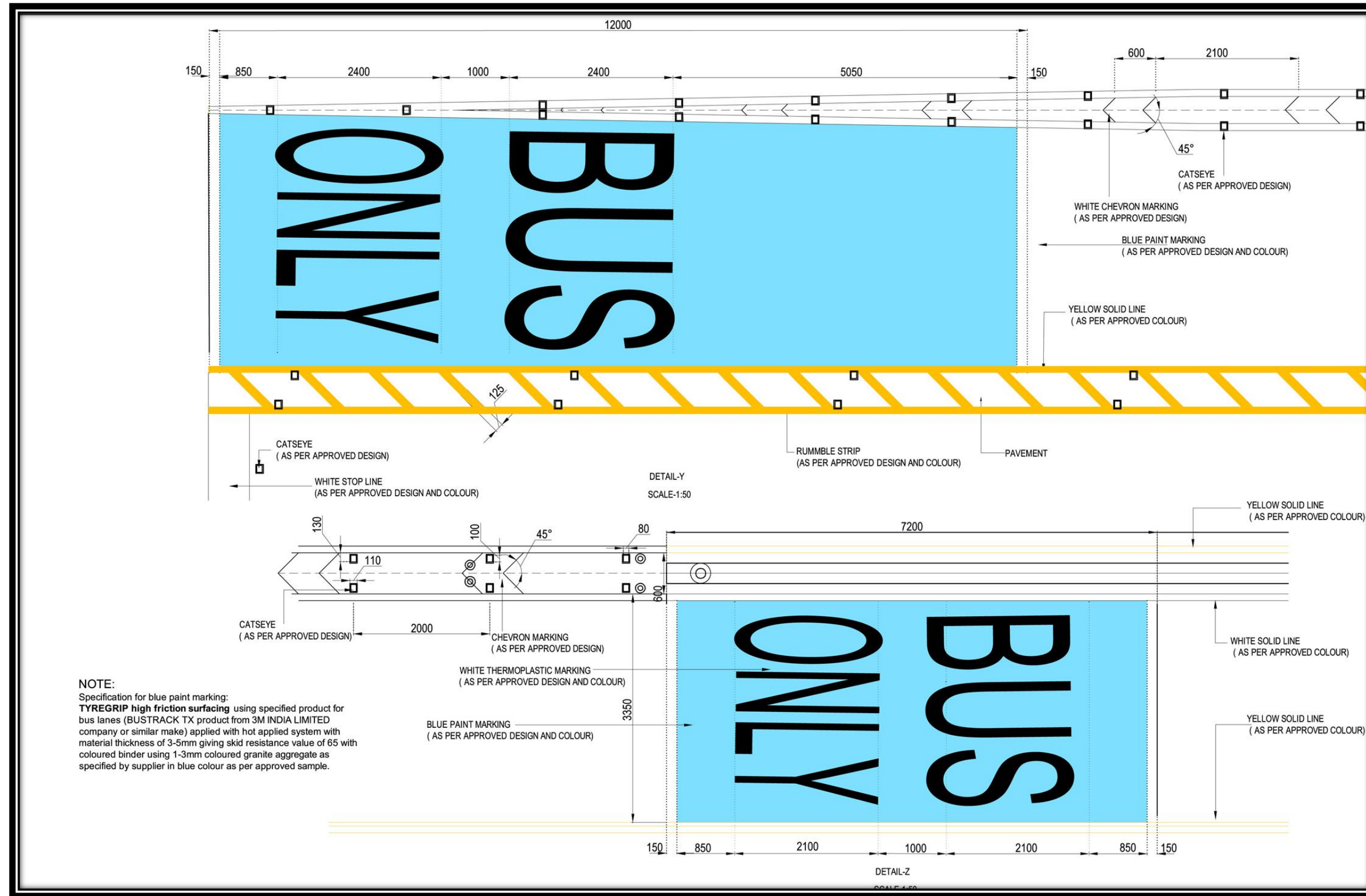


Plate C

Figure 12-3 Plate C

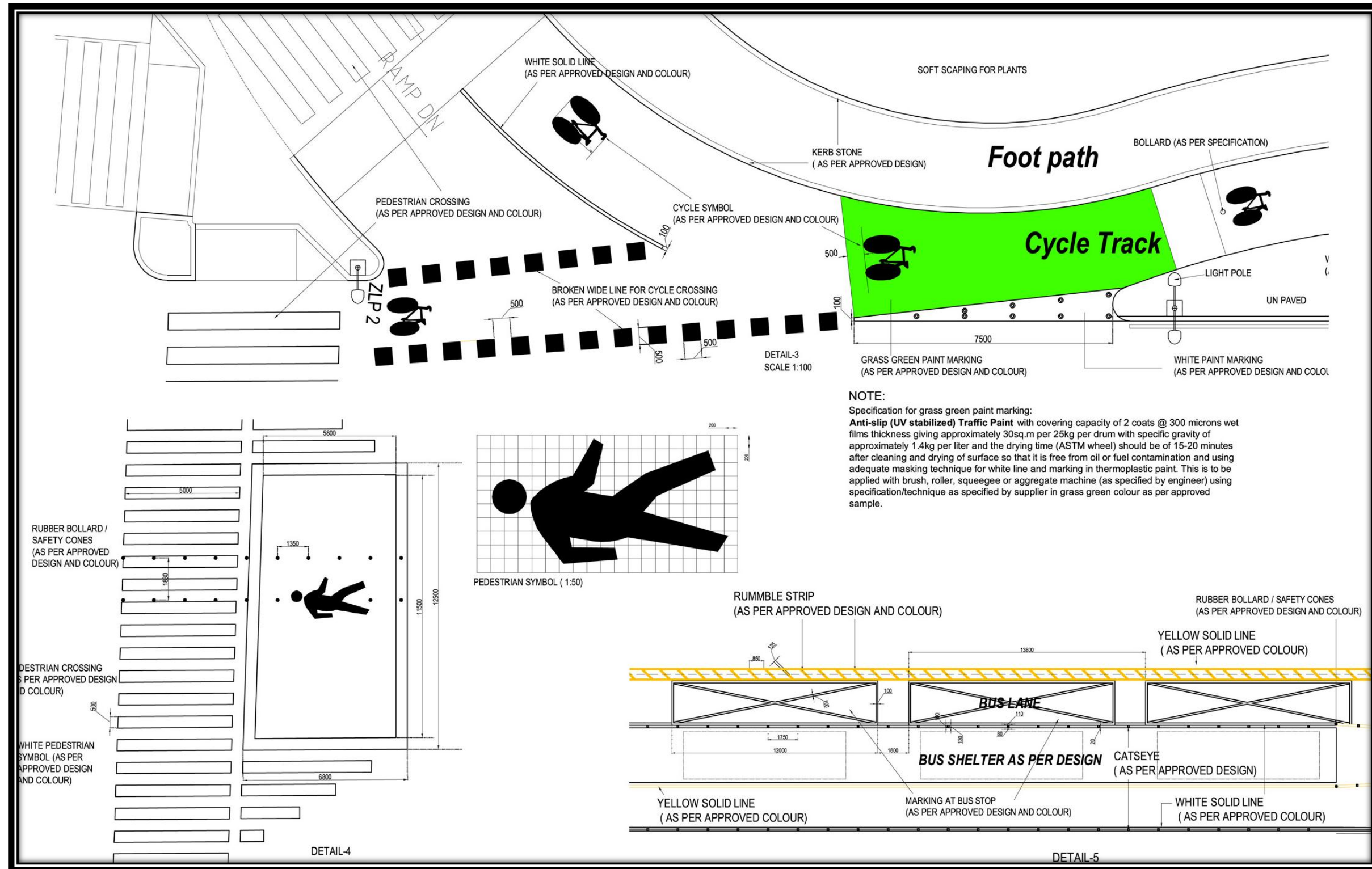


Figure 12-4 Plate D

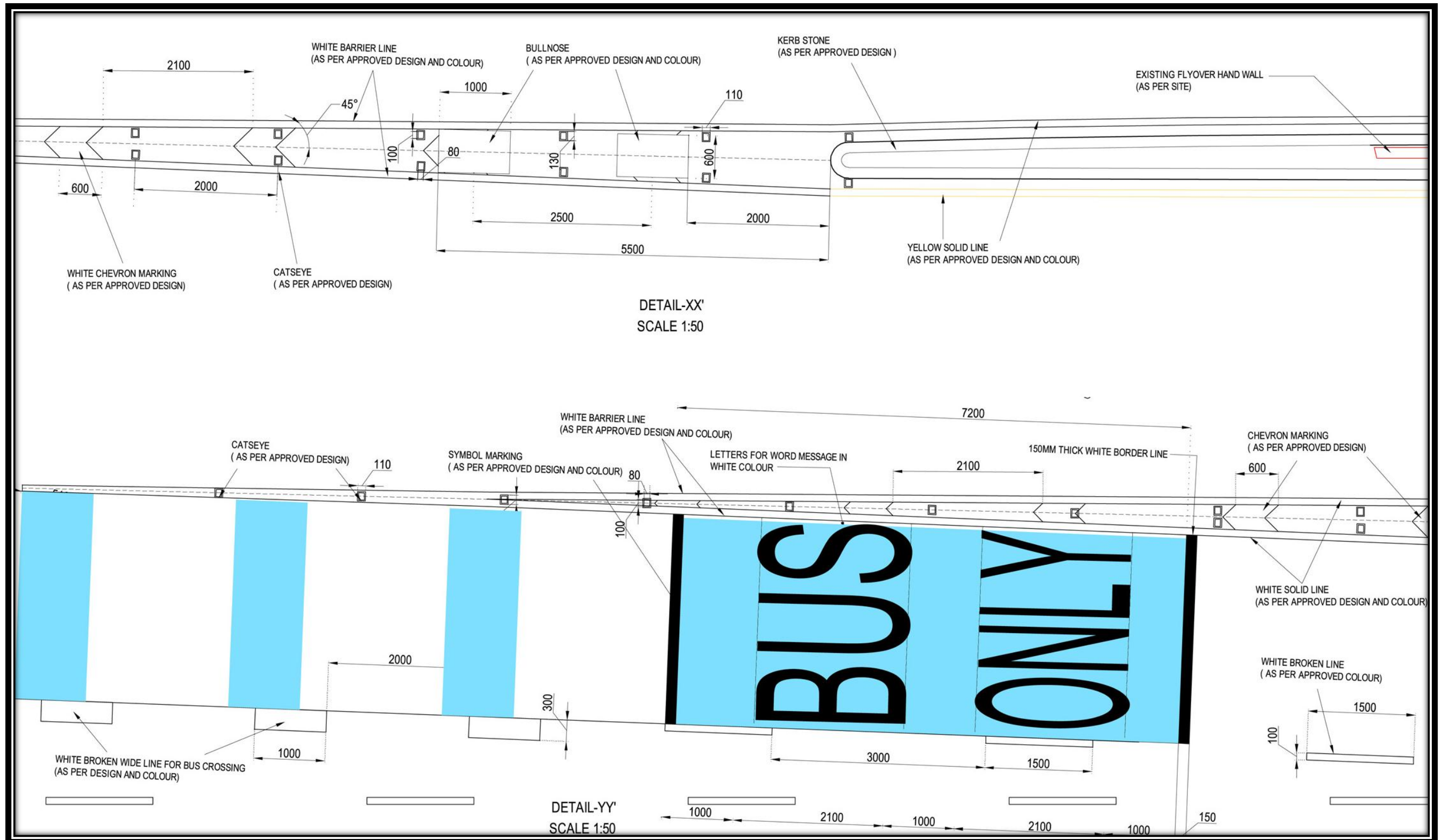


Figure 12-6 Plate F

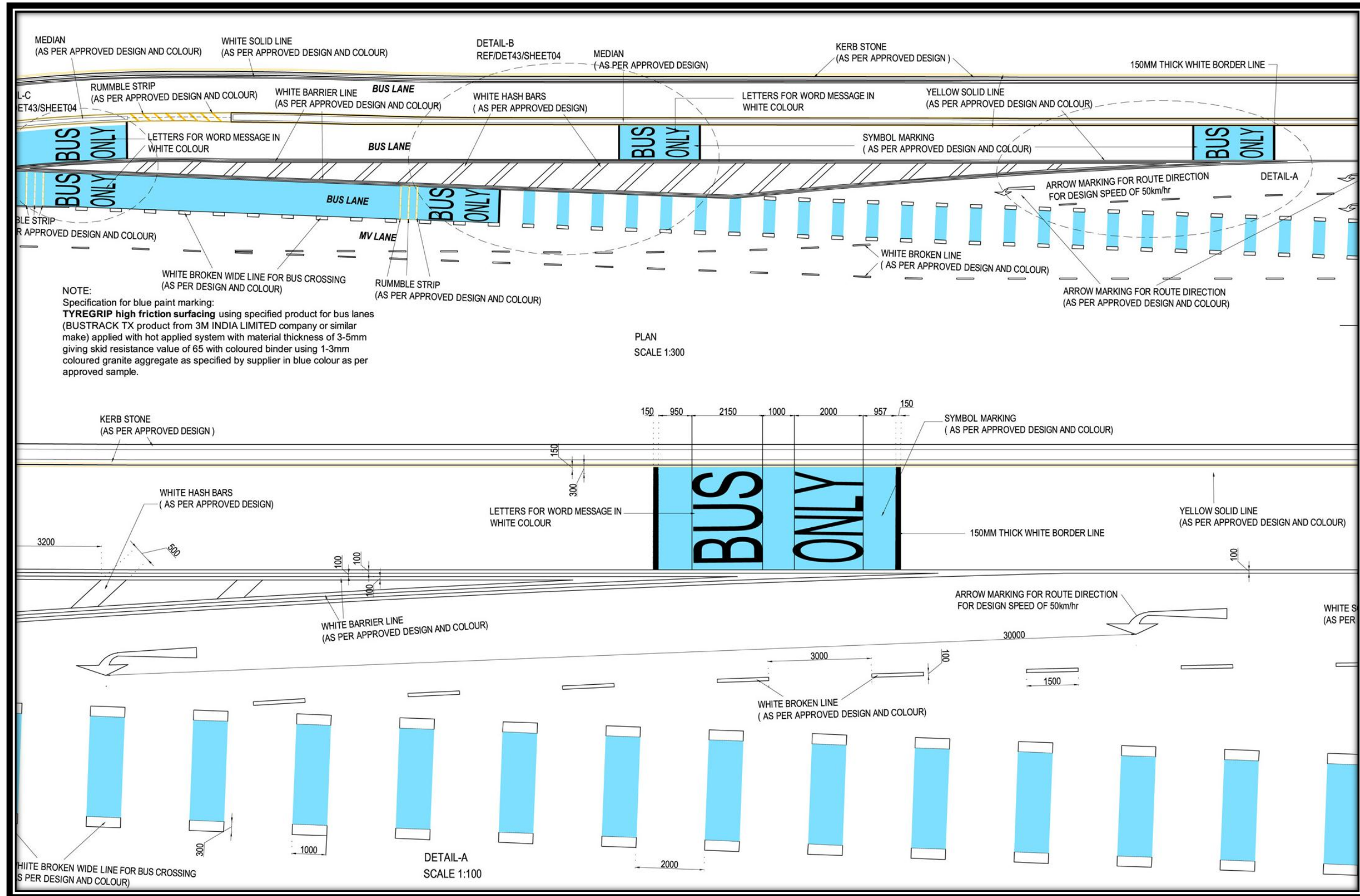


Figure 12-7 Plate G

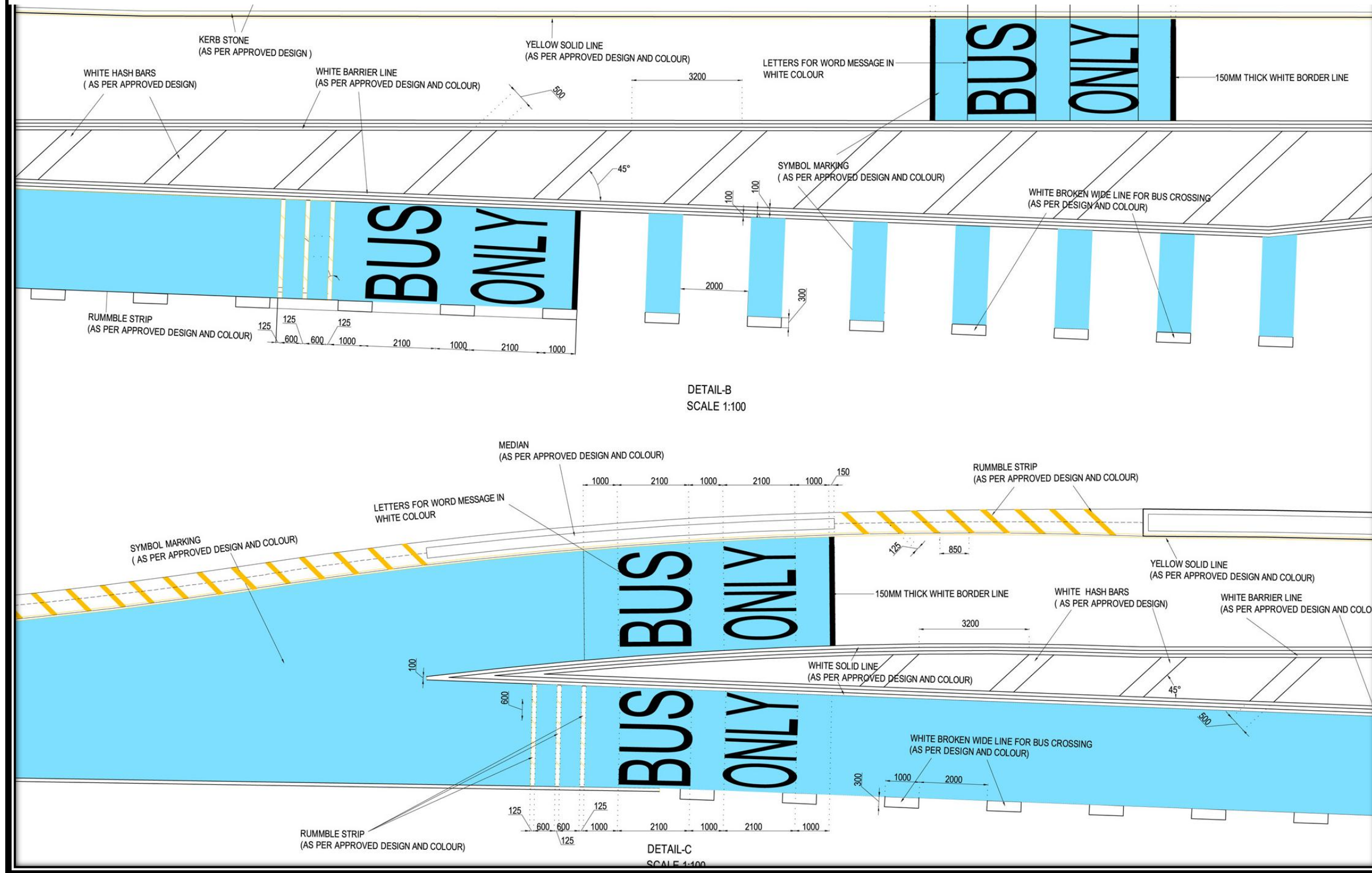


Figure 12-8 Plate H

Plate H



Figure 12-9 Plate I

Plate I