GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

2024/Proj./CMRL/SoD/PH-II/30/98 New Delhi, dated 13.05.2025

Managing Director,
Chennai Metro Rail Limited (CMRL)
No.327, Anna Salai, Nandanam,
Chennai-600 035, Tamil Nadu.

Sub: Approval of Schedule of Dimensions (SoD) for Standard Gauge (1435 mm) for Chennai Metro Phase 2 project of Chennai Metro Rail Limited (CMRL)

Ref: (i) SoD document uploaded on RDSO's online portal by CMRL on 28.10.2024 along with compliance
(ii) CMRL letter no. CMRL/PHASE II/RDSO/SOD dated 02.04.2025
(iii) RDSO's letter no. UT/38/CMRL/Civil dated 18.03.2025

The Schedule of Dimensions (SoD) for Standard Gauge (1435 mm) for Chennai Metro Phase 2 project of Chennai Metro Rail Limited (CMRL) has been examined in consultation with RDSO and approval of Railway Board is hereby conveyed for the same.

Accordingly, approved copy of SoD is enclosed.

Encl: As above

13.05.25

(F. A. Ahmad)
Director/Gati Shakti (Civil)-IV
Railway Board
Ph: 011-47845480
Email: **dirgsc4@gmail.com**

Copy to:

1. **Executive Director/UTHS**, RDSO, Manak Nagar, Lucknow w.r.t letter No.UT/CMRL/CMRL/P02/072023 dated 11.11.2024
2. **OSD/UT & Ex-Officio Joint Secretary**, Ministry of Housing & Urban Affairs (MoHUA), Nirman Bhavan, New Delhi-110011

CHENNAI METRO RAIL LIMITED

SCHEDULE OF DIMENSIONS
FOR
STANDARD GAUGE

(1435 mm)

CMRL PHASE 2 PROJECT

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

13/5/25

S. ASHOK KUMAR, IRSE
Chief General Manager
(Viaduct & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai
Nandanam, Chennai - 600035

DOCUMENT VERIFICATION AND REVISION RECORD

PROJECT NAME	Chennai Metro Rail Project Phase – 2		
DOC/ NO.	P2C0000PRW000-0GC1-ENGERT-00001	DATE OF ISSUE	10-10-2024
DOC/ TITLE	Schedule of Dimensions for Standard Gauge (1435 mm)		

REV. No.	DATEOF ISSUE/REV.	DESCRIPTION	PREPARED / DESIGNED	CHECKED	APPROVED
A1	25-04-2021	Submission for review	Dr. Selva	Mahatma	Tony
A2	13-07-2021	Submission for Review	Dr. Selva	Mahatma	Tony
A3	17-07-2021	Submission for Review	Dr. Selva	Mahatma	Tony
A4	14-09-2021	Submission for Review	Dr. Selva	Mahatma	Tony
A5	23-Oct-2021	Submission for Review	Dr. Selva	Mahatma	Tony
A6	14-Sep-2022	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
A7	29-Nov-2022	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
A8	13-Dec-2022	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
A9	16-Feb-2023	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
A10	08-Sep-2023	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
A11	31-Oct-2023	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
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A13	30-Jul-2024	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian
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A15	10-Oct-2024	Submission for Review	Suresh D/ Selvakumar	Dr. Selva	Ian

Revision History

REV. No.	Highlight of changes	Revision History
A2	Underline	CMRL/ DDC/GC comments updated
A3	Underline	Internal GC review comments updated
A4	Underline	CMRL Comments/SOD amendments / Highlighted changes from approved SOD
A5	Underline	CMRL comments/update from DMRC SOD
A6	Underline	CMRL/GC comments/update from DMRC SOD
A7	Underline	CMRL/GC comments/update from DMRC SOD
A8	Underline	CMRL/GC comments/update from DMRC SOD
A9	Underline	CMRL/GC comments/update from RDSO Guidelines for framing SOD
A10	Underline	RDSO Comments updated
A11	Underline	RDSO Comments updated

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Kona Salai,
Mandaveli, Chennai - 600028

Approved
13/5/23

A12	Underline	RDSO Comments updated
A13	Underline	RDSO Comments updated
A14	Underline	RDSO Comments updated
A15	Underline	RDSO Comments updated

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Project Directorate Approved on 13/5/25

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Annex Salai
Nandanam, Chennai - 600035

APPENDIX

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai
Nandanam, Chennai 600035

Project Directorate Approved on 13/5/25 Railway Board

LIST OF DRAWINGS
25 KV AC OHE TRACTION SYSTEM

PREAMBLE

The Schedule of Dimensions (SOD) has been prepared for the Chennai Metro Rail project-Phase 2 having Standard Gauge Track(1435mm), with OHE and Front evacuation.

This SOD has been prepared based on the following guiding factors:

1. The SOD has been developed assuming certain coach dimensions and design characteristics as well as track and coach maintenance tolerance. Whenever, new Rolling Stock is introduced the track and coach tolerance for maintenance should be laid down. The suitability of Rolling Stock for operation with these maintenance tolerances should be established and sanction shall be obtained from the competent authority before operation of the Rolling Stock commences.

2. The Kinematic Envelope has been developed for 2900mm wide and 3900 mm to 4048 mm high Rolling Stock and the max height of Kinematic Envelope is defined as 4200 mm.

3. The clearances are based on the assumption that windows are sealed, and doors are closed during movement/operation of Rolling Stock.

4. Track and Rolling Stock shall be maintained to the tolerances that were considered for the calculation of the kinematic envelope.

5. The Structure Gauge indicated in SOD shall not be violated under any circumstances except for platform coping, platform screen doors/gates, hand railing in back of house of platform edge, track access gates. The Kinematic Envelope of Rolling Stock should not infringe under any circumstance. Any infringement to SOD should be condoned by Railway Board.

6. The vehicle Kinematic Envelope has been calculated assuming a cross wind speed of 70 Kmph for the platform areas of At-Grade and, Elevated stations. At all other At-Grade and Elevated locations (e.g. outside of stations), the Kinematic Envelope was calculated assuming a cross wind speed of 100 Kmph.

7. At all underground sections (including stations) the Kinematic Envelope was calculated assuming a cross wind speed of 0 Kmph.

8. The Kinematic Envelope has been developed taking into account all Track defects and Rolling Stock defects within the tolerances.

9. The speed of trains at platform on Elevated or At Grade Station shall be restricted to 40 Kmph when wind speed is more than 70 KMPH but less than 90 KMPH. Metro operations shall cease when the wind speed reaches 90 KMPH or more. Continuous recording of wind speed shall be done at critical locations defined by the Metro Administration.

10. The Maximum Design Speed is 90 Kmph, however, the Operating Speed shall be limited to 80 Kmph (Except for stations where the Operating Speed is 55 kmph). The Operating speed in depots shall be 25 Kmph. The maximum speed potential on diverging lines at turnouts having:

   (i) Weldable CMS crossing (1 in 9) and thick web switch with 300 m radius of lead curve rail shall be 45Kmph.

(ii) Weldable CMS crossing (1 in 9) and thick web switch with 190 m radius of lead curve rail shall be 35Kmph.

(iii) Weldable CMS crossing (1 in 7) and thick web switch with 190 m radius of lead curve rail shall be 35Kmph.

(iv) Weldable CMS crossing (1 in 7) and thick web switch with 140 m radius of lead curve rail shall be 25Kmph.

11. No work/workmen/equipment is allowed between vehicle and Structure gauge during operation of trains.

12. The Fitness of OHE Installation must meet the requirements of the Rolling Stock at its Design Speed. Electrical Clearances should be measured from the Kinematic Envelope drawn at Design speed of Rolling Stock.

13. The train operation will be stopped in affected section by Central Control if any one of the Train in UP or DN direction derails. The operation will remain suspended till the clearance given by Accident Site Manager from the site by exchange of private number with Central Control.

14. The clearance between S&T gear and Structure Gauge should always be kept not less than 25 mm.

15. The front-end evacuation comprises of an on-train detrainment door which deploys a ramp to the 4 foot zone of the track. The minimum width of the ramp is 700mm and the door has a minimum headroom of 1900mm. The minimum clear width of the pathway (within the 4 foot zone) is 610mm.

16. The Regional wind speed as per IS 875 is 50 m/sec and the same was considered for CMRL Phase 2 Project OHE Design.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approval on
13/5/25
Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tunnels & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Annex Nolan,
Nandanam, Chennai- 600035

CHENNAI METRO RAIL LIMITED

SCHEDULE OF DIMENSIONS

STANDARD GAUGE (1435mm)

(For 2900 wide stock)

INTRODUCTION

The dimension given in this Schedule of Dimensions are to be observed in all works on 1435mm, Standard Gauge, and 2900 mm wide Rolling Stock, unless prior sanction has been obtained from the Railway Board through the Commissioner of Metro Railway safety to execute works which infringe this Schedule of Dimensions.

This Schedule of Dimensions is applicable to Under Ground, Elevated and At-Grade sections of Chennai Metro Rail Limited Project-Phase 2 which shall be with 25 kV AC Traction system and Over Head current collection. The Rolling Stock shall be 2900 mm wide with sealed windows and doors closed while in motion.

The Under Ground system may be with a Circular Tunnel or Rectangular Box or of any other suitable shape while Elevated system may be with suitable Over Ground Structures such as Viaducts. Both, Under Ground and Elevated systems shall have suitably designed Ballastless track. For depot, the track may be ballasted/ ballastless.

The schedule of Dimensions (SOD) has been divided into five chapters as under:

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S, Anna Salai,
Nandanam, Chennai - 600035

Approved
13/5/25

CHAPTER – 1

GENERAL

1.1 SPACING OF TRACKS

1.1.1 Minimum distance, centre to centre of tracks without any structure between tracks for tangent (straight) track for:

(a) Under Ground Sections : 3600 mm

(b) Elevated Sections : 3650 mm

(c) At-Grade Sections : 3650 mm

Note: See Appendix-1 for minimum track centres on curves.

1.2 CURVES

1.2.1 Minimum radius of curves(horizontal)

(a) On main running lines

i) Under Ground Sections : 200 m

ii) Elevated and At-Grade Sections :120 m

(b) Depot and other non-passenger Lines :100 m

(c) At passenger platforms :1000 m

1.2.2 Minimum Transition length (horizontal)

(a) On main running lines

i) Under Ground Sections : 15 m

ii) Elevated and At-Grade Sections :15 m

iii) The Minimum transition length inside Platform : 15 m

1.2.3 Minimum length of alignment elements(horizontal)

The Minimum length of alignment elements (circular curves and straights) between two transition curves should be 20 m.

1.2.4 Check Rail/Restraining Rail:

(a) Check rail/Restraining Rail shall be provided on curves on main line where radius is 190 m or less. Check rail/Restraining Rail shall not be mandatory for curves in depots, yards and non-passenger lines where speed is less than 25Kmph.

(b) The clearance between check/restraining rail and running rail shall be suitably decided by metro depending upon study of track vehicle interaction.

Minimum radius of vertical curve: 1500 m

Minimum length of vertical curve: 20 m

(To keep vertical acceleration in range of 0.3 to 0.45 m/s^2)

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Examined and found in order
Pradeep Kr. Mishra
ADGM.T./DIVIL
R.D.S.O. (Ministry of Railways)

S. ASHOK KUMAR, IRSE
Chief Comms Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai
Nandanam, Chennai 600035

1.2.5 Cant and Cant Deficiency (suggested values)

Criteria	SG (1435 mm)
Maximum Cant Gradient	1 in 440
Maximum Cant on curves	110 mm (Desirable)
Maximum Cant on curves	125 mm (Exceptional)
Maximum Cant Deficiency	85 mm (Desirable)
Maximum Cant Deficiency	100 mm (Exceptional)
Desirable rate of change of Cant	40 mm/ sec
Desirable rate of change of Cant deficiency	40 mm/ sec
Maximum Lateral acceleration	0.55 m/sec^2

1.3 GRADIENTS

1.3.1 The maximum grade (compensated) shall be 4%.

Note- (i) There will be no change of gradient in transition portion of curves.

(ii) The gradient will be compensated for curvature at the rate of 0.04% per degree of curve.

1.4 BUILDINGS AND STRUCTURES

1.4.1 Minimum horizontal distance from centre of track to any structure (except a passenger platform) for heights above rail level on level / constant grade tangent track shall be as under:

(a) Under Ground Sections

(i) Circular tunnels

S.N.	Height from rail level	Horizontal distance from C.L. of track
(i)	Rail level to 65mm	Up to 1465 mm
(ii)	65 mm to 200 mm	1465 mm increasing to 1585 mm
(iii)	200 mm to 305 mm	1585 mm
(iv)	305 mm to 940 mm	1585 mm increasing to 1670 mm
(v)	940 mm to 1095 mm	1670 mm increasing to 1675 mm
(vi)	1095 mm to 3305 mm	1675 mm increasing to 1740 mm
(vii)	3305 mm to 3965 mm	1740 mm decreasing to 1250 mm
(viii)	3965 mm to 4775 mm	1250 mm
(ix)	4775 mm to 4920 mm	1250 mm decreasing to zero along an arc of circle of radius of 2900

Also refer to Drawing No. CMSG-2(TNL)

(ii) Rectangular Box Tunnels

S.N.	Height from rail level	Horizontal distance from C.L. of track
(i)	Rail Level to 65 mm	Up to 1465 mm
(ii)	65 mm to 200 mm	1465 mm increasing to 1585 mm
(iii)	200 mm to 305 mm	1585 mm
(iv)	305 mm to 940 mm	1585 mm increasing to 1670 mm
(v)	940 mm to 1095 mm	1670 mm increasing to 1675 mm
(vi)	1095 mm to 3305 mm	1675 mm increasing to 1740 mm
(vii)	3305 mm to 3965 mm	1740 mm decreasing to 1250 mm
(viii)	3965 mm to 4838 mm	1250 mm

Also refer to Drawing No. CMSG-2(TNL)

(b) Elevated and At-Grade Sections

S.N.	Height from rail level	Horizontal distance from C.L. of track
(i)	Rail Level to 65 mm	Up to 1465 mm
(ii)	65 mm to 200 mm	1465 mm increasing to 1640 mm
(iii)	200 mm to 305 mm	1640 mm
(iv)	305 mm to 930 mm	1640 mm increasing to 1735 mm
(v)	930 mm to 1095 mm	1735 mm increasing to 1740 mm
(vi)	1095 mm to 3310 mm	1740 mm increasing to 1825 mm
(vii)	3310 mm to 3775 mm	1825 mm decreasing to 1546 mm
(viii)	3775 mm to 6250 mm	1546 mm

Also refer to Drawing No. CMSG-2

Notes for (a) and (b) above:

i) Extra allowance shall be provided for curves as laid down at para 1.7

ii) The term 'structure' covers any item including light ones like ladders, isolated posts, cable etc., erected alongside the track.

iii) Minimum lateral clearance for OHE masts for tangent track at-grade and elevated station shall be 2150mm from centre line of nearest track.

iv) Minimum lateral clearance for OHE masts for tangent track at depot shall be 1950mm from centre line of nearest track.

v) For passenger platform refer to para 2.2.1 to 2.2.3 of chapter 2.

1.4.2 Minimum vertical clearance from rail level to bottom of following structures

i) Light overhead structures such as Foot over bridges on Open : 5750 mm

ii) Light overhead structures such as Foot over bridges on Depot : 5820 mm

iii) Heavy overhead structures, such as Road over Bridges & Flyovers : 5750 mm

Notes:

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1. In areas where 25kv A.C traction is used, if any turnout or crossover is located under a heavy overhead structure or within 40m from its nearest face, irrespective of the position of the level crossing gate, the minimum overhead structure shall be 5750mm. In case the turnout is beyond 40m; but the level crossing gate is within 520m from the nearest face of the bridge, the height of such overhead structure shall be 5750mm.
2. The height mentioned against items i,ii,iii above shall be measured from the higher or super-elevated rail.

1.5 KINEMATIC ENVELOPE

The maximum limit of Kinematic Envelope allowed for Rolling Stock (for level or constant grade tangent track is defined in the following drawings:

i) Drawing No. CMSG-1 for - Kinematic Envelope for 90kmph –Through & Semi through Girder Bridges At Grade, Elevated Sections on level (or constant grade) tangent track.

ii) Drawing No. CMSG-1(TNL) for - Kinematic Envelope for 90 kmph–Underground Sections on level (or constant grade) tangent track

iii) Drawing No CMSG-1A for Kinematic Envelope for 65 kmph – At Grade and Elevated Stations on level (or constant grade) tangent track.

iv) Drawing No. CMSG-1A(TNL) for - Kinematic Enveiope for 65 kmph – Underground Stations on level (or constant grade) tangent track.

1.6 STRUCTURE GAUGE

1.6.1 Under Ground Sections

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing a minimum clearance of 100 mm to the derived Kinematic Envelope and minimum electrical clearance of 270mm from 25 kV live parts conforming to the stipulation in chapter – 4 of this SOD.

Refer to Drawing No. CMSG-2(TNL) for Structure Gauge for Outside station on level or constant grade tangent track.

Note:

Extra allowance shall be provided for curves as laid down at para 1.7.

1.6.2 Elevated Sections

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing minimum clearance of 150 mm to the derived Kinematic Envelope and minimum electrical clearance of 320 mm from 25 kV live parts conforming to the stipulations in chapter – 4 of this SOD.

Refer to Drawing No. CMSG-2, for Structure Gauge for outside stations on level or constant grade tangent track.

Note:

Extra allowance shall be provided for curves as laid down at para 1.7

1.6.3 At-Grade Sections

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing minimum clearance of 150 mm to the derived Kinematic Envelope and minimum electrical clearance of 320mm from 25kV live parts, conforming to stipulations in chapter 4 of this SOD.

Refer to Drawing No. CMSG-2 for Structure Gauge for outside stations on level or constant grade tangent track.

Note:

Extra allowance shall be provided for curves as laid down in para 1.7

1.7 EXTRA CLEARANCE ON CURVES

Following are the extra allowances considered for curves.

Abbreviations used in para 1.7

C is the distance between centres of bogies in metres

C1 is the car (Vehicle) length in metres

R is the radius of curve in metres

Ca is the Cant applied in mm

h is the height from rail level in mm and

g is the distance between centres of rails in mm

1.7.1 Inside of Curve

(A) Curvature effect

(a) Mid throw at the centre of the vehicle = V (in mm) = $125xC^2/R$

(b) Allowance due to gauge widening on curves

For values of items (i) and (ii) above, refer to Appendix-2A

Note:

Lateral shift of 26mm due to nosing is included in Kinematic Envelope for tangent track (and as a result, included in Structure Gauge also) shall be subtracted from the total extra allowance worked out as at para 1.7.1(A)-i and ii above for inside of a curve in case the value of mid throw (V) is equal to or greater than 26mm. In case the value of mid throw (V) is less than 26mm, the curvature effect shall be due to widening of the gauge only. (The Mid throw minus 26mm shall be taken as zero). Refer to Appendix-2.

(B) Allowance for super elevation

(a) Under Ground (Box Structures), Elevated and At-Grade Sections

The lean 'L' due to Cant at any point at height 'h' above rail level is given by:

L= Ca x h/g(all in mm)

Project Directorate Approved on 13/5/25 Railway Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Nagar,
Nandanam, Chennai - 600035

For values of Structure Gauge (E1) for inside of a curve with cant effect only, (as shown in Drawing No. CMSG-4) refer to:

(i) Appendix -3 (TNL) for Under Ground Sections

(ii) Appendix-3 for At-Grade and Elevated Sections

(b) Circular Tunnels

In the case of Circular Tunnel, the cant is provided by raising the outer rail and suitably shifting the centre of the Circular Tunnel towards inside of curve and upwards. This has same effect as assuming rotation of the Circular Tunnel about midpoint of top of inner rail resulting in shift of Tunnel centre laterally towards inside of curve and also vertically upwards.

The Rigid OCS (if applicable) shall also be rotated with the tunnel so as to be along the centre line of canted track.

For values of horizontal and vertical shifts of centre of Circular Tunnel for different values of cant, refer to Appendix-4 and Drawing No. CMSG-3.

(C) Allowance for vertical curve (vertical throw)

Vertical throw V1 and V2 (in mm) for vertical curve shall be calculated as under:

V1 (with vertical centre in sag or vehicle end on summit) = $125 \times C^2/R$

V2 (with vehicle centre on summit or vehicle end in sag) = $125 \times C1^2/R)-(125 \times C^2/R)$

Values of vertical throw due to vertical curves of different radii are given in Drawing No. CMSG5

1.7.2 OUTSIDE OF CURVE

(A) Curvature effect

i) End throw at the end of vehicle = Vo (in mm)

$= (125 \times C1^2/R)-(125 \times C^2/R)$

ii) Allowance due to gauge widening on curves.

iii) Additional nosing due to gauge widening on curves.

The values of items (i) and (iii) are shown in Appendix -2B.

(B) Allowance for super elevation.

(a) Under Ground (Box Structures), Elevated and At-Grade Sections

The lean 'L' due to Cant at any point at height 'h' above rail level is given by:

L = (-) Ca x h/g (all in mm)

-ve sign indicates relief due to cant or reduction in clearance required.

Note:

Full relief for lean due to cant (Ca) is to be taken into account only for calculation of track spacing without any structure between tracks. In case there is a structure adjacent to track, relief for lean is to be taken into account only if the cant provided is greater than 50mm and shall be limited to a value = (Ca-50) x h/g.

Values of Structure Gauge (F1) on outside of curve with cant effect only (as shown in Drawing No. CMSG-4), refer to:

i) Appendix 3 (TNL) for Under Ground Sections (Rectangular Box)

ii) Appendix 3 for Elevated and At-Grade Sections

(b) Circular Tunnels

In the case of Circular Tunnel, the cant is provided by raising the outer rail and suitably shifting the centre of the Circular Tunnel towards inside of curve and upwards. This has same effect as assuming rotation of the Circular Tunnel about mid point of top of inner rail resulting in shift of Tunnel centre laterally towards inside of curve and also vertically upwards.

The Rigid OCS (if applicable) shall also be rotated with the tunnel so as to be along the centre line of canted track.

For the values of horizontal and vertical shifts of centre of Circular Tunnel for different values of cant, refer to Appendix-4 and Drawing No. CMSG-3 .

(C) Allowance for vertical curve (vertical throw)

The provision at para 1.7.1 (C) above shall be applicable in this case also.

1.8 MINIMUM TRACK SPACING ON CURVES

Under Ground, Elevated and At-Grade Sections

The worst case will be when the end of a bogie carriage on the inner track is opposite to the centre of a similar carriage on the outer track.

1.8.1 Without any structure between tracks

The minimum track spacing on curves without any structure between tracks shall be the sum of the following:

a) (E +F),

b) T_1(Extra lateral clearance due to curvature on inside of curve),

c) T_2(Extra lateral clearance due to curvature on outside of curve),

d) Minimum clearance between adjacent Kinematic Envelope stipulated is as under:

i) 300 mm for Under-Ground Sections

ii) 300 mm for Elevated and At-Grade Sections.

Where,

'E' is the distance from vertical axis of centre line of canted track to canted Kinematic Envelope on inside of curve at a height 'h' (from rail level) for a given cant (Drawing No. CMSG-4A) and,

'F' is the distance from vertical axis of centre line of canted track to canted Kinematic Envelope on outside of curve at a height 'h' (from rail level) for a given cant (Drawing No. CMSG-4A).

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

S. ASHOK KUMAR
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
MRTS O.S. Anna Salai,
Nandanam, Chennai - 600035

Project Directorate
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13/5/25
Railway Board

Notes:

i) The value of 'F', calculated from the formula at Drawing No. CMSG-4A includes full relief due to cant.

ii) The sum of 'E' and 'F' for same height (which are with cant effect only), shall be the maximum of values calculated for various heights from rail level.

For values of E, F, T_1 and T_2, refer to the Appendices as shown below:

SECTIONS	For E & F	For T_1&T_2
i) Under Ground	3A (TNL)	2A & 2B
ii) Elevated and At-Grade	3A	2A & 2B

1.8.2 With a structure between adjacent tracks

The minimum track spacing on curves with a structure between tracks shall be the sum of the following:

a) (E_1+T_1) Minimum clearance to the structure from centre line of track on inside of curve (for outer track),

b) (F_1+T_2) Minimum clearance to the structure from centre line of track on outside of curve (for inner track),

c) Width of structure between adjacent tracks (measured across the tracks).

Where,

E_1 is the horizontal distance from vertical axis of centre line of track to canted Structure Gauge on inside of curve for a given cant (Drawing No. CMSG-4),

F_1 is the horizontal distance from vertical axis of centre line of track to canted Structure Gauge on outside of curve for a given cant (Drawing No. CMSG-4),

T_1 is extra lateral clearance due to curvature on inside of curve and

T_2 is extra lateral clearance due to curvature on outside of curve

Notes:

i) The values of 'E_1' and 'F_1' for a given cant Ca, shall each be the maximum of values at different heights of structure from rail level. In case the cant provided is greater than 50 mm on inner track, the value of F_1 shall be for the cant of (Ca-50) mm. In case the cant provided is 50 mm or less on inner track, the value of F_1 shall be for ZERO cant.

ii) Minimum track spacing, so worked out with a structure between the adjacent tracks shall not be less than that calculated as per para 1.8.1 for tracks without any structure between adjacent tracks.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

For values of E_1, F_1, T_1 and T_2, refer to the Appendices as shown below:

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Nandanam, Chennai - 600035

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	SECTIONS	For E_1 & F_1	For T_1&T_2
i)	Under Ground	3 (TNL)	2A & 2B
ii)	Elevated and At-Grade	3	2A & 2B

1.9 DERAILMENT GUARD

(a) Derailment Guard shall be provided on on outside of running rail on viaduct & At grade section and inside of running rail in tunnel. In tunnel, the derailment guard should preferably be provided inside the track so that it permits less sway of coach towards tunnel wall in case of derailment.

Note:

Location for providing Derailment Guard in single track tunnel:

1. Entry of tunnel 200 m from tunnel portal outside the tunnel to 50 m inside the tunnel.
2. Exit of tunnel 50 m from inside of tunnel portal to 200 m outside of tunnel
3. In curved track having radius 500m or less including transition portion but excluding location where check rail is provided.
4. Location of all-important installations e.g. Location of any substation or hazardous structure inside the tunnel, etc. damage to which in the assessment of the metro rail administration can result into serious loss of life or / and infrastructure as a result of derailment in tunnel.

   The above is subject to the condition that metro railway shall carry out of the risk assessment analysis for derailment in the tunnel and ensure that the maintenance practices in the maintenance manual as per the risk assessment mitigation plan. (For Risk Analysis kindly refer Drawing No: CMSG-9A, CMSG-9B, CMSG-10A & CMSG-10B).

(b) Lateral Clearance between the running rail and the derailment Guard should be 210 ± 30 mm. It shall not be lower than 25 mm below the top of running rail and should be clear of the rail fastenings to permit installation, replacement and maintenance.

Note:

In case of Double Resilient Base Plate Assembly Fastening System as approved by MOR, the lateral clearance between running rail and the derailment guard shall be 250±20 mm. This fastening system, if used in tunnels having multiple tracks, Metro Administration should ensure that KE for adjacent track is not infringed so long as the wheels of any derailed vehicle are within the main rail and derailment guard and also the KE of derailed rolling stock shall not have any infringement with the structure gauge.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

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S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED

CHAPTER – 2

STATION

2.1 SPACING OF TRACKS AT STATIONS

Minimum spacing of tracks at station on straight and on curve of radius of 1000m and flatter, without any structure between tracks At-Grade, Elevated and Under- Ground Stations-3900 mm.

2.2 PLATFORMS

2.2.1 Horizontal distance from Centre of track to face of passenger platform coping/PSD threshold/ components of fixed glazing for future PSD shall be

Condition	Value
For Elevated, At Grade section,	Minimum value: 1515 Mm Maximum value: 1520 mm
For Underground section	Minimum value: 1510 Mm Maximum value: 1515mm

Notes:

a) Passenger platforms have PSD's therefore, the closest dimension to the centreline of the track is always the PSD threshold/Platform Coping/ components of fixed glazing for future PSD.

b) Platform coping faces shall be flared away smoothly (wherever there is no PSD/ components of fixed glazing for future PSD) from the centre line of the track at either end for a distance of 1500 mm beyond passenger area/at Platform end so as to give from centre of track a minimum dimension:

Condition	Value
Elevated, At Grade section,	1590±5
Underground section	1575±5

c) For additional clearance for platforms on curves, refer to para 2.7

2.2.2 Height above rail level for passenger platform:

		Maximum	Minimum
(a)	At-Grade Ballasted.....	1085 mm	1075 mm
(b)	Elevated/Under Ground.....	1095 mm	1085 mm

2.2.3

(i)	Minimum horizontal distance of any isolated structure on a passenger platform from the edge of coping except PSD/ components of fixed glazing for future PSD.	2500 mm
(ii)	Minimum horizontal distance of any continuous Structure on a passenger platform from the edge of coping except PSD/ components of fixed glazing for future PSD.	3000 mm

(Refer Appendix – 6 & 6A - Sample egress calculation report for Underground station & Elevated Station)

Notes:

a) The Platform Gates (PG) may be installed at platform as per design of Original Equipment Manufacturer (OEM) of PG but shall have a minimum clearance of 10 mm from Kinematic Envelope.

b) The structure on the platform is treated as isolated if the length along the platform length is 2000 mm or less. Any structure having a length exceeding 2000 mm is treated as continuous structure.

c) The clocks/mirrors/CCTV/LED/LCD Screens/PIDS (passenger Information Display System)/ Signages etc. shall not be considered structures and shall be located at a minimum horizontal distance of 1000 mm from platform edge/coping with minimum height of 2500 mm from top of platform.

Note: Anything like above, hung from the Roof of Station shall be adequately secured and a safety loop is to be provided for taking care of incidences of failure of hanging arrangement.

d) For platform structure setting-out dimensions at stations, refer to Drawing No. CMSG-6 and CMSG-7 for Elevated/at grade station and Drawing No. CMSG-6(TNL) and CMSG-7(TNL) for underground station. No fixed structures should infringe the Structure Gauge except for designated railway operational platform gates, hand railing in back-of-house platform edge, Track Access Gates. Such designated railway operational structures should not infringe the Kinematic Envelope under any circumstances.

2.2.4 For Structure Gauge at station platform, refer to following drawings:

a) For under Ground Station	CMSG-6(TNL) & CMSG-7(TNL)
b) For At-Grade and Elevated Stations	CMSG-6 & CMSG-7

2.3 TRACK GRADIENT

2.3.1 TRACK GRADIENTS IN PLATFORM

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

1.	Desirable Grade (Recommended)	: Level
2.	Maximum Grade	: 1 in 1200
3.	Exceptional Grade	: 1 in 400

Note:

1. There shall be no change of grade within station platform track.
2. Any gradient steeper than 1 in 1200 and up to Exceptional gradient of 1 in 400shall be proposed by Civil Engineering Head and approved by Managing Director in consultation with Head of Safety nominated by Metro Authority.

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2.3.2 GRADIENT ON TURNOUTS

Maximum permissible gradient on turnouts

On Ballasted Track	0.25%
On Ballastless Track	3.00%

Notes:

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Nandanam, Chennai - 600035

(i) There shall be no change of gradient (i.e., vertical curve) on and within 15.0 m (desirable)/3.0m (minimum) length from any turnout on Ballastless track. In case of Ballasted track, there shall be no change of gradient on and within 30 meters of any turnout.

(ii) There shall be no horizontal curve within 15.0 m length (desirable)/3.0m (minimum) from any turnout on Ballastless track and 30 meters from any turnout on Ballasted Track.

(iii) Turnout shall normally be installed on straight track. In exceptional situations, turnout may take off from curve provided that the radius of lead curve (main line as well as diverging line) is not less than 190 m. The negotiability of rolling stock on such turnout must be certified by rolling stock supplier and confirmed through oscillation trial and a suitable speed restriction should be imposed on main and/or diverging line based on track geometry and other considerations, if required. In case of turnout installed on curved track, the minimum distance for commencement of vertical curve or another horizontal curve shall be 15m for Ballastless track. Turnout shall not be laid on transition curve.

(iv) The limit of turnout for above purposes shall be taken from Stock Rail Joint (SRJ) to end (i.e. heel) of crossing for Ballastless track. For Ballasted track, it shall be from SRJ to last common sleeper behind end of crossing.

(v) The maximum permissible gradient on turnout and the location of turnout with respect to vertical/horizontal curves in vicinity shall be ensured by metro that the Rolling Stock is fit to negotiate these gradients.

(vi) The above stipulations shall also be applicable for turnout to be laid outside station limit, if any.

2.4 INTERLOCKING AND SIGNAL GEAR

Maximum height above rail level or any part of interlocking or signal gear on either side of centre of track subject to the restrictions embodied in Note below shall be as under:

(a) For Under Ground Stations

- From CL of track to 1330 mm — 25 mm
- From 1330 mm to 1465 mm — 25 mm rising to 65 mm
- From 1465 mm to 1585 mm — 65 mm rising to 200 mm

(b) For Surface and Elevated Stations

- From CL of track to 1330 mm — 25 mm
- From 1330 mm to 1465 mm — 25 mm rising to 65 mm
- From 1465 mm to 1640 mm — 65 mm rising to 200 mm

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Note: Except for check rails of ordinary and diamond crossings, or wing rails and point rails of crossings leading to snag dead ends, or such parts of signalling gear as are required to be actuated by the wheels, no gear or track fittings shall project above rail level for a distance of 229 mm outside and 140 mm inside the gauge face of the rails.

2.5 Points and Crossings:

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO5, Anna Salai,
Mandaveli, Chennai - 600028

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Para	Description	SG (1435mm)
2.5.1	Maximum clearance of check rail opposite nose of crossing	44 mm
2.5.2	Minimum clearance of check rail opposite nose of crossings	41 mm
2.5.3	Minimum clearance between switch rail and stock rail at heel of Switch Rail	52 mm
2.5.4	Maximum clearance of wing rail at nose of crossing	44 mm
2.5.5	Minimum clearance of wing rail at nose of crossings	41 mm
2.5.6	Minimum clearance between toe of open switch and stock rail	160 mm
2.5.7	Minimum radius of curvatures for slip points, turnouts and crossover	190 m

2.5.8 On main lines, the turnouts and diamond crossings shall be of the following types or flatter: -

a) 1 in 9 type turnout 300m/190m radius

b) 1 in 7 type turnout 190m radius

c) Scissors cross-over of 1 in 9 type consisting of 4 turnouts of 300m/190m radius and 1 diamond crossing

d) Scissors cross-over of 1 in 7 type consisting of 4 turnouts of 190m radius and 1 diamond crossing

e) 1 in 7 derailing switches/ 1 in 7 type symmetrical split turnout

2.5.9 On depot lines, the turnouts and diamond crossings shall be of the following types or flatter:

a) 1 in 7 type turnout 190m radius

b) 1 in 7 type turnout 140m radius

c) Scissors cross-over of 1 in 7 type consisting of 4 turnouts of 190m/140m radius and 1 diamond crossing

d) 1 in 7 derailing switches/ 1 in 7 type symmetrical split turnout

2.5.10 Diamond crossings not to be flatter than 1 in 4.5

2.5.11

Note:

a) The above restrictions shall not apply to moveable diamond crossings.

b) There must be no change of super elevation (of outer rail over inner rail) between points 18 meters outside toe of switch rail and nose of crossings respectively, except in the case

of special crossing leading to snag dead – ends or under circumstances as provided for in item 2.6 below.

2.5.12 Minimum length of tongue rail: 9000 mm for Standard Gauge.

2.6 Superelevation and speed at stations on curves with turnouts of contrary and similar flexure.

2.6.1 Main Line:

Subject to the permissible run through speed based on the standard of interlocking the equilibrium super elevation calculated for the speed of the fastest train may be reduced by a maximum amount of Cant deficiency without reducing speed on the main line.

2.6.2 Turnouts:

i) Curves of contrary flexure
The equilibrium super elevation (s) in mm should be = $(G/127)(V^2/R)$
Where G = Dynamic gauge in mm, R = radius of turnout in metres and
V is speed on turnout in kmph.
The permissible negative super elevation on the turnout (which is also the actual super elevation of the main line) may then be = (Cant deficiency-s) mm.

ii) Curves of Similar Flexure

The question of reduction or otherwise of super elevation on the main line must necessarily be determined by the administration concerned. In the case of a reverse curve close behind the crossing of a turnout, the super elevation may be run out at the maximum of 1 mm in 440 mm.

iii) There must be no change of superelevation (of outer rail over inner rail) between points 18 metres outside toe of switch rail and nose of crossings respectively, except in the case of special crossing leading to snag dead – ends

2.7 ADDITIONAL CLEARANCE FOR PLATFORMS ON CURVES

The additional clearance for platforms on curves is to be provided as shown at appendix-5.

Note:

i) As the minimum radius of horizontal curve for station platform line is 1000 metres, there will be no super elevation and gauge widening at stations on passenger platform lines.

ii) Platforms located in curve shall be fitted with gap filler/ or suitable arrangement wherever necessary to maintain the Maximum stepping distance (between platform and car body floor) at platform as 75 mm in Horizontal direction and 45 mm in Vertical direction. The gap filler shall be of elastic nature and flexible to allow train contact without any adverse effect on passenger safety and stability of train.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METROS, Anna Salai,
Mandaveli, Chennai - 600035

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CHAPTER – 3

ROLLING STOCK

3.1 Passenger Rolling Stock

Note: all dimensions are in mm

S.No.	Description	Specified Value
1	Gauge	1435 (SG)
2	a) Maximum Length of the coach body (including end fairings)	22150
	b) Length of coach over couplers	22600
	c) Width of the Coach Body	2900
	d) Height of the coach body (maximum with pantograph in locked down condition)	4048
3	a) Distance between bogie centres*	14850±250
	b) Length of rigid wheel base for single bogie*	2400±200
	c) Maximum Distance between any two adjacent axles	12900
Note: * The above dimensions a), b) should commensurate to each other as per the design selected by Metro considering the manoeuvrability of the coach and the entire train on sharper curves and maximum gradient to avoid any infringement to the structure gauge.		
4	Kinematic Envelope for level tangent track	**Drawing No:**
	a) Kinematic Envelope for 90kmph –Through & Semi through Girder Bridges At Grade, Elevated Sections on level (or constant grade) tangent track.	CMSG-1
	b) Kinematic Envelope for 65 kmph – At Grade and Elevated Stations on level (or constant grade) tangent track.	CMSG-1A
	c) Kinematic Envelope for 90 kmph–Underground Sections on level (or constant grade) tangent track.	CMSG-1(TNL)
	d) Kinematic Envelope for 65 kmph – Underground Stations on level (or constant grade) tangent track.	CMSG-1A(TNL)
5	**a)** Minimum clearance from rail level under fully loaded condition for bogie mounted equipment in worst condition* (**The worst condition means wheels with maximum tread wear and primary springs with maximum deflection*) in static condition.	75
	b) Minimum clearance from rail level under fully loaded condition for body mounted equipment in worst condition* (**The worst condition means deflated secondary air spring, wheels with maximum tread* wear and primary springs with maximum deflection) in static condition.	102
	c) Minimum clearance from rail level, under dynamic condition of fully loaded vehicle, with maximum tread wear and primary springs with maximum deflection, with the exception of wheels & attachments there to (vide note below #). **Note**: # A tyre or an attachment to a wheel or sand pipes or wheel / Track Lubrication Nozzle in line with the wheel may project below the minimum height of 50mm from a distance of 51mm inside to 216mm outside of the gauge face of wheel.	50
6	**Wheel Profile** *Note: The "Incline of tread" for S1002 has a varying gradient and must therefore be inferred from the coordinates shown in Table C.1 of EN 13715. Alternative profiles [V135 or EPS 32.5] may be adopted, if the RS Contractor's wheel-rail interface study demonstrates significantly better overall wear characteristics.*	S1002/h28/e32.5 Reverse slope between 6.7 and 15%

7	**Wheel** a) Maximum wheel gauge back-to-back distance	1360
	b) Minimum wheel gauge back-to-back distance	1358
8	a) Maximum wheel diameter on the tread *(Wheel Profile dimensions as per EN 13715 / EN15313. Wheel Diameter value "D" is measured from point D0 on the wheel tread; 70mm from wheel gauge face)*	860
	b) Minimum wheel diameter on the tread *(Wheel Profile dimensions as per EN 13715 / EN15313. Wheel Diameter value "D" is measured from point D0 on the wheel tread; 70mm from wheel gauge face)*	780
9	a) Maximum projection for flange of new wheel *(Wheel Profile dimensions as per EN 13715 / EN15313. Flange Height value "h" is measured from point D0 on the wheel tread; 70mm from wheel gauge face)*	36
	b) Minimum projection for flange of new wheel *(Wheel Profile dimensions as per EN 13715 / EN15313. Flange Height value "h" is measured from point D0 on the wheel tread; 70mm from wheel gauge face)*	28
10	a) Maximum thickness of flange of wheel *(Wheel Profile dimensions as per EN 13715 / EN15313. Flange Thickness values " e1, e2" are measured 10mm below wheel tread point D0)*	32.5
	b) Minimum thickness of flange of wheel. *(Wheel Profile dimensions as per EN 13715 / EN15313. Flange Thickness values " e1, e2" are measured 10mm below wheel tread point D0)*	22
11	Minimum width of Wheel as per respective wheel profile	135±1
12	**a)** Maximum height above rail level for floor of any unloaded vehicle	1130
	b) Minimum height above rail level for floor of fully loaded normal vehicle	1100
13	**a)** Maximum height of centre coupler above rail level for unloaded vehicle	815
	b) Minimum height of centre coupler above rail level for fully loaded vehicle	740

3.2 LOCOMOTIVE AND ENGINEERING SERVICE VEHICLES

Other items of Rolling Stock viz. shunting locomotives, OHE maintenance and inspection cars, emergency re-railing van, track machines etc., used on Chennai Metro System (where these cars should be plying) will conform with the kinematic envelope of the Passenger Electric Multiple Units as detailed in the annexure of KE drawings.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approved
13/5/25
Railway Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai
Nandanam, Chennai - 600035

CHAPTER – 4

OVERHEAD ELECTRIC TRACTION 25 KV/AC 50 CYCLES PER SECOND

Note:

(i) Electrical Clearances are compiled as per Table 2 of Electrical Clearances under 'Para 5.1.3 – Clearances between live parts of contact lines and earth' of BS EN 50119:2009. However, These Electrical clearances are minimum and may be increased depending on various parameters e.g. Absolute humidity, the Ambient Temperature range, Air Pressure, Pollution, Relative Air Density, Shape and material for both energised and earth Structures. Metro may consider each case individually as suggested in BS EN 50119:2009.

(ii) Wherever electric traction is in use, special precautions must be taken to maintain following clearances:

4.1 Electrical Clearances for under ground

Minimum height from rail level to the underside of the Wearing Copper / Metal Conductor of Rigid OCS (Overhead Contact System) in Tunnel would be - 4318 mm.

Note:

a) Location of level crossing from the exit point of the tunnel will take into consideration the OHE height of 4318 mm at the tunnel exit and the permissible contact wire gradient.

b) In the Depot deck portion, where Rigid OCS is provided and the track is Ballastless, the Electrical clearances laid down at paras 4.1.1 to 4.1.4 shall be applicable.

c) For location of rigid OCS in circular tunnel with canted track, refer to para 1.7.1(B)-b and 1.7.2(B)-b.

d) It shall be ensured that environment level inside the tunnel is controlled suitably so that no extra air clearance, over and above the minimum separation prescribed in para 4.1.3 and 4.1.4 on account of pollution, fog etc. is required.

4.1.1 Stagger of Rigid OCS Conductor in Tunnels shall not be more than (IRS Code)

(a) On Straight ..... ± 200 mm (from IR SOD)
(b) On Curves..... .... ± 300 mm (from IR SOD)

4.1.2 Prescribed minimum clearance between live parts of contact lines and bodies of structures.

Examined and found in order
Pradeep Kr. Mishra
ADE/M.T.C/VII,
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Air clearance between bodies of structures and live un-insulated parts of contact lines, feeders and current collectors for 25 KV shall be as per IEC 60913 as under:

	Condition	Minimum clearance between live parts and structures	Absolute minimum dynamic clearance between live parts and structure
a)	Long duration (Static)	270 mm	-

S. ASHOK KUMAR, IRSE
Chief Depot Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Nandanam, Chennai - 600035

Project Directorate
Approved
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b)	Short Duration (Dynamic)	170 mm	150 mm*

*In exceptional cases and considering operating in climatic conditions (Ref: IEC 60913)

4.1.3 **Prescribed minimum clearance between live parts of contact lines and bodies of vehicles**

	Condition	Clearance (mm)
a)	Long duration (Static)	290 mm
b)	Short Duration (Dynamic)	190 mm

4.1.4 **Maximum width of pantograph – under dynamic condition:** (indicative)

The Kinematic Envelope for the underground system with Ballast less track is shown in Drawing No. CMSG-1(TNL). The pantograph adopted should be such that its actual half KE width does not exceed 820 mm and 980 mm at the top and bottom respectively in pantograph raised condition for a contact wire height of 4318 mm to fulfil electrical clearances as per item 4.1.3.

4.2 ELECTRICAL CLEARANCES FOR AT-GRADE AND ELEVATED SECTIONS

4.2.1 Minimum vertical distance between any live bare conductor (overhead equipment) and any earthed structure or other bodies (over bridges, signal gantries etc.)

	Condition	For Flexible OHE
a)	Long duration (Static)	320 mm
b)	Short Duration (Dynamic)	270 mm

Note: A minimum vertical distance of 340 mm shall normally be provided between rolling stock and contact wire to allow for a 20 mm temporary raising of the tracks during maintenance. Wherever the allowance required for track maintenance exceeds 20 mm, the vertical distance between rolling stock and contact wire shall correspondingly be increased.

4.2.2 Minimum lateral distance between bare live conductor (overhead equipment) or any earthed structure or other bodies (over bridges, signal gantries etc.)

	Condition	For Flexible OHE
a)	Long duration (Static)	320 mm
b)	Short Duration (Dynamic)	220 mm

Examined and found in orde
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

4.2.3 Height of contact wire:

Minimum height from rail level to the underside of live Conductor wire.

a)	Under bridges	4408 mm
b)	In the open (Elevated & At grade sections)	5000 mm
c)	Minimum Height of contact wire at Depot	5500 mm

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METROS, Anna Salai,
Nandanam, Chennai - 600035

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d)	In running and carriage sheds wherever staff are expected to work on the roof of rolling stock	5200 mm

Note:

(1) On curves, all vertical distances specified in items 4.2.3 above, shall be measured above level of the inner rail, increased by half the super elevation.

(2) Minimum Contact wire height from Rail level to underside of Conductor Wire.

(i) Height of the locomotive (with Panto locked position): 4048 mm

(ii) Minimum Static clearances from 25kV live conductor :320 mm

(iii) Allowance for OHE erection Maintenance: 20 mm

(iv) Allowance for track maintenance: 20 mm (Ballastless Track)

(v) Minimum height of contact wire (Total): 4408 mm

4.2.4 Maximum variation of the live conductor wire on either side of the centre line of the track under static conditions:

i) On Straight ..... ± 200 mm
ii) On Curves..... ± 300 mm

4.2.5 Maximum width of pantograph collector:

The Kinematic Envelope with the size of Pantograph adopted shall be within the Kinematic Envelope shown at Drawing No: CMSG-1.

4.3 (i)The vertical clearance from Overhead line to power line crossing of Railway Tracks:

Sl. No	Overhead Crossing Voltage	Minimum clearance from Rail level		Minimum Clearance between Highest Traction Conductor and lowest Transmission Line Crossing Conductor
		Existing Power Line Crossing For Non-Electrified Territory	New Power Line Crossing or Crossing Planned For Alteration	
(1)	*(2)*	*(3)*	*(4)*	*(5)*
(a)	Upto and including 11kV	Normally by Underground Cable		
(b)	Above 11kV & upto 33kV	10860mm	14660mm	2440mm
(c)	Above 33kV & upto 66kV	11160mm	14960mm	2440mm

(d)	Above 66kV & upto 132kV	11760mm	15560mm	3050mm
(e)	Above 132kV & upto 220kV	12660mm	16460mm	4580mm
(f)	Above 220kV & upto 400kV	14460mm	18260mm	5490mm
(g)	Above 400kV & upto 500kV	15360mm	19160mm	7940mm
(h)	Above 500kV & upto 800kV	18060mm	21860mm	7940mm

Note:

(i) All height/clearances are in mm and under maximum sag conditions.

(ii) If the crossing is provided with a guarding, a minimum clearance of 2000mm shall be maintained between bottom of the guard wire and highest traction conductor.

(iii) Power line crossing in yards & stations area shall be avoided.

(iv) For any electrification work of existing track or construction of new track /gauge conversion with electrification, existing power line crossings can continue, if dimensions are as per Column (5) above, even if dimensions of Column (3) are not satisfied i.e., for electrification works Column (3) is not applicable.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

4.3 (ii) Minimum clearance between any conductor not adequately insulated and any railway structure under most adverse conditions

Sl. No	Voltage	Minimum Clearance
(1)	(2)	(3)
(a)	Upto and including 650 volts	2500mm
(b)	Above 650 volts and upto & including 33 kV	3700mm
(c)	Above 33 kV and upto & including 66 kV	4000mm
(d)	Above 66 kV and upto & including 132 kV	4600mm
(e)	Above 132 kV and upto & including 165 kV	4900mm
(f)	Above 165 kV and upto & including 220 kV	5500mm
(g)	Above 220 kV and upto & including 400 kV	7300mm
(h)	Above 400 kV and upto & including 500 kV	8200mm
(i)	Above 500 kV and upto & including 800 kV	10900mm

4.3 (iii) Minimum height above rail level for telegraph, telephone 6100mm

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Nandanam, Chennai - 600035

Project Directorate
Approved on 13/5/25
Railway Board

and other such low-tension wires crossing a railway

4.3 (iv) Minimum Horizontal Distance of Structures:

The minimum horizontal distance measured at right- angle to, and from the centre of nearest track to any part of the structure above ground level, carrying electrical conductor crossing a railway line shall be:

(i) For new structure : (H+6)m

(ii)For existing rigid well founded post/structures : 3m, or 1.5m away from the toe of embankment/top of cutting, whichever is more

Where, 'H' is the height of post/structure from nearest ground level

Note:

(1) Rigid well founded post/structure: Any post/structure which is so constructed or guyed as to remain in a vertical position or failing this to continue to provide the minimum horizontal clearances of 2.135m from the centre of nearest track, with one or all of the conductors broken or with its conductors attached, when subjected to maximum wind pressure, shall be considered to be a "rigid well-founded post/structure".

The existing rigid well founded post/structures, presently at a distance equal to or more than (ii) as given above, but less than (H+2.135) m, shall be inspected by railway's nominated electrical official once in a year jointly with the owner of the post/structure and certify the safety of the structure, keeping appropriate records of inspections.

(2) If the existing post/structure carrying electrical conductors crossing a railway line, is not rigid and well-founded then the minimum horizontal distance, measured at right angles from the centre of nearest track, shall be equal to height of post/structure above ground level plus 2.135m.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approved on
13/5/25
Railway Board

S. ASHOK KUMAR IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO Area Sala
Nandanam, Chennai - 600035

CHAPTER – 5

PLATFORM SCREEN DOOR (PSD)

(As per MoHUA guidelines issued in 2013, planning of Metro system with PSD is mandatory.)

5.1 Setting out Dimensions

S.N.	Particular	2900 mm wide RS
i.	Minimum Platform Screen Door Width (clear opening)	2000 mm
ii.	Minimum Platform Screen Door Height from PF level (Full hight)	2100 mm
iii.	Minimum Platform Screen Gate Height from PF level (Half hight)	1500 mm
iv.	Minimum Platform Screen Door threshold offset from track centreline – straight track (Underground)	1510 mm
v.	Minimum Platform Screen Door panel offset from track centreline – straight track (underground)	1535 mm Excluding the deflector plate
vi.	Minimum Platform Screen Door threshold offset from track centreline – straight track (Elevated/At Grade)	1515 mm
vii.	Minimum Platform screen door panel offset from Track – centre line – straight track (Elevated/At- Grade)	1540 mm Excluding the deflector plate, drive assembly
viii.	The minimum size of object which can be sensed for retraction of doors (the dimensions given are only indicative, Metro may adopt more sensitive screen door which can sense lesser size as indicated).	19mm dia Rod or 5mmx40mm plate

RS door width of 1400mm, stopping accuracy of +-300mm of signalling considered for PSD door width

Note

a) Stopping Accuracy of Metro Train is (+/-) 300 mm or less.

b) For curved platforms, additional clearance as per appendix-5 to be considered.

c) Platform Gates are considered as designated railway operational structure. Therefore, platform gates may infringe the structure gauge, but does not infringe the kinematic envelope of train in station.

d) The deflector (if provided) attached to the bottom of the sliding door shall be designed in order not to protrude beyond the door threshold.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL.
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate Approved on 13/5/25 Railway Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Mandaveli, Chennai - 600035

APPENDIX-1

PERMISSIBLE SPEED, CANT AND MINIMUM TRACK SPACING ON CURVES UNDERGROUND (TUNNELS), ELEVATED AND AT-GRADE SECTIONS

Reference Para 1.1

RADIUS OF CURVE	CANT	PERMISSIBLE SPEED	MINIMUM DISTANCE BETWEEN ADJACENT TRACKS	
			BALLASTLESS	
			UNDERGROUND	ELEVATED & AT-GRADE
metres	mm	kmph	mm	mm
>3000	-	80	3600	3650
3000	15	80	3600	3650
2800	15	80	3600	3650
2400	20	80	3600	3650
2000	20	80	3600	3650
1600	25	80	3600	3650
1500	30	80	3600	3650
1200	35	80	3600	3670
1000	45	80	3650	3700
800	55	80	3600	3750
600	70	80	3650	3750
500	95	80	3750	3800
450	115	80	3800	3850
400	120	75	3850	3900
350	120	70	3850	3900
300	125	65	3900	3950
200	120	55	4000	4050
150	110	45	4100	4150
150*	0	25	4000	4050
120	110	40	4200	4250
120*	0	25	4100	4150

Notes:

a) The Track spacing shown in the table above is without any column / structure between two tracks and is with equal cant for both outer and inner tracks.

b) Track spacing shown in Table above is not applicable to station which should be calculated depending on specific requirement but the spacing should not be less than the spacing stipulated in para 2.1.

c) Cant provided is limited to Exceptional value of 125mm

d) Maximum cant deficiency is 100mm

e) *The curve with radius 120 and 150 without cant are used in depot/depot connections.

f) For in between radius more sharper radius to be adopted to arrive track spacing

Project Directorate Approved 13/5/25 Railway Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Nandanam, Chennai - 600035

APPENDIX-2A

EXTRA HORIZONTAL SHIFT ON CURVES (CURVATURE EFFECT)

INSIDE OF CURVE

RADIUS	MID THROW (28500/R)	EXTRA GAUGE TOLERANCE ON CURVES	EXTRA NOSING DUE TO EXTRA GAUGE TOLERANCE	EXTRA HORIZONTAL SHIFT ON CURVE	REMARKS
R	(V)	(N)	(G)	(T1)	
100	285.0	26	9.0	268	
120	237.5	26	9.0	221	
150	190.0	26	9.0	173	
175	162.9	26	9.0	146	
190	150.0	26	9.0	133	
200	142.5	26	9.0	126	
250	114.0	26	9.0	97	
300	95.0	26	9.0	78	**(G) Extra Gauge Tolerance on Curves sharper than 1000m Radius.**
350	81.4	26	9.0	64	
400	71.3	26	9.0	54	
450	63.3	26	9.0	46	
500	57.0	26	5.0	36	
550	51.8	26	5.0	31	**9mm for curves with Radius sharper than 500 m radius and**
600	47.5	26	5.0	27	
650	43.8	26	5.0	23	
700	40.7	26	5.0	20	
750	38.0	26	5.0	17	
800	35.6	26	5.0	15	**5 mm for curves of with Radius of 500 m to less than 1000m**
850	33.5	26	5.0	13	
900	31.7	26	5.0	11	
950	30.0	26	5.0	9	
1000	28.5	26	0.0	3	
1100	25.9	26	0.0	0	
1200	23.8	26	0.0	0	
1300	21.9	26	0.0	0	
1400	20.4	26	0.0	0	**T1 = V-N+G for V equal to or Greater than (N) and T1 = G for V <(N)**
1500	19.0	26	0.0	0	
1600	17.8	26	0.0	0	
1700	16.8	26	0.0	0	
1800	15.8	26	0.0	0	
1900	15.0	26	0.0	0	
2000	14.3	26	0.0	0	
2200	13.0	26	0.0	0	
2400	11.9	26	0.0	0	
2600	11.0	26	0.0	0	
2800	10.2	26	0.0	0	
3000 OR More	9.50	26	0.0	0	

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Mandaveli, Chennai - 600028

Approved on 13/5/25 Railway Board

Mid Throw (in mm) $V=(125XC^2)/R = 28500/R$

Where C is the distance between bogie centres = 14.850+0.250=15.100m OR

14.850-0.250= 14.600m

The worst case will be with C= 15.100 m

R is the Radius of curve in mtrs

Mid Throw (in MM) $V=(125xC^2) / R = 28500/R$

For in Between radius more sharper radius to be adopted

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approved
13/5/25
Railway Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METRO'S Anna Salai,
Nandanam, Chennai - 600035

APPENDIX-2B

EXTRA HORIZONTAL SHIFT ON CURVES (CURVATURE EFFECT)

OUTSIDE OF CURVE

RADIUS	END THROW (34683/R)	EXTRA GAUGE TOLERANCE ON CURVES	EXTRA NOSING DUE TO EXTRA GAUGE TOLERANCE	EXTRA HORIZONTAL SHIFT ON CURVE	REMARKS
R	(Vo)	(G)	(EN)	(T2)	
100	346.8	9	2.3	358	
120	289.0	9	2.3	300	
150	231.2	9	2.3	242	
175	198.2	9	2.3	209	
190	182.5	9	2.3	194	
200	173.4	9	2.3	185	
250	138.7	9	2.3	150	
300	115.6	9	2.3	127	
350	99.1	9	2.3	110	
400	86.7	9	2.3	98	
450	77.1	9	2.3	88	(G) Extra Gauge Tolerance on Curves sharper than 1000m Radius.
500	69.4	5	1.3	76	
550	63.1	5	1.3	69	
600	57.8	5	1.3	64	
650	53.4	5	1.3	60	9mm for curves with Radius sharper than 500 m radius and
700	49.5	5	1.3	56	
750	46.2	5	1.3	53	
800	43.4	5	1.3	50	5 mm for curves of with Radius of 500 m to less than 1000m
850	40.8	5	1.3	47	
900	38.5	5	1.3	45	
950	36.5	5	1.3	43	
1000	34.7	0	0.0	35	
1100	31.5	0	0.0	32	
1200	28.9	0	0.0	29	
1300	26.7	0	0.0	27	T2 = V0+G+EN
1400	24.8	0	0.0	25	EN=G x 0.251986301
1500	23.1	0	0.0	23	
1600	21.7	0	0.0	22	
1700	20.4	0	0.0	20	
1800	19.3	0	0.0	19	
1900	18.3	0	0.0	18	
2000	17.3	0	0.0	17	
2200	15.8	0	0.0	16	
2400	14.5	0	0.0	14	
2600	13.3	0	0.0	13	
2800	12.4	0	0.0	12	
3000 OR More	11.6	0	0.0	12	

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
METROS, Anna Salai,
Nandanam, Chennai - 600035

Approved on 13/5/25 Railway Board

End Throw (in mm) $V=(125XC1^2)/R - (125 XC^2)/R=34683/R$

Where C is the distance between bogie centres = 14.850+0.250=15.100m OR

14.850-0.250= 14.600m

The worst case will be with C= 14.6000m

C1 is the length of coach in meters =22.150 and

R is the radius of curve in meters

For in between radius more sharper radius to be adopted.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approved on
13/5/25
Railway Board

S. ASHOK KUMAR, IRSE
Chief General Manager
(Tracks & Elevated)
CHENNAI METRO RAIL LIMITED
MMRDS, Anna Salai,
Nandanam, Chennai - 600035

APPENDIX-3

CANT EFFECT ON STRUCTURE GAUGE - HORIZONTAL AT-GRADE AND ELEVATED

REFERENCE: PARA 1.7.2

ALL FIGURES ARE IN MM

Height above rail level measured perpendicular to plane of track → / Distance from centre line of track to Structure Gauge for tangent track →					h = 305 ab= 1640				h = 930 ab = 1735				h = 3310 ab = 1825				h = 3775 ab=1546				h= 6250 ab = 1546			
Cant	Angle a Degrees	Sin a	cos a	tan a	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2
125	4.748	0.083	0.997	0.083	1660	1609	502	231	1806	1652	1133	846	2093	1545	3512	3210	1853	1228	3953	3697	2058	1023	6419	6163
120	4.558	0.079	0.997	0.080	1659	1611	494	234	1803	1656	1125	849	2082	1556	3505	3214	1841	1241	3946	3700	2038	1044	6413	6167
115	4.368	0.076	0.997	0.076	1658	1612	487	237	1801	1659	1117	853	2072	1568	3497	3219	1829	1254	3939	3704	2018	1066	6407	6172
110	4.178	0.073	0.997	0.073	1658	1613	479	240	1798	1663	1109	856	2061	1579	3489	3223	1817	1267	3933	3707	1997	1087	6401	6176
105	3.987	0.070	0.998	0.070	1657	1615	471	243	1795	1666	1101	860	2051	1590	3481	3228	1805	1280	3926	3711	1977	1108	6395	6180
100	3.797	0.066	0.998	0.066	1657	1616	463	246	1793	1670	1093	863	2040	1602	3474	3232	1793	1293	3919	3714	1957	1129	6389	6184
95	3.607	0.063	0.998	0.063	1656	1618	455	249	1790	1673	1085	867	2030	1613	3466	3236	1780	1305	3912	3718	1936	1150	6382	6188
90	3.417	0.060	0.998	0.060	1655	1619	447	252	1787	1676	1077	870	2019	1624	3458	3240	1768	1318	3905	3721	1916	1171	6376	6192
85	3.227	0.056	0.998	0.056	1655	1620	439	255	1785	1680	1069	873	2008	1636	3450	3245	1756	1331	3899	3724	1895	1192	6370	6196
80	3.037	0.053	0.999	0.053	1654	1622	431	258	1782	1683	1061	877	1998	1647	3442	3249	1744	1344	3892	3728	1875	1213	6363	6199
75	2.847	0.050	0.999	0.050	1653	1623	424	261	1779	1687	1053	880	1987	1658	3434	3253	1732	1357	3885	3731	1855	1234	6357	6203
70	2.657	0.046	0.999	0.046	1652	1624	416	264	1776	1690	1044	884	1976	1670	3426	3257	1719	1369	3878	3734	1834	1255	6350	6207
65	2.467	0.043	0.999	0.043	1652	1625	408	267	1773	1693	1036	887	1966	1681	3418	3261	1707	1382	3871	3737	1814	1276	6343	6210
60	2.277	0.040	0.999	0.040	1651	1627	400	270	1771	1697	1028	890	1955	1692	3410	3265	1695	1395	3863	3741	1793	1296	6336	6214
55	2.087	0.036	0.999	0.036	1650	1628	392	273	1768	1700	1020	894	1944	1703	3402	3269	1682	1407	3856	3744	1773	1317	6330	6217
50	1.898	0.033	0.999	0.033	1649	1629	384	276	1765	1703	1012	897	1934	1714	3394	3273	1670	1420	3849	3747	1752	1338	6323	6220
45	1.708	0.030	1.000	0.030	1648	1630	376	278	1762	1707	1004	900	1923	1726	3385	3277	1658	1433	3842	3750	1732	1359	6316	6224
40	1.518	0.026	1.000	0.026	1648	1631	368	281	1759	1710	996	904	1912	1737	3377	3280	1645	1445	3835	3753	1711	1380	6309	6227
35	1.328	0.023	1.000	0.023	1647	1632	360	284	1756	1713	987	907	1901	1748	3369	3284	1633	1458	3827	3756	1690	1401	6302	6230
30	1.138	0.020	1.000	0.020	1646	1634	353	287	1753	1716	979	910	1890	1759	3361	3288	1621	1471	3820	3759	1670	1422	6294	6233
25	0.949	0.017	1.000	0.017	1645	1635	345	290	1750	1719	971	914	1880	1770	3352	3292	1608	1483	3813	3761	1649	1442	6287	6236
20	0.759	0.013	1.000	0.013	1644	1636	337	293	1747	1723	963	917	1869	1781	3344	3296	1596	1496	3805	3764	1629	1463	6280	6239
15	0.569	0.010	1.000	0.010	1643	1637	329	296	1744	1726	955	920	1858	1792	3335	3299	1583	1508	3798	3767	1608	1484	6273	6242
10	0.379	0.007	1.000	0.007	1642	1638	321	299	1741	1729	946	923	1847	1803	3327	3303	1571	1521	3790	3770	1587	1505	6265	6245
5	0.190	0.003	1.000	0.003	1641	1639	313	302	1738	1732	938	927	1836	1814	3319	3306	1558	1533	3783	3772	1567	1525	6258	6247
0	0.000	0.000	1.000	0.000	1640	1640	305	305	1735	1735	930	930	1825	1825	3310	3310	1546	1546	3775	3775	1546	1546	6250	6250

REFER TO FIGURE: CMSG-4

E_1 = [ab+(h x tan α)] x cos α: F_1=[ab-(h x tan α)] x cos α

H_1 = (Ca/2) + (h/cos α)+(Ab-h x tan α)x sin α

H_2 = (Ca/2) + (h/cos α)-(ab+h x tan α) x sin α

ab = Ab = Distance from centre line of vehicle to Structure gauge for Tangent Track at height 'h' from rail level

ac = Distance from centre line of canted track to Structure Gauge for Tangent track at height 'h' from rail level.

bc = hxtanα =Lateral increment due to cant (measured along the line parallel to line joining top of rails).

Examined and found in order
Pradeep Kr. Mishra
ADEN/J.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate Approved on 13/5/25 Railway Board

APPENDIX - 3 (TNL)

CANT EFFECT ON STRUCTURE GAUGE-HORIZONTAL UNDER GROUND SECTIONS (RECTANGULAR BOX TUNNELS)

REFERENCE: PARA 1.7.2

ALL FIGURES IN MM

Height above rail level measured perpendicular to plane of track → / Distance from centre line of track to Structure Gauge for tangent track →					h = 305 ab= 1585				h = 940 ab = 1670				h = 3305 ab = 1740				h = 3965 ab=1250				h= 4838 ab = 1250			
Cant	Angle a Degrees	Sin a	cos a	tan a	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2	E_1	F_1	H_1	H_2
125	4.748	0.083	0.997	0.083	1605	1554	498	235	1742	1586	1138	861	2008	1460	3500	3212	1574	917	4117	3910	1646	845	4987	4780
120	4.558	0.079	0.997	0.080	1604	1556	490	238	1739	1590	1130	864	1997	1472	3493	3216	1561	931	4112	3913	1631	862	4982	4783
115	4.368	0.076	0.997	0.076	1604	1557	482	241	1737	1594	1122	868	1987	1483	3485	3220	1548	944	4106	3916	1615	878	4977	4786
110	4.178	0.073	0.997	0.073	1603	1559	475	244	1734	1597	1114	871	1976	1495	3478	3224	1536	958	4101	3918	1599	894	4971	4789
105	3.987	0.070	0.998	0.070	1602	1560	467	247	1731	1601	1106	874	1966	1506	3470	3229	1523	971	4095	3921	1583	911	4966	4792
100	3.797	0.066	0.998	0.066	1602	1561	459	249	1729	1604	1099	877	1955	1517	3463	3233	1510	985	4089	3924	1568	927	4960	4795
95	3.607	0.063	0.998	0.063	1601	1563	452	252	1726	1608	1091	881	1944	1529	3455	3236	1497	998	4083	3926	1552	943	4955	4797
90	3.417	0.060	0.998	0.060	1600	1564	444	255	1723	1611	1083	884	1934	1540	3448	3240	1484	1011	4077	3928	1536	959	4949	4800
85	3.227	0.056	0.998	0.056	1600	1565	436	258	1720	1614	1075	887	1923	1551	3440	3244	1471	1025	4072	3931	1520	976	4943	4802
80	3.037	0.053	0.999	0.053	1599	1567	429	261	1717	1618	1067	890	1913	1562	3433	3248	1458	1038	4066	3933	1505	992	4937	4805
75	2.847	0.050	0.999	0.050	1598	1568	421	263	1715	1621	1059	893	1902	1574	3425	3252	1445	1052	4060	3936	1489	1008	4932	4807
70	2.657	0.046	0.999	0.046	1597	1569	413	266	1712	1625	1051	897	1891	1585	3417	3256	1432	1065	4054	3938	1473	1024	4926	4810
65	2.467	0.043	0.999	0.043	1597	1570	405	269	1709	1628	1044	900	1881	1596	3409	3260	1420	1078	4048	3940	1457	1041	4920	4812
60	2.277	0.040	0.999	0.040	1596	1572	398	272	1706	1631	1036	903	1870	1607	3402	3263	1407	1091	4042	3942	1441	1057	4914	4815
55	2.087	0.036	0.999	0.036	1595	1573	390	275	1703	1635	1028	906	1859	1618	3394	3267	1394	1105	4035	3944	1425	1073	4908	4817
50	1.898	0.033	0.999	0.033	1594	1574	382	277	1700	1638	1020	909	1848	1630	3386	3271	1381	1118	4029	3946	1410	1089	4902	4819
45	1.708	0.030	1.000	0.030	1593	1575	375	280	1697	1641	1012	912	1838	1641	3378	3274	1368	1131	4023	3948	1394	1105	4896	4821
40	1.518	0.026	1.000	0.026	1593	1576	367	283	1694	1645	1004	915	1827	1652	3370	3278	1355	1145	4017	3950	1378	1121	4889	4823
35	1.328	0.023	1.000	0.023	1592	1578	359	286	1691	1648	996	919	1816	1663	3362	3281	1342	1158	4010	3952	1362	1138	4883	4825
30	1.138	0.020	1.000	0.020	1591	1579	351	288	1688	1651	988	922	1805	1674	3354	3285	1329	1171	4004	3954	1346	1154	4877	4827
25	0.949	0.017	1.000	0.017	1590	1580	344	291	1685	1654	980	925	1794	1685	3346	3288	1315	1184	3998	3956	1330	1170	4871	4829
20	0.759	0.013	1.000	0.013	1589	1581	336	294	1682	1657	972	928	1784	1696	3338	3292	1302	1197	3991	3958	1314	1186	4864	4831
15	0.569	0.010	1.000	0.010	1588	1582	328	297	1679	1661	964	931	1773	1707	3330	3295	1289	1211	3985	3960	1298	1202	4858	4833
10	0.379	0.007	1.000	0.007	1587	1583	320	299	1676	1664	956	934	1762	1718	3321	3298	1276	1224	3978	3962	1282	1218	4851	4835
5	0.190	0.003	1.000	0.003	1586	1584	313	302	1673	1667	948	937	1751	1729	3313	3302	1263	1237	3972	3963	1266	1234	4845	4836
0	0.000	0.000	1.000	0.000	1585	1585	305	305	1670	1670	940	940	1740	1740	3305	3305	1250	1250	3965	3965	1250	1250	4838	4838

REFER TO FIGURE: CMSG-4A

$E_1 = [ab+(h \times \tan \alpha)] \times \cos \alpha$; $F_1 = [ab-(h \times \tan \alpha)] \times \cos \alpha$

$H_1 = (Ca/2)+(h/\cos \alpha)+(Ab-h \times \tan \alpha) \times \sin \alpha$ & $H_2 = (Ca/2)+(h/\cos \alpha)-(ab+h \times \tan \alpha) \times \sin \alpha$

ab = Ab=Distance from centre line of vehicle to Structure gauge for Tangent Track at height 'h' from rail level

ac=Distance from centre line of canted track to Structure Gauge for Tangent track at height 'h' from rail level.

bc = hxtanα =Lateral increment due to cant (measured along the line parallel to line joining top of rails).

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate Approved on 13/5/25 Railway Board

APPENDIX - 3A

CANT EFFECT ON KINEMATIC ENVELOPE-HORIZONTAL AT-GRADE AND ELEVATED SECTIONS

REF: PARA 1.7.1

Height above rail level measured → Perpendicular to plane of track					h = 938				h = 997				h = 1130				h = 2878				h = 3296				h = 4014				h = 4866				h = 5018			
Distance from centre line of track to K.E. for tangent track →					ab = 1582				ab = 1584				ab = 1590				ab = 1858				ab = 1658				ab = 1225				ab = 1220				ab = 880			
Cant	Angle α	Sin a	cos a	tan a	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2
125	4.748	0.083	0.997	0.083	1654	1499	1128	866	1661	1496	1187	925	1678	1491	1320	1057	1891	1434	3068	2793	1925	1379	3484	3210	1553	889	4164	3961	1619	813	5013	4811	1292	462	5136	4990
120	4.558	0.079	0.997	0.080	1652	1502	1121	869	1658	1500	1180	928	1675	1495	1313	1060	1881	1434	3061	2797	1915	1391	3477	3214	1540	902	4159	3964	1603	829	5008	4814	1276	478	5132	4992
115	4.368	0.076	0.997	0.076	1649	1506	1113	872	1655	1503	1172	931	1671	1499	1305	1063	1872	1434	3053	2801	1904	1402	3470	3218	1527	916	4153	3967	1587	846	5002	4816	1260	495	5128	4994
110	4.178	0.073	0.997	0.073	1646	1509	1106	875	1652	1507	1165	934	1668	1503	1298	1066	1863	1444	3046	2805	1894	1413	3463	3221	1514	929	4148	3969	1571	862	4997	4819	1243	512	5124	4996
105	3.987	0.070	0.998	0.070	1643	1513	1098	878	1649	1511	1157	937	1665	1508	1290	1069	1854	1454	3039	2808	1883	1425	3456	3225	1501	943	4142	3972	1555	879	4992	4822	1227	529	5120	4997
100	3.797	0.066	0.998	0.066	1641	1516	1091	881	1647	1514	1150	940	1661	1512	1283	1072	1845	1464	3031	2812	1873	1436	3449	3229	1488	956	4136	3974	1540	895	4986	4825	1210	546	5115	4999
95	3.607	0.063	0.998	0.063	1638	1520	1083	884	1644	1518	1142	943	1658	1516	1275	1075	1836	1474	3024	2815	1862	1447	3441	3233	1475	970	4131	3976	1524	911	4981	4827	1194	563	5111	5000
90	3.417	0.060	0.998	0.060	1635	1523	1076	887	1641	1522	1135	946	1655	1520	1268	1078	1827	1484	3017	2819	1852	1459	3434	3236	1462	984	4125	3979	1508	928	4975	4830	1178	579	5107	5002
85	3.227	0.056	0.998	0.056	1632	1527	1068	890	1638	1525	1127	949	1651	1524	1260	1081	1817	1493	3009	2823	1841	1470	3427	3240	1449	997	4119	3981	1492	944	4969	4832	1161	596	5102	5003
80	3.037	0.053	0.999	0.053	1629	1530	1060	893	1635	1529	1120	952	1648	1528	1253	1034	1808	1503	3002	2826	1830	1481	3419	3244	1436	1011	4113	3983	1476	960	4964	4835	1145	613	5098	5004
75	2.847	0.050	0.999	0.050	1627	1533	1053	896	1632	1533	1112	955	1644	1532	1245	1087	1799	1513	2994	2830	1820	1492	3412	3247	1423	1024	4107	3986	1460	977	4958	4837	1128	630	5093	5006
70	2.657	0.046	0.999	0.046	1624	1537	1045	899	1629	1536	1104	957	1641	1536	1237	1090	1790	1523	2987	2833	1809	1503	3404	3251	1410	1038	4101	3988	1444	993	4952	4839	1112	646	5088	5007
65	2.467	0.043	0.999	0.043	1621	1540	1038	902	1625	1540	1097	960	1637	1540	1230	1093	1780	1533	2979	2836	1798	1515	3397	3254	1397	1051	4096	3990	1428	1009	4947	4841	1095	663	5084	5008
60	2.277	0.040	0.999	0.040	1618	1543	1030	904	1622	1543	1089	963	1634	1544	1222	1096	1771	1542	2972	2840	1788	1526	3389	3258	1384	1065	4090	3992	1412	1026	4941	4844	1079	680	5079	5009
55	2.087	0.036	0.999	0.036	1615	1547	1023	907	1619	1547	1082	966	1630	1548	1215	1099	1762	1552	2964	2843	1777	1537	3382	3261	1370	1078	4083	3994	1396	1042	4935	4846	1062	697	5074	5010
50	1.898	0.033	0.999	0.033	1612	1550	1015	910	1616	1550	1074	969	1627	1552	1207	1102	1752	1562	2956	2847	1766	1548	3374	3264	1357	1091	4077	3996	1380	1058	4929	4848	1046	713	5069	5011
45	1.708	0.030	1.000	0.030	1609	1553	1007	913	1613	1554	1066	972	1623	1556	1199	1105	1743	1571	2949	2850	1755	1559	3366	3268	1344	1105	4071	3998	1364	1074	4923	4850	1029	730	5064	5012
40	1.518	0.026	1.000	0.026	1606	1557	1000	916	1610	1557	1059	975	1619	1560	1192	1107	1734	1531	2941	2853	1745	1570	3359	3271	1331	1118	4065	4000	1348	1091	4917	4852	1013	747	5060	5013
35	1.328	0.023	1.000	0.023	1603	1560	992	919	1607	1560	1051	978	1616	1563	1184	1110	1724	1591	2933	2856	1734	1581	3351	3274	1318	1132	4059	4002	1332	1107	4910	4854	998	763	5055	5014
30	1.138	0.020	1.000	0.020	1600	1563	984	921	1603	1564	1043	980	1612	1567	1176	1113	1715	1600	2925	2859	1723	1592	3343	3277	1305	1145	4053	4004	1316	1123	4904	4856	980	780	5049	5015
25	0.949	0.017	1.000	0.017	1597	1566	977	924	1600	1567	1036	983	1608	1571	1169	1116	1705	1610	2918	2863	1712	1603	3335	3281	1291	1158	4046	4006	1300	1139	4898	4858	963	797	5044	5015
20	0.759	0.013	1.000	0.013	1594	1569	969	927	1597	1571	1028	986	1605	1575	1161	1119	1696	1620	2910	2866	1702	1614	3328	3284	1278	1172	4040	4007	1284	1155	4892	4859	946	813	5039	5016
15	0.569	0.010	1.000	0.010	1591	1573	961	930	1594	1574	1020	989	1601	1579	1153	1122	1687	1629	2902	2869	1691	1625	3320	3287	1265	1185	4033	4009	1268	1172	4885	4861	930	830	5034	5017
10	0.379	0.007	1.000	0.007	1588	1576	953	933	1591	1577	1012	991	1597	1582	1146	1124	1677	1639	2894	2872	1680	1636	3312	3290	1252	1198	4027	4011	1252	1188	4879	4863	913	847	5029	5017
5	0.190	0.003	1.000	0.003	1585	1579	946	935	1587	1581	1005	994	1594	1586	1138	1127	1668	1648	2886	2875	1669	1647	3304	3293	1238	1212	4021	4012	1236	1204	4873	4864	897	863	5023	5018
0	0.000	0.000	1.000	0.000	1582	1582	938	938	1584	1584	997	997	1590	1590	1130	1130	1658	1658	2878	2878	1658	1658	3296	3296	1225	1225	4014	4014	1220	1220	4866	4866	880	880	5018	5018

REFER TO FIGURE: CMSG-4A

E = [ab+(h x tan α)] x cos α

F = [ab-(h x tan α)] x cos α

H_1 = (Ca/2)+(h/cos α)+(Ab-h x tan α)x sin α

H_2 = (Ca/2)+(h/cos α)-(ab+h x tan α) x sin α

ab = Ab=Distance from centre line of vehicle to K.E. for Tangent Track at height 'h' from rail level

ac = Distance from centre line of canted track to K.E. for Tangent track at height 'h' from rail level.

bc = hxtanα =Lateral increment due to cant (measured along the line parallel to line joining top of rails).

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approved on
13/5/25
Railway Board

APPENDIX - 3A (TNL)

CANT EFFECT ON KINEMATIC ENVELOPE UNDER GROUND SECTIONS (RECTANGULAR BOX/ TUNNELS)

REF: PARA 1.7.2

Height above rail level measured perpendicular to plane of track →					h = 947				h = 1130				h = 2885				h = 3287				h = 4005				h = 4158				h = 4318			
Distance from centre line of track to K.E. for tangent track →					ab = 1570				ab = 1576				ab = 1622				ab = 1629				ab = 1089				ab = 980				ab = 820			
Cant	Angle a	Sin a	cos a	tan a	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2	E	F	H_1	H_2
125	4.748	0.083	0.997	0.083	1643	1486	1136	876	1664	1477	1319	1058	1862	1385	3072	2803	1896	1351	3473	3203	1417	754	4144	3964	1321	632	4287	4125	1175	460	4434	4298
120	4.558	0.079	0.997	0.080	1640	1490	1129	879	1661	1481	1312	1061	1853	1395	3065	2806	1885	1363	3466	3207	1404	767	4139	3966	1307	646	4283	4127	1161	474	4430	4299
115	4.368	0.076	0.997	0.076	1638	1493	1121	882	1657	1485	1304	1064	1844	1405	3056	2810	1875	1374	3459	3211	1391	781	4134	3968	1294	660	4278	4129	1146	489	4425	4301
110	4.178	0.073	0.997	0.073	1635	1497	1114	885	1654	1489	1297	1067	1835	1415	3051	2814	1864	1385	3452	3215	1378	794	4129	3970	1280	674	4273	4131	1132	503	4421	4302
105	3.987	0.070	0.998	0.070	1632	1500	1106	888	1651	1494	1289	1070	1826	1424	3044	2817	1854	1396	3445	3218	1365	808	4124	3972	1267	688	4269	4132	1118	518	4417	4303
100	3.797	0.066	0.998	0.066	1629	1504	1099	891	1647	1498	1282	1073	18.6	1434	3037	2821	1843	1408	3438	3222	1352	821	4118	3974	1253	702	4264	4134	1104	532	4413	4304
95	3.607	0.063	0.998	0.063	1626	1507	1091	894	1644	1502	1274	1076	1807	1444	3029	2824	1833	1419	3430	3226	1339	835	4113	3976	1240	716	4259	4136	1090	547	4409	4305
90	3.417	0.060	0.998	0.060	1624	1511	1084	897	1641	1506	1267	1079	1798	1454	3022	2828	1822	1430	3423	3229	1326	848	4108	3978	1226	730	4254	4137	1076	561	4404	4306
85	3.227	0.056	0.998	0.056	1621	1514	1076	900	1637	1510	1259	1082	1789	1464	3015	2831	1811	1441	3416	3233	1313	862	4102	3980	1213	744	4249	4139	1062	576	4400	4307
80	3.037	0.053	0.999	0.053	1618	1518	1069	902	1634	1514	1252	1085	1780	1474	3007	2835	1801	1453	3409	3236	1300	875	4097	3982	1199	758	4244	4140	1048	590	4395	4308
75	2.847	0.050	0.999	0.050	1615	1521	1061	905	1630	1518	1244	1088	1770	1484	3000	2838	1790	1464	3401	3240	1287	889	4092	3983	1185	772	4239	4142	1033	605	4391	4309
70	2.657	0.046	0.999	0.046	1612	1524	1054	908	1627	1522	1237	1091	1761	1494	2992	2841	1780	1475	3394	3243	1273	902	4086	3985	1172	786	4234	4143	1019	619	4386	4310
65	2.467	0.043	0.999	0.043	1609	1528	1046	911	1623	1526	1229	1094	1752	1503	2985	2845	1769	1486	3387	3246	1260	916	4081	3987	1158	800	4229	4144	1005	633	4382	4311
60	2.277	0.040	0.999	0.040	1606	1531	1039	914	1620	1530	1222	1096	1742	1513	2977	2848	1758	1497	3379	3250	1247	929	4075	3989	1144	814	4224	4146	991	648	4377	4312
55	2.087	0.036	0.999	0.036	1603	1534	1031	917	1616	1534	1214	1099	1733	1523	2970	2851	1748	1508	3372	3253	1234	942	4070	3990	1131	828	4218	4147	977	662	4373	4313
50	1.898	0.033	0.999	0.033	1600	1538	1023	919	1613	1538	1207	1102	1724	1533	2962	2854	1737	1519	3364	3256	1221	956	4064	3992	1117	842	4213	4148	963	677	4368	4313
45	1.708	0.030	1.000	0.030	1598	1541	1016	922	1609	1542	1199	1105	1714	1542	2955	2858	1726	1530	3357	3259	1208	969	4058	3993	1103	856	4208	4149	948	691	4363	4314
40	1.518	0.026	1.000	0.026	1595	1544	1008	925	1605	1546	1191	1108	1705	1552	2947	2861	1716	1541	3349	3263	1195	983	4052	3995	1090	870	4203	4151	934	705	4358	4315
35	1.328	0.023	1.000	0.023	1592	1548	1001	928	1602	1549	1184	1111	1695	1562	2939	2864	1705	1552	3341	3266	1182	996	4047	3996	1076	883	4197	4152	920	720	4353	4315
30	1.138	0.020	1.000	0.020	1589	1551	993	931	1598	1553	1176	1113	1686	1571	2932	2867	1694	1563	3334	3269	1168	1009	4041	3998	1062	897	4192	4153	906	734	4348	4316
25	0.949	0.017	1.000	0.017	1585	1554	985	933	1594	1557	1168	1116	1677	1581	2924	2870	1683	1574	3326	3272	1155	1023	4035	3999	1049	911	4186	4154	891	748	4343	4316
20	0.759	0.013	1.000	0.013	1582	1557	978	936	1591	1561	1161	1119	1667	1591	2916	2873	1672	1585	3318	3275	1142	1036	4029	4000	1035	925	4181	4155	877	763	4338	4317
15	0.569	0.010	1.000	0.010	1579	1561	970	939	1587	1565	1153	1122	1658	1600	2909	2876	1662	1596	3311	3278	1129	1049	4023	4001	1021	939	4175	4156	863	777	4333	4317
10	0.379	0.007	1.000	0.007	1576	1564	962	942	1583	1568	1145	1125	1648	1610	2901	2879	1651	1607	3303	3281	1115	1062	4017	4003	1008	952	4169	4156	849	791	4328	4317
5	0.190	0.003	1.000	0.003	1573	1567	955	944	1580	1572	1138	1127	1639	1619	2893	2882	1640	1618	3295	3284	1102	1076	4011	4004	994	966	4164	4157	834	806	4323	4318
0	0.000	0.000	1.000	0.000	1570	1570	947	947	1576	1576	1130	1130	1629	1629	2885	2885	1529	1629	3287	3287	1089	1089	4005	4005	980	980	4158	4158	820	820	4318	4318

REFER TO FIGURE: CMSG-4A

E = [ab+(h x tan α)] x cos α F= [ab-(h x tan α)] x cos α

H_1 = (Ca/2)+(h / cos α)+(Ab-h x tan α)x sin α; H_2=(Ca/2)+(h/cos α)-(ab+h x tan α) x sin α

ab=Ab=Distance from centre line of vehicle to K.E. for Tangent Track at height 'h' from rail level & ac = Distance from centre line of canted track to K.E for Tangent track at height 'h' from rail level.

bc = hxtanα =Lateral increment due to cant (measured along the line parallel to line joining top of rails).

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate Approved on 13/5/25 Railway Board

APPENDIX – 4

LATERAL AND VERTICAL SHIFT OF CENTRE OF CIRCULAR TUNNEL FOR DIFFERENT CANT VALUES

(With D_1 = 880 mm & Radius r=2900mm

REFER TO FIGURE: CMSG-3 AND PARA Nos. 1.7.1 (B)-b & 1.7.2 (B)-b

All figures are in mm

CANT	Sin α = Cant / 1510	Angle α	Angle θ	Lateral Shift of Tunnel centre - X	Vertical Shift of Tunnel centre = Y	Remark
Min		Degrees	Degrees	mm	mm	
125	0.08278	4.7485	69.5061	170	56	
120	0.07947	4.5581	69.5061	163	54	
115	0.07616	4.3678	69.5061	156	52	
110	0.07285	4.1776	69.5061	149	50	
105	0.06954	3.9874	69.5061	142	48	
100	0.06623	3.7972	69.5061	135	46	
95	0.06291	3.6071	69.5061	129	43	
90	0.05960	3.4170	69.5061	122	41	
85	0.05629	3.2270	69.5061	115	39	
80	0.05298	3.0370	69.5061	108	37	
75	0.04967	2.8470	69.5061	101	35	
70	0.04636	2.6570	69.5061	94	33	
65	0.04305	2.4671	69.5061	88	31	
60	0.03974	2.2773	69.5061	81	28	
55	0.03642	2.0874	69.5061	74	26	
50	0.03311	1.8976	69.5061	67	24	
45	0.02980	1.7077	69.5061	61	22	
40	0.02649	1.5179	69.5061	54	19	
35	0.02318	1.3282	69.5061	47	17	
30	0.01987	1.1384	69.5061	40	15	
25	0.01656	0.9486	69.5061	34	12	
20	0.01325	0.7589	69.5061	27	10	
15	0.00993	0.5692	69.5061	20	7	
10	0.00662	0.3794	69.5061	13	5	
5	0.00331	0.1897	69.5061	7	2	
0	0	0	69.5061	0	0	

(a) The cant is provided by raising the outer rail which will mean, rotating the tunnel about the mid point of top of inner rail.

(b) ' X' is lateral shift of the centre of the tunnel towards inside of the curve

$X = [\{2 \times (r-D1)/\sin\theta\} \times \{\sin\alpha/2\}] \times \cos(90-\theta-\alpha/2)$

(c) 'Y' is the vertical shift of the centre of the tunnel (upwards)

$Y = [\{2 \times (r-D1)/\sin\theta\} \times \{\sin\alpha/2\}] \times \sin(90-\theta-\alpha/2)$ where,

'r' is internal radius of the circular tunnel=2900 mm

D1 = depth from rail level to invert of circular tunnel=880 mm

α = angle of rotation=$\sin^{-1}$ (Cant/g) and

θ = angle subtended by line joining top of two rails and the line joining mid point of top of inner rail and the centre of circular Tunnel

= $\tan^{-1}[(r-D1) / (g/2)]$ in degrees=69.5061

g= Centre to centre of rails = 1510 mm

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL.
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

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APPENDIX – 5

ADDITIONAL CLERANCE FOR PLATFORMS ON CURVES UNDER GROUND, ELEVATED AND AT GRADE STATIONS

Refer Para 2.7

RADIUS	EXTRA CLEARANCE													
	INSIDE OF CURVE								OUTSIDE OF CURVE					
	At centre line between Bogies				At Edge of Open Door, Nearest to the centre line between Bogies				At End of Coach	At Edge of Open Door, Farthest from the centre line between Bogies				
	Mid throw =28500/R	Nosing	Additional Clearance	Additional Clearance (rounded up)	Throw =27720/R	Nosing= 13*1.25/11.075	Additional Clearance	Additional Clearance (rounded up)	End throw =34683/R	Throw =23856/R	Nosing =13*10.05 /11.075	Diff bet N & N2	Additional Clearance	Additional Clearance (rounded up)
R	V	N	V-N	V-N	V_3	N_1	V_3-(N-N_1)	V_3-(N-N_1)	V_0	V_4	N_2	N-N_2	V_4-(N-N_2)	V_4-(N-N_2)
Metres	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1	2	3	4a	4	5	6	7a	7	8	9	10	11	12a	12
3000	10	13	-3.5	0	9.2	1.5	-2.3	0	12	8.0	11.8	1.2	6.7	5
2800	10	13	-2.8	0	9.9	1.5	-1.6	0	12	8.5	11.8	1.2	7.3	10
2600	11	13	-2.0	0	10.7	1.5	-0.9	0	13	9.2	11.8	1.2	8.0	10
2400	12	13	-1.1	0	11.6	1.5	0.0	0	14	9.9	11.8	1.2	8.7	10
2200	13	13	0.0	0	12.6	1.5	1.1	5	16	10.8	11.8	1.2	9.6	10
2000	14	13	1.3	5	13.9	1.5	2.3	5	17	11.9	11.8	1.2	10.7	10
1800	16	13	2.8	5	15.4	1.5	3.9	5	19	13.3	11.8	1.2	12.1	10
1700	17	13	3.8	5	16.3	1.5	4.8	5	20	14.0	11.8	1.2	12.8	15
1600	18	13	4.8	5	17.3	1.5	5.8	10	22	14.9	11.8	1.2	13.7	15
1500	19	13	6.0	10	18.5	1.5	6.9	10	23	15.9	11.8	1.2	14.7	15
1400	20	13	7.4	10	19.8	1.5	8.3	10	25	17.0	11.8	1.2	15.8	20
1300	22	13	8.9	10	21.3	1.5	9.8	10	27	18.4	11.8	1.2	17.1	20
1200	24	13	10.8	15	23.1	1.5	11.6	15	29	19.9	11.8	1.2	18.7	20
1100	26	13	12.9	15	25.2	1.5	13.7	15	32	21.7	11.8	1.2	20.5	25
1000	29	13	15.5	20	27.7	1.5	16.2	20	35	23.9	11.8	1.2	22.7	25

NOTES:

1. For outside of curve ,the difference between clearance required at coach end that the farthest door edge is less than 25mm.As half width of coach at ends is at least 25mm less than that at doors locations, additional clearance to be provided is additional clearance required at the farthest door edge (column 12).
2. Values of additional clearances (Column 4,7 and 12) rounded UP to the nearest value that is divisible by 5mm.
3. Negative values of additional clearance are taken as zero in the columns 4 & 7 with rounded off figures.
4. Extra clearance for curve:
   (a) Inside of curve:
   V_3= (125C² / R) =28500/R when C=15.10m (worst case/ max bogie pitch)
   V_3= [(125)x(15.1² - 4x 1.25²) /R] =27720 /R
   N_1=N x (X)/(C_1/2)=13 x 1.25/11.075 =1.467 mm
   The 1.25m value (X) above is the distance between the centre line between the Bogies and the edge of the nearest door leaf (0.875m wide) in its open position
   The higher of (i) column 4 and (ii) column 7 shall be adopted.
   (b) Outside of curve
   V_0=(125 $C_1$²/R)-(125c²/R)=34683 /R for coach end when c=14.6 meters (worst case/ min bogie pitch) and C_1= 2x11.075 meters
   V_4=125x(20.1*20.1-14.6x14.6)/R = 23856.3/R for furthest edge of end door in open position with
   C_1=2x10.05=20.1 meters and C=14.60 meters for the worst case.
   N_2=Nosing at the farthest edge of an open door =Nx (X)/(C_1/2) =13 x 10.05/11.075mm=11.8 mm
   R= Radius of curve in meters
   The 10.05m value (X) above is the distance between the centre line between the Bogies and the edge of the furthest door leaf (0.875m wide) in its open position
5. There will be no super elevation on curves in platform portion.

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

Project Directorate
Approved
13/5/25
Reitwan Road

APPENDIX – 6

Sample Egress calculation report for Underground Station

UNDERGROUND STATION				
Year	**Boarding**	**Alighting**		
Dir 1 *(Towards CMBT)*	**57.55**	**44.67**	**Per Min**	
Dir 2 *(Towards MMC)*	**11.42**	**28.93**	**Per Min**	
Head way			3.54	mins
Sectional Load Direction 1			5176	Considering 1 missed headway and surge factor
Sectional Load Direction 2			2996	
Dense Crush Load			2004	
Platform Evacuation Time		***within***	**4**	**mins**
Surge Factor			1.3	mins
2 Headway entraining load for Peak Direction			7.1	mins
1 Headway entering entraining load for off-peak Direction			3.54	mins
POL (Emergency Service) Incident Direction 1			2586.2	
POL (Emergency Service) Incident Direction 2			2373.9	
Required Egress Capacity of Platform 1 (PEC)			**646.56**	
(Evacuation Load / Evacuation Time)				
Staircase Egress Capacity (Per/min)			55.50	
Working Escalator Egress Capacity (Per/min)			120.00	
Slopped Escalator Egress Capacity (Per/min)			55.50	
Elements			**Width**	**Nos**
Public Staircase			3.6	1
Fire Escape staircase inside station box			1.5	2
Working Escalator (4 nos; 3 used)			1	3
Stopped Escalator (0 nos; 0 used)			1	0
Proposed Egress Capacity			**726.3**	
Proposed Time For evacuation of Platform(Tp)			**3.56**	

Examined and found in ord
Pradeep Kr. Mishra
ADSN/Y.DN/L
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

A. ASHOK KUMAR, IRSE

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Project Directorate
Approved on
13/5/25
Railway Board

APPENDIX – 6A

Sample Egress calculation report for Elevated Station

ELEVATED STATION			
Year	Boarding	Alighting	
Dir 1 *(Towards CMBT)*	34.47	3.80	Per Min
Dir 2 *(Towards MMC)*	5.27	31.52	Per Min

Head way			8.56	mins
Sectional Load Direction 1			1181	Considering 1 missed headway and surge factor
Sectional Load Direction 2			997	
Dense Crush Load			2004	
Platform Evacuation Time		*within*	**5.5**	**mins**
Surge Factor			1.3	mins
2 Headway entraining load for Peak Direction			17.1	mins
1 Headway entering entraining load for off-peak Direction			8.56	mins

POL (Emergency Service) Direction 1	1947.8
POL (Emergency Service) Direction 2	1114.6

Direction 1		
Elements	Width	Nos
Public Staircase	3.6	1
Fire Escape staircase inside station box	3.6	1
Fire Escape staircase outside station box	0	0
Working Escalator (2 nos; 1 used)	1	1
Stopped Escalator (0 nos; 0 used)	1	0
Proposed Egress Capacity	**519.6**	
Proposed Time For evacuation of Platform(Fp)	**3.75**	

Direction 2		
Elements	Width	Nos
Public Staircase	3.6	1
Fire Escape staircase inside station box	3.6	1
Fire Escape staircase outside station box	0	0
Working Escalator (2 nos; 1 used)	1	1
Stopped Escalator (0 nos; 0 used)	1	0
Proposed Egress Capacity	**519.6**	
Proposed Time For evacuation of Platform(Fp)	**2.15**	

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

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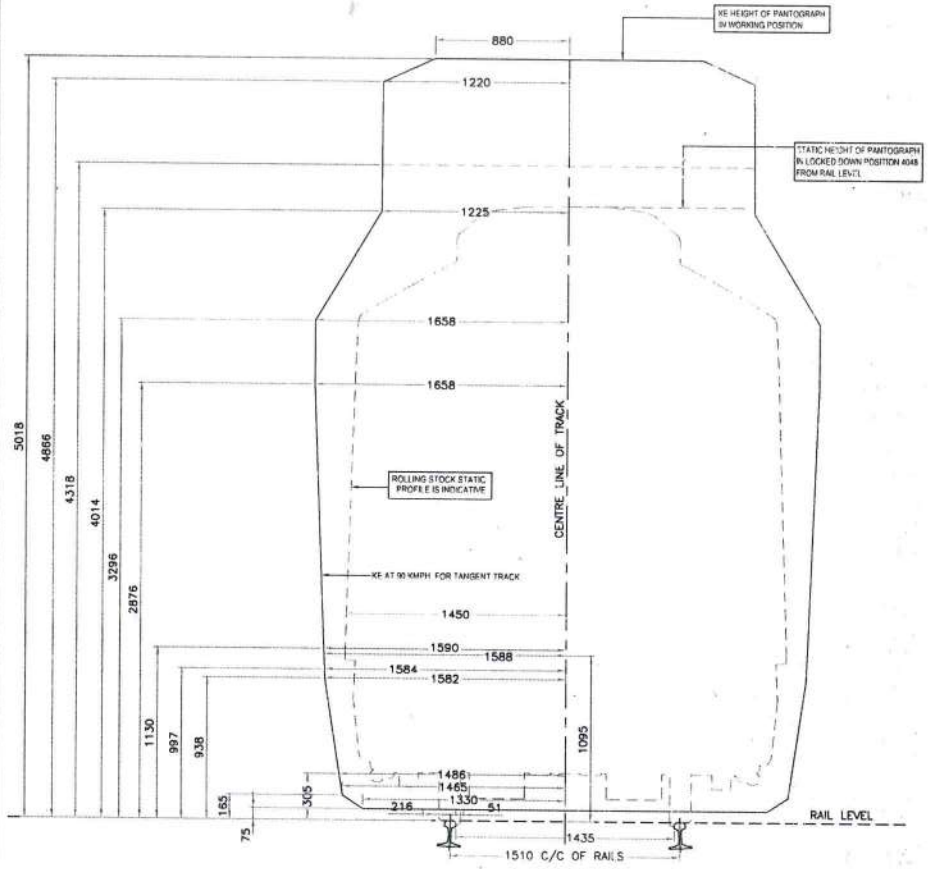
Project Directorate
Approved on
13/5/25
Railway Board



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE ADDITIONAL.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. THE CONDUCTOR HEIGHT ABOVE RAIL LEVEL SHALL ALSO TAKE IN TO CONSIDERATION PRESCRIBED ELECTRICAL CLEARENCES BETWEEN ALL LIVE OVERHEAD EQUIPMENT & PANTOGRAPH/VEHICLE AND ALL PARTS THEREOF.
5. A TYRE OR ATTACHMENT OF A WHEEL MAY PROJECT BELOW THE MINIMUM HEIGHT OF KINEMETIC ENVELOPE FOR A DISTANCE OF 51 MM INSIDE AND 216 MM OUTSIDE OF THE GAUGE FACE OF THE WHEEL.
6. KINEMATIC ENVELOPE IS VALID FOR VEHICLE SPEEDS UPTO 90 KMPH
7. ROLLING STOCK STATIC PROFILE IS REPRESENTATIVE. ALL ROLLING STOCK CONTRACTORS WILL COMPLY TO THE KINEMATIC ENVELOPE AS IT HAS BEEN FIXED
8. THE CROSS WIND SPEED FOR CALCULATING THE KINEMATIC ENVELOPE WAS CONSIDERED AS 100 KMPH ON AT-GRADE /ELEVATED SECTION.
9. STATIC AND DYNAMIC ELECTRICAL CLEARANCES 290 MM AND 190 MM AS PER CLAUSE 4.1.3
10. REGIONAL WIND SPEED OF THE LOCATION OF TRAIN OPERATION AS PER IS: 875 (LATEST) : 50 M/SEC.
11. DESIGN SPEED : 90 KMPH
12. INFRINGEMENT TO SOD : NIL
13. LEGEND

KINEMATIC ENVELOPE LEVEL TANGENT TRACK
ROLLING STOCK STATIC PROFILE
REDUCED HEIGHT KINEMATIC ENVELOPE LIMIT IS APPLICABLE FOR THROUGH & SEMI THROUGH GIRDER BRIDGES.

A. ASHOK KUMAR

Examined and found in order
Pradeep Kr. Mishra
ADE/A.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

CHENNAI METRO RAIL LIMITED
Phase-2 Project
Metro8, No 327, Anna Salai, Nandanam, Chennai-600035.
Ph: 044-23792000, Fax: 044-23792299.
Email: chennaimetromail@gmail.com

STANDARD GAUGE
(1435mm)
25KV 50Hz A.C.TRACTION

GENERAL NOTES

REV	DATE	DESCRIPTION	APPROVED

APPROVED
CHECKED
DRAWN
DATE

DRAWING NAME: KINEMATIC ENVELOPE FOR 90 KMPH – THROUGH & SEMI THROUGH GIRDER BRIDGES, AT GRADE, AND ELEVATED SECTIONS ON LEVEL (OR CONSTANT GRADE) TANGENT TRACK.

DRAWING NUMBER: CMSG-1 REF-PARA 1.5

SHEET NO: 1 of 1 | SHEET SIZE: A1

SCALE: 1:1

REV: 1

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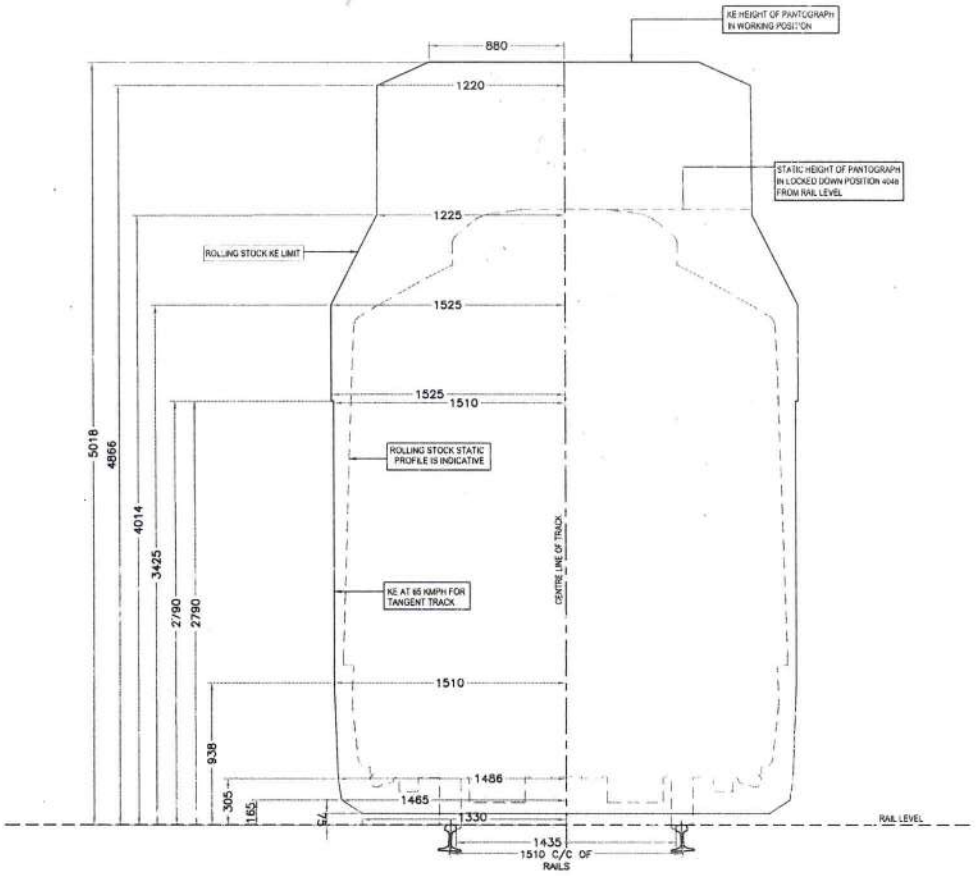
13/5/25
Railway Board



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE ADDITIONAL.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION. KINEMATIC ENVELOPE IS VALID FOR VEHICLE SPEEDS UPTO 65 KMPH
4. ROLLING STOCK STATIC PROFILE IS REPRESENTATIVE. ALL ROLLING STOCK CONTRACTORS WILL COMPLY TO THE LIMIT FOR KINEMATIC ENVELOPE AS SHOWN.
5. THE CROSS WIND SPEED FOR CALCULATING THE KINEMATIC ENVELOPE WAS CONSIDERED AS 70 KMPH ON AT-GRADE/ ELEVATED STATION.
6. STATIC AND DYNAMIC ELECTRICAL CLEARANCES 290 MM AND 190 MM AS PER CLAUSE 4.1.3
7. REGIONAL WIND SPEED OF THE LOCATION OF TRAIN OPERATION AS PER IS: 875 (LATEST) : 50 M/SEC.
8. DESIGN SPEED : 65 KMPH
9. INFRINGEMENT TO SOD : NIL
10. LEGEND

KINEMATIC ENVELOPE LEVEL TANGENT TRACK (ELEVATED STATIONS)
ROLLING STOCK STATIC PROFILE

Examined and found in order

POINT	X	Y
1	0	5018
2	880	5018
3	1220	4866
4	1225	4014
5	1525	3425
6	1525	2790
7	1510	2790
8	1510	938
9	1486	305
10	1465	165
11	1330	75
12	0	75

CHENNAI METRO RAIL LIMITED
Phase-2 Project
Metro5, No:327, Anna Salai, Nandanam, Chennai-600035.
Ph: 044-23762000, Fax: 044-23762200, Email: chennaimetrorail@gmail.com

STANDARD GAUGE
(1435mm)
25KV 50Hz A.C.TRACTION

GENERAL NOTES

REV	DATE	DESCRIPTION	APPROVED

APPROVED
CHECKED
DRAWN
DATE

DRAWING NAME: KINEMATIC ENVELOPE FOR 65 KMPH – AT GRADE AND ELEVATED STATIONS ON LEVEL (OR CONSTANT GRADE) TANGENT TRACK.

DRAWING NUMBER: CMSG-1A REF-PARA 1.6

SHEET NO: 1 of 1 | SHEET SIZE: A3
SCALE: 1:1
REV: 1

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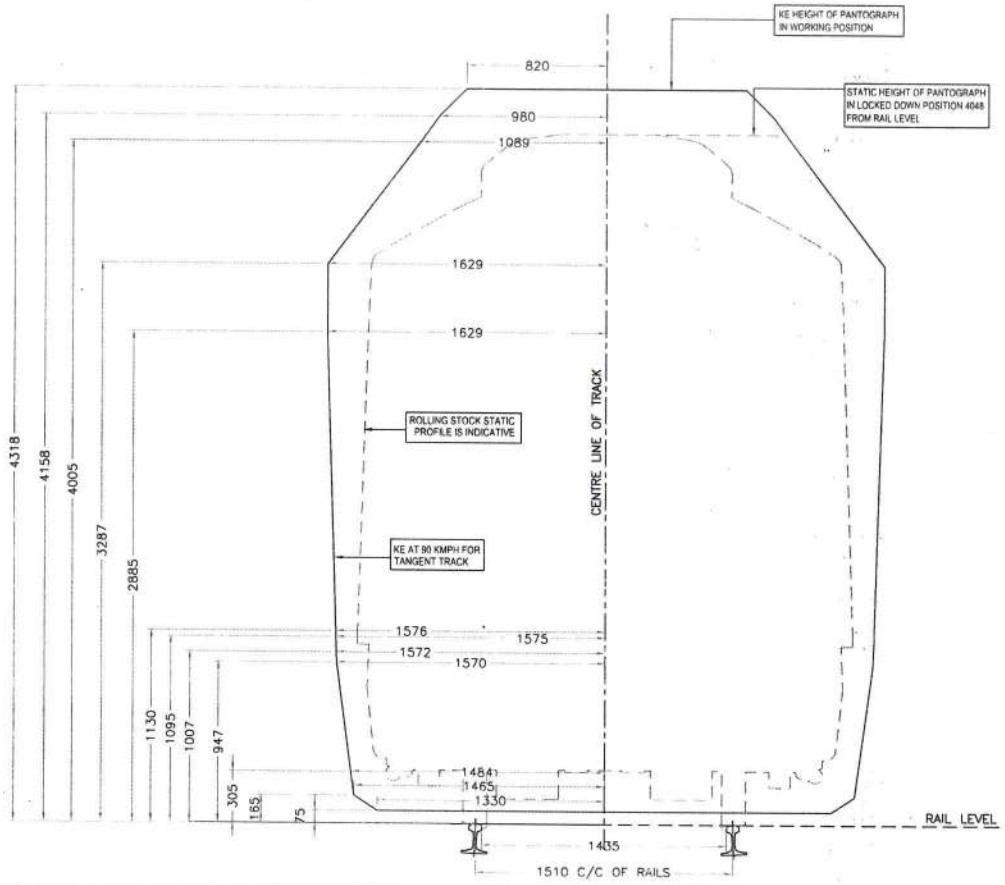

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE ADDITIONAL.
3. KINEMETIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. THE CONDUCTOR HEIGHT ABOVE RAIL LEVEL SHALL ALSO TAKE IN TO CONSIDERATION PRESCRIBED ELECTRICAL CLEARENCES BETWEEN ALL LIVE OVERHEAD EQUIPMENT AND PANTOGRAPH/VEHICLE AND ALL PARTS THEREOF.
5. A TYRE OR ATTACHMENT OF A WHEEL MAY PROJECT BELOW THE MINIMUM HEIGHT OF KINEMETIC ENVELOPE FOR A DISTANCE OF 51 MM INSIDE AND 216 MM OUTSIDE OF THE GAUGE FACE OF THE WHEEL.
6. KINEMATIC ENVELOPE IS VALID FOR VEHICLE SPEEDS UPTO 90 KMPH
7. ROLLING STOCK STATIC PROFILE IS REPRESENTATIVE. ALL ROLLING STOCK CONTRACTORS WILL COMPLY TO THE KINEMATIC ENVELOPE LIMIT SHOWN
8. THE CROSS WIND SPEED FOR CALCULATION THE KINEMATIC ENVELOPE WAS CONSIDERED AS ZERO KMPH FOR UNDERGROUND SECTIONS
9. STATIC AND DYNAMIC ELECTRICAL CLEARANCES 290 MM AND 190 MM AS PER CLAUSE 4.1.3
10. REGIONAL WIND SPEED OF THE LOCATION OF TRAIN OPERATION AS PER IS: 875 (LATEST) : 50 M/SEC.
11. DESIGN SPEED : 90 KMPH
12. INFRINGEMENT TO SOD : NIL
13. LEGEND

——— KINEMATIC ENVELOPE LEVEL TANGENT TRACK
– – – – ROLLING STOCK STATIC PROFILE

Examined and found in order
Pradeep Kr. Mishra
ADGM/T./CIVIL
R.D.S.O. (Ministry of Railways)

CHENNAI METRO RAIL LIMITED Phase-2 Project Metro8, No:327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000, Fax: 044-23792200. Email- chennaimetrorail@gmail.com		**STANDARD GAUGE** (1435mm) 25KV 50 Hz A.C.TRACTION	GENERAL NOTES	APPROVED CHECKED DRAWN DATE	DRAWING NAME: KINEMATIC ENVELOPE FOR 90 KMPH – UNDERGROUND SECTIONS ON LEVEL (OR CONSTANT GRADE) TANGENT TRACK. DRAWING NUMBER: CMSG-1(TNL)REF-PARA 1.5

REV.	DATE	DESCRIPTION	APPROVED

SHEET NO: 1 of 1 | SHEET SIZE: A3 | SCALE: 1:1 | REV: 2

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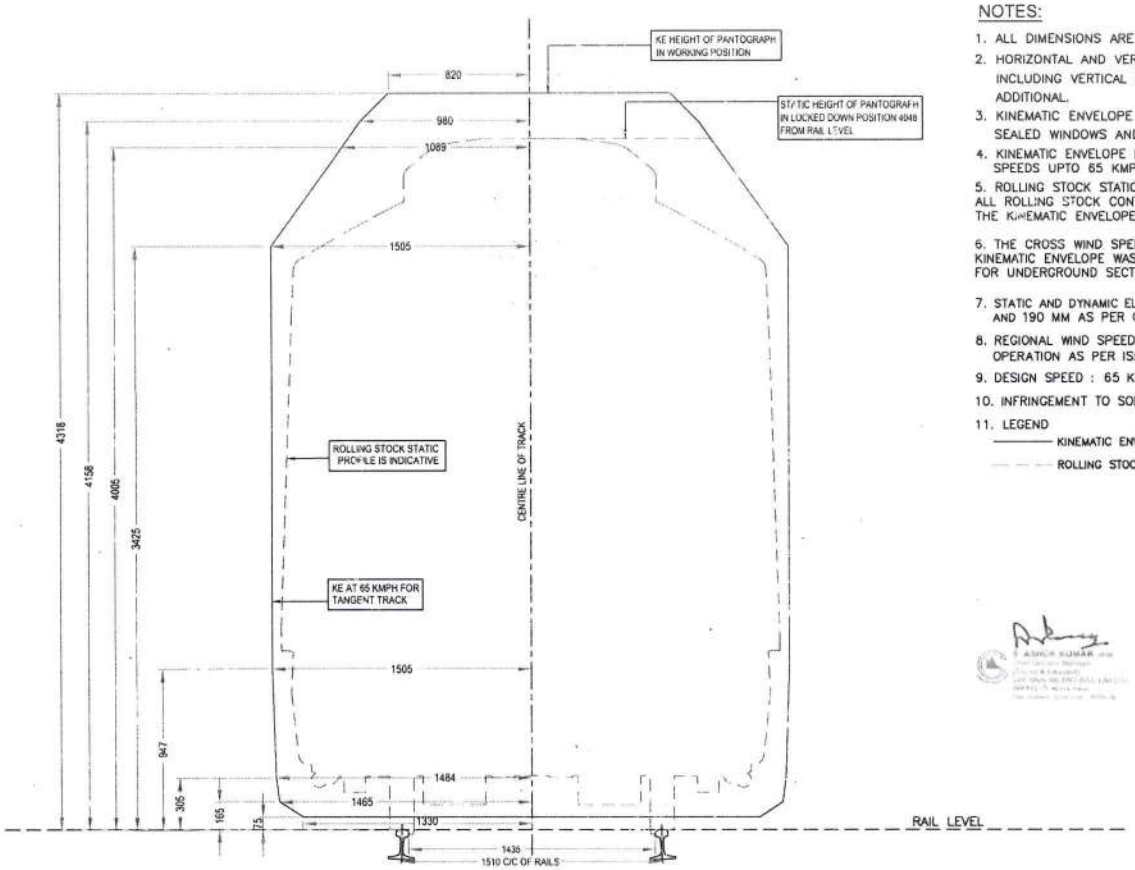
Railway Board



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE ADDITIONAL.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. KINEMATIC ENVELOPE IS VALID FOR VEHICLE SPEEDS UPTO 65 KMPH
5. ROLLING STOCK STATIC PROFILE IS REPRESENTATIVE. ALL ROLLING STOCK CONTRACTORS WILL COMPLY TO THE KINEMATIC ENVELOPE AS IT HAS BEEN FIXED
6. THE CROSS WIND SPEED FOR CALCULATION THE KINEMATIC ENVELOPE WAS CONSIDERED AS ZERO KMPH FOR UNDERGROUND SECTIONS
7. STATIC AND DYNAMIC ELECTRICAL CLEARANCES 290 MM AND 190 MM AS PER CLAUSE 4.1.3
8. REGIONAL WIND SPEED OF THE LOCATION OF TRAIN OPERATION AS PER IS: 875 (LATEST) : 50 M/SEC.
9. DESIGN SPEED : 65 KMPH
10. INFRINGEMENT TO SOD : NIL
11. LEGEND

——— KINEMATIC ENVELOPE LEVEL TANGENT TRACK (UNDERGROUND STATIONS)

– – – – ROLLING STOCK STATIC PROFILE

POINT	X	Y
1	0	4318
2	820	4318
3	980	4158
4	1089	4005
5	1505	3425
6	1505	947
7	1484	305
8	1465	165
9	1330	75
10	0	75

Examined and found in order
Pradeep Kr. Mishra
ADD'L.T.C/CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

CHENNAI METRO RAIL LIMITED Phase-2 Project Metro28, No:327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000, Fax: 044-23792200 Email: chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50 Hz A.C.TRACTION	GENERAL NOTES	APPROVED CHECKED DRAWN DATE	DRAWING NAME: KINEMATIC ENVELOPE FOR 65 KMPH – UNDERGROUND STATIONS ON LEVEL (OR CONSTANT GRADE) TANGENT TRACK. DRAWING NUMBER: CMSG–1A(TNL)REF–PARA 1.5 SHEET NO: 1 of 1, SHEET: A3, SCALE: 1:1, REV: 1

REV. | DATE | DESCRIPTION | APPROVED

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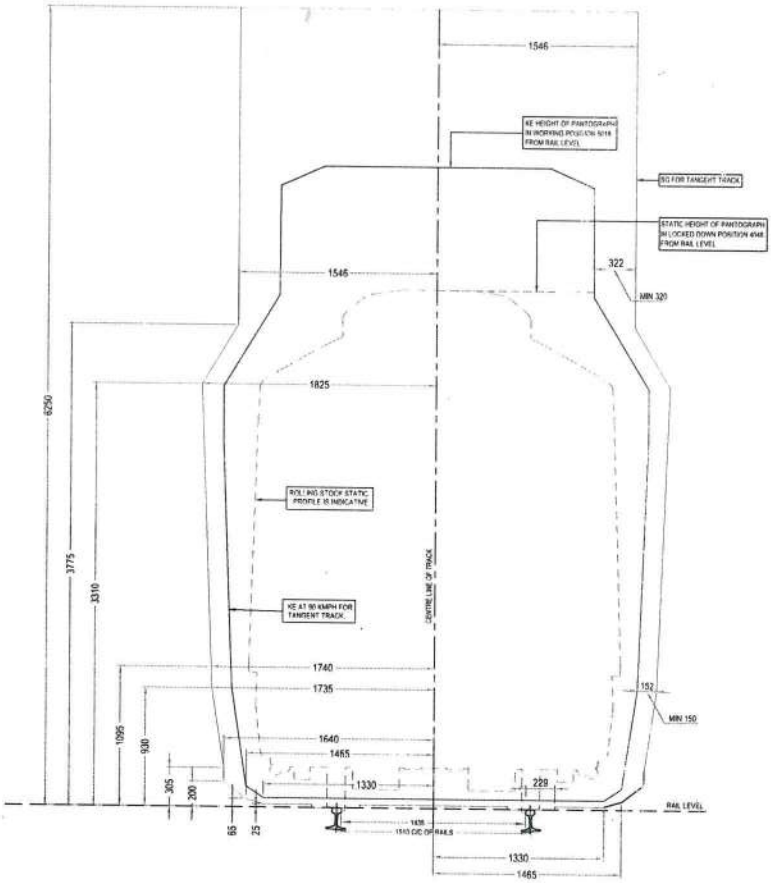

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. THIS STRUCTURE GAUGE WILL ALSO BE APPLICABLE FOR ROBs/FOBs AT STATIONS WITHOUT THE MAST UNDER THE STRUCTURES.
3. WHERE IT IS NECESSARY TO PROVIDE MAST UNDER THE ROB/FOB,THE HEIGHT SHALL BE INCREASED FROM 6250 mm TO 8290 mm. IN CASE THE CONTACT WIRE IS HIGHER, THE HEIGHT OF THE ROB/FOB SHALL BE INCREASED ACCORDINGLY.
4. MINIMUM CLEARANCE BETWEEN KINEMATIC ENVELOPE AND STRUCTURE GAUGE WILL BE 150 mm.
5. MINIMUM ELECTRICAL CLEARANCE OF 320 mm SHALL BE MAINTAINED BETWEEN 25 KV LIVE PARTS AND THE EARTHED STRUCTURES.
6. MINIMUM CLEARANCE FOR OHE MAST WILL BE 2150 mm FROM THE CENTRE OF TRACK.
7. KINEMETIC ENVELOPE AND STRUCTURE GAUGE ARE VALID FOR ROLLING STOCK WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
8. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHELL BE EXTRA.
9. FOR KINEMATIC ENVELOPE, REFER TO DRG.NO:CMSG-1.

LEGEND:

- KINEMATIC GAUGE
- STATIC PROFILE
- STRUCTURE GAUGE

Examined and found in order
Pradeep Kr. Mishra
ACE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

CHENNAI METRO RAIL LIMITED Phase-2 Project Metro, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23792356. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	DRAWING NAME STRUCTURE GAUGE - AT GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK (OUTSIDE STATION)	SHEET NO 1 of 1 SHEET S A1 SCALE: NOT TO SC. DRAWING NUMBER: CMSG-2 REV: 3

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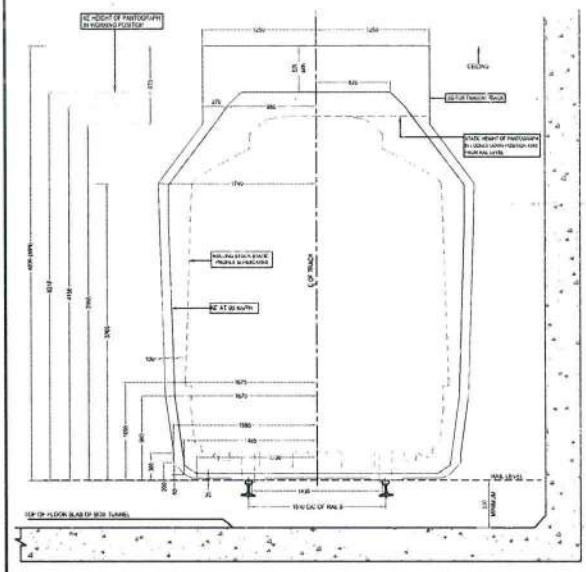
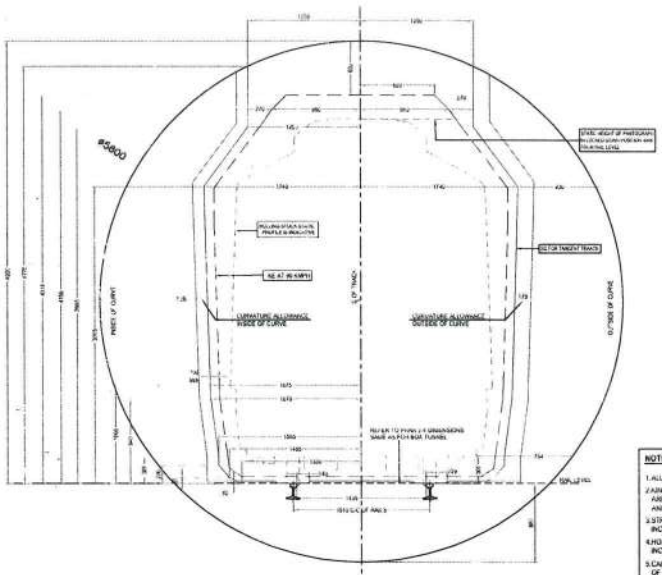


RECTANGULAR BOX TUNNEL



CIRCULAR TUNNEL 5800 mm DIA

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. KINEMATIC ENVELOPE AND STRUCTURE GAUGE ARE VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
3. STRUCTURE GAUGE FOR CURVE DOES NOT INCLUDE LATERAL SHIFT (LEAN) DUE TO CANT.
4. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
5. CANT WILL BE PROVIDED BY RAISING OUTER RAIL ONLY AND SHIFTING OF THE CENTRE OF THE CIRCULAR TUNNEL TOWARDS INSIDE OF THE CURVE AND UPWARDS. THIS WILL BE SAME AS ROTATING THE CIRCULAR TUNNEL ABOUT THE MID POINT OF TOP OF INNER RAIL.
6. MINIMUM CLEARANCE BETWEEN KINEMATIC ENVELOPE AND STRUCTURE GAUGE = 100mm.
7. THE ELECTRICAL CLEARANCE FROM 25kV LIVE PARTS AND EARTHED STRUCTURES SHALL BE 270 mm.
8. VERTICAL THROW DUE TO VERTICAL CURVE HAS NOT BEEN SHOWN IN THE FIGURE AND SHALL BE EXTRA.
9. FOR DETAILS OF KINEMATIC ENVELOPE, REFER TO DRAWING No. CMSG-1(TNL).
10. TUNNEL CONSTRUCTION TOLERANCE OF MAXIMUM ±100 mm SHALL BE PERMITTED ON DESIGNED TUNNEL DIA OF 5800 mm.

LEGEND
- KINEMATIC GAUGE
- STATIC PROFILE
- STRUCTURE GAUGE

CHENNAI METRO RAIL LIMITED, Phase-2 Project, Metro8, No.327, Anna Salai, Nandanam, Chennai-600035. Ph. 044-23792000, Fax. 044-23792200, Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50 Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED: CHECKED DRAWN DATE	DRAWING NAME: STRUCTURE GAUGE. CIRCULAR TUNNEL (5800MM DIA) AND RECTANGULAR BOX TUNNEL ON TANGENT TRACK AND CURVE UPTO R=200M. DRAWING NUMBER: CMSG-2(TNL)	SHEET NO 1 of 1 SCALE: NOT TO SC REV. 0

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Project Directorate Approved on 13/5/25 Railway Board

$\tan\theta = (r-D1)/(g/2)$

$\theta = \tan^{-1}[(r-D1)/(g/2)]$

$\sin\alpha = \text{cant}/g$

$\alpha = \sin^{-1}(\text{cant}/g)$

Chord $C_1C_2 = 2 \times [(r-D1)/\sin\theta) \times (\sin\alpha/2)]$

$X = C_1C_2 \times \cos(90-\theta-\alpha/2)$

$= 2 \times [(r-D1)/\sin\theta) \times (\sin\alpha/2)] \times \cos(90-\theta-\alpha/2)$

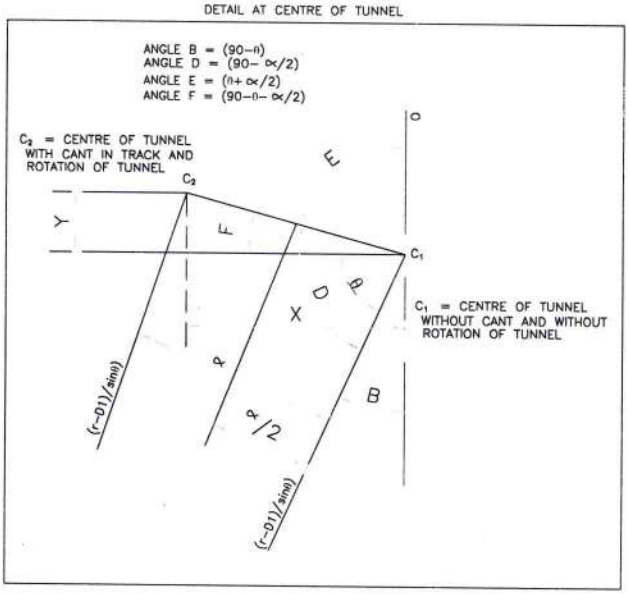
$Y = 2 \times [(r-D1)/\sin\theta) \times (\sin\alpha/2)] \times \sin(90-\theta-\alpha/2)$

where 'r' is internal radius of tunnel,

D_1 = depth from Rail level to invert of tunnel

g = distance between centres of rails = 1510 mm

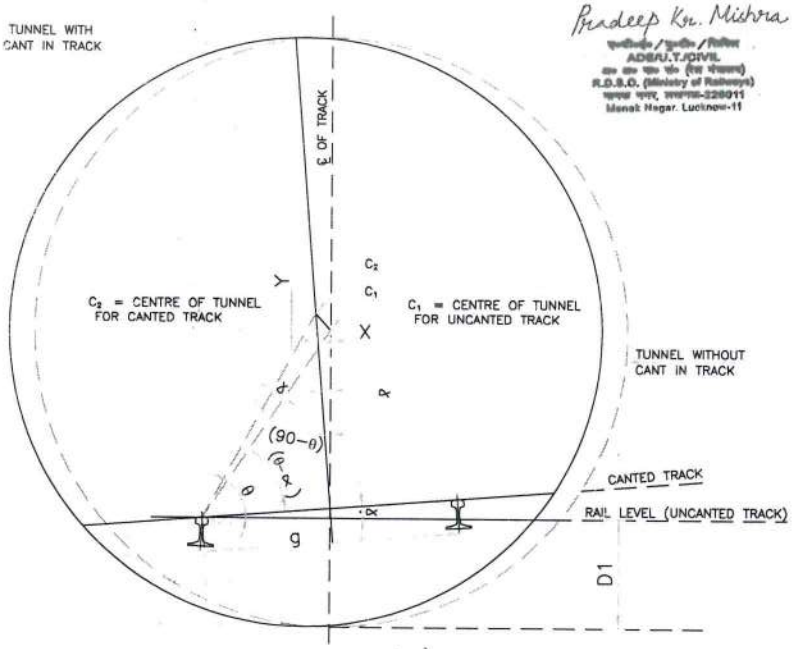
DETAIL AT CENTRE OF TUNNEL



NOTES:

1. THE CIRCULAR TUNNEL IS ROTATED ABOUT THE MID POINT OF TOP OF INNER RAIL FOR CANT.
2. FOR VALUES OF SHIFT 'X' AND 'Y' FOR VARIOUS VALUES OF CANT,REFER TO APPENDIX−4

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11



CHENNAI METRO RAIL LIMITED Phase-2 Project MetroS, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23792200 Email: chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	DRAWING NAME SHIFT OF THE CENTRE OF CIRCULAR TUNNEL DUE TO ROTATION OF TUNNEL TO PROVIDE CANT DRAWING NUMBER CMSG−3	SHEET NO 1 of 1 SCALE NOT TO SC. REV. 0	SHEET A3

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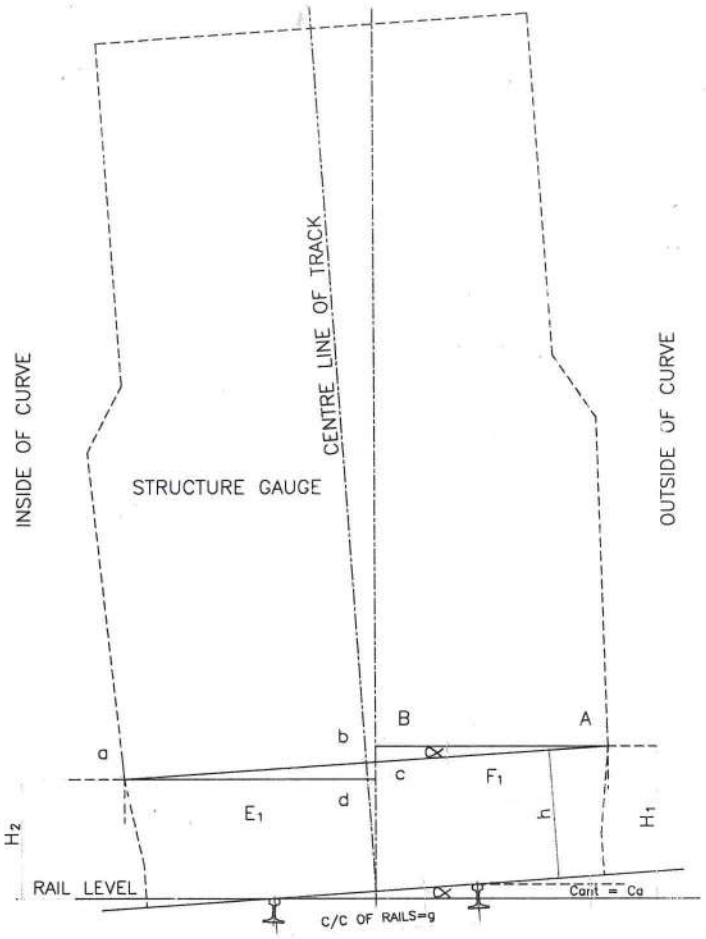

ab=Ab=Distance from centre line of track to Structure Gauge for Tangent Track at height 'h'

$\sin \alpha$ = cant/g

g = 1510mm

Ca = Cant applied

$E_1 = [ab+(h \times \tan\alpha)] \times \cos\alpha$

$F_1 = [Ab-(h \times \tan\alpha)] \times \cos\alpha$

$H_1 = (Ca/2)+(h/\cos\alpha)+(Ab-h \times \tan\alpha) \times \sin\alpha$

$H_2 = (Ca/2)+(h/\cos\alpha)-(ab+h \times \tan\alpha) \times \sin\alpha$

For values of E_1, F_1, H_1 AND H_2 refer to Appendix 3 and 3 (TNL)

NOTES:-

1. STRUCTURE GAUGE FOR AT – GRADE/ELEVATED SECTION HAS BEEN SHOWN AS A TYPICAL FIGURE.
2. THE FORMULAE FOR E_1, F_1, H_1 AND H_2 SHOWN IN THIS FIGURE WILL ALSO APPLY TO UNDER GROUND BOX TUNNELS.

Examined and found in order
Pradeep Kr. Mishra
ADEN/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

CHENNAI METRO RAIL LIMITED		STANDARD GAUGE (1435mm) 25KV 50 Hz A.C.TRACTION	GENERAL NOTES	REV	DATE	DESCRIPTION	APPROVED	APPROVED CHECKED DRAWN DATE DRAWING NAME: EFFECT OF CANT ON STRUCTURE GAUGE DRAWING NUMBER: CMRS-6 SHEET NO: 1 of 1 SHEET SIZE: A3 SCALE: NOT TO SCALE REV: 0

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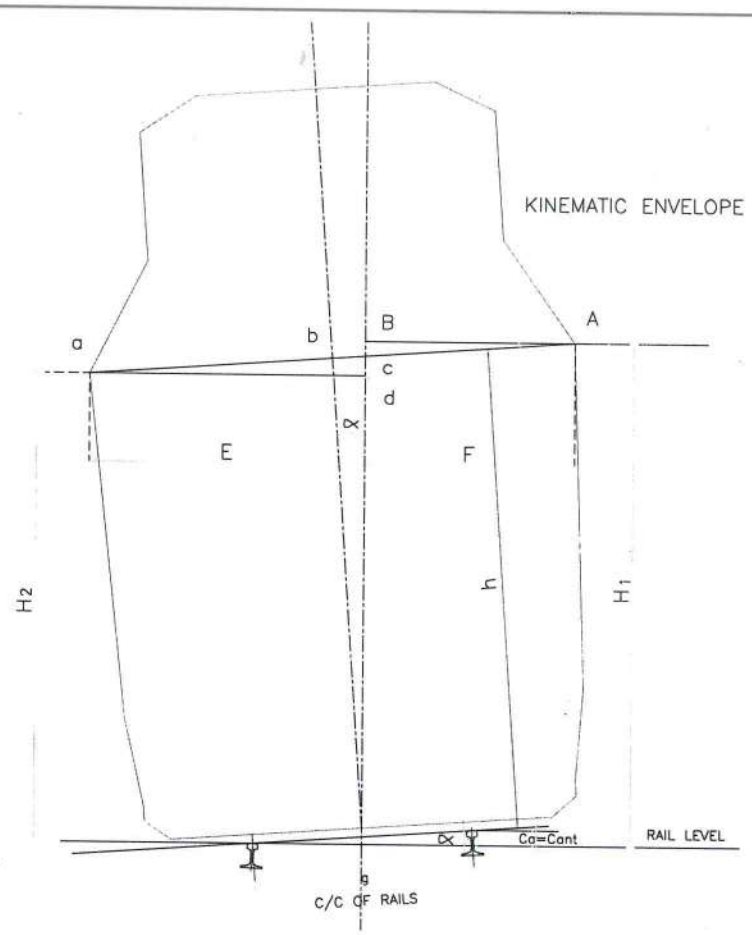
Project Directorate Approved on 13/5/25 Railway Board



ab=Ab=Distance from centre line of track to Kinematic Envelope for Tangent Track at height 'h'

$\sin \alpha$ = cant/g

g = 1510mm

Ca = Cant applied

$E = [ab+(h \times \tan \alpha)] \times \cos \alpha$

$F = [Ab-(h \times \tan \alpha)] \times \cos \alpha$

$H_1 = (Ca/2)+(h/\cos \alpha)+(Ab-h \times \tan \alpha) \times \sin \alpha$

$H_2 = (Ca/2)+(h/\cos \alpha)-(ab+h \times \tan \alpha) \times \sin \alpha$

For values of E, F, H_1 and H_2 refer to Appendix 3A and 3A (TNL)

NOTES:-

1. KINEMATIC ENVELOPE FOR AT-GRADE/ELEVATED SECTIONS HAS BEEN SHOWN AS A TYPICAL FIGURE.
2. THE FORMULAE FOR E, F, H_1 AND H_2 SHOWN IN THIS FIGURE WILL ALSO APPLY TO UNDER GROUND BOX TUNNELS.

Examined and found in order
Pradeep Kr. Mishra
ADEN/J.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

CHENNAI METRO RAIL LIMITED		STANDARD GAUGE (1435mm) 25KV 50 Hz A.C.TRACTION	GENERAL NOTES	APPROVED	DRAWING NAME: EFFECT OF CANT ON KINEMATIC ENVELOPE	SHEET NO: 1 of 1
				CHECKED		
				DRAWN		SCALE: NOT TO SC.
			REV. DATE DESCRIPTION APPROVED	DATE	DRAWING NUMBER: CMSG-4A	REV: 0

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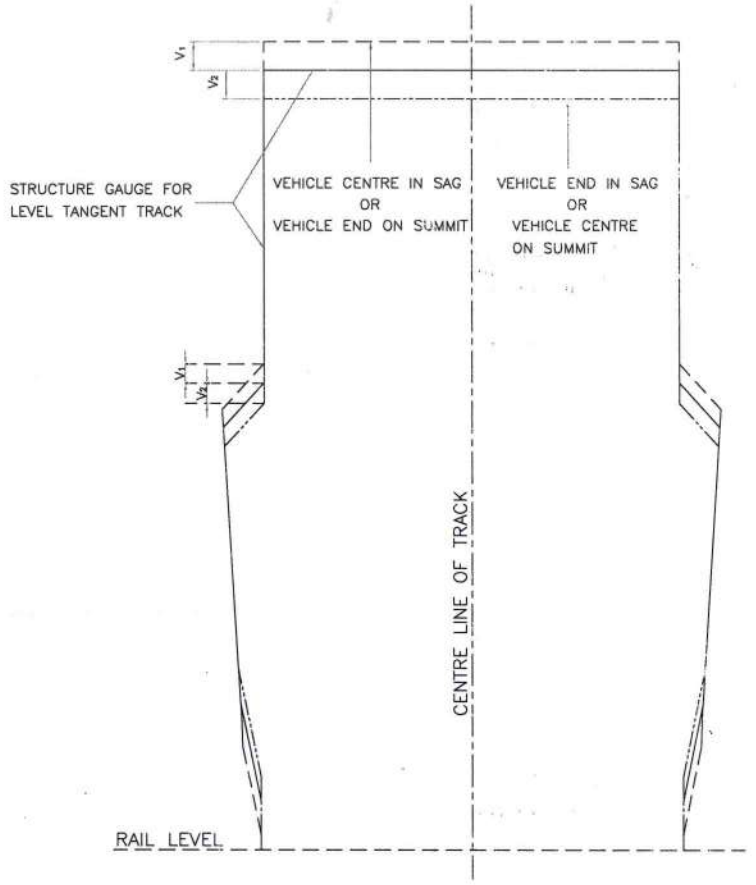
Project Directorate Approved on 13/5/2025 Railway Board



VERTICAL THROW

RADIUS OF VERTICAL CURVE metres	V_1 mm	V_2 mm
1500	19	22
1600	18	21
1700	17	20
1800	16	19
1900	15	18
2000	14	17
2100	14	16
2200	13	15
2300	12	15
2400	12	14
2500	11	14
2600	11	13
2700	11	12
2800	10	12
2900	10	12
3000	10	11

Examined and found in order
Pradeep Kr. Mishra
ADS/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES:-

1. ALL DIMENSIONS ARE IN MM.
2. THE FIGURE IS TYPICAL AND WILL APPLY TO UNDER GROUND, ELEVATED AND AT GRADE SECTIONS.

A. AVINASH KUMAR

CHENNAI METRO RAIL LIMITED
Phase-2 Project
Metro Rail Bhavan, No.32/1, Anna Salai, Nandanam, Chennai-600035.
Ph: 044-23792000 , Fax: 044-23792200.
Email- chennaimetrorail@gmail.com

STANDARD GAUGE
(1435mm)
25KV 50 Hz A.C.TRACTION

GENERAL NOTES :

REV.	DATE	DESCRIPTION	APPROVED

APPROVED
CHECKED
DRAWN
DATE

DRAWING NAME: EFFECT OF VERTICAL CURVE ON STRUCTURE GAUGE

DRAWING NUMBER: CMSG-5

SHEET NO: 1 of 1 | SHEET SIZE: A3

SCALE: NOT TO SC

REV: 0

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Project Directorate
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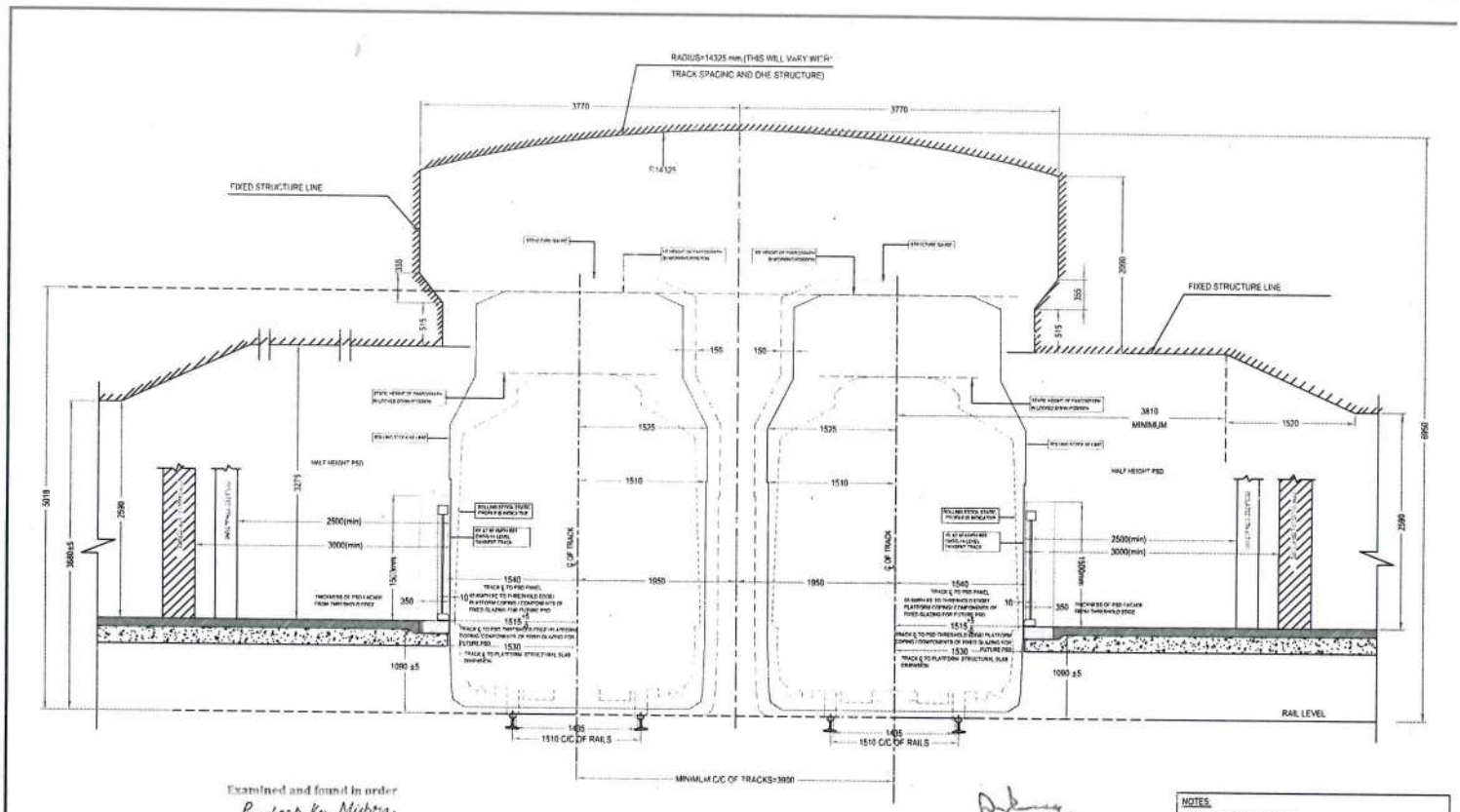
13/5/25
Railway Board



Examined and found in order
Pradeep Kr. Mishra.
ADGM/T,P&WL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

ASHOK KUMAR

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. ADDITIONAL CLEARANCE FOR PLATFORM ON CURVES SHALL BE AS PER APPENDIX-5, HOWEVER THE TRACK CENTRES AT STATION WILL NOT INCREASE WITH CURVES OF RADIUS OF 1000 M AND ABOVE.
3. STRUCTURE CLEARANCE IS VAILD FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. OHE IS SUSPENDED FROM CEILING BY DROP ARM.

CHENNAI METRO RAIL LIMITED Phase-2 Project Metro5, No.327, Anna Salai, Nandanam, Chennai-600035. Ph 044-23792000 , Fax 044-23792200. Email: chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50 Hz A.C.TRACTION	GENERAL NOTES	APPROVED CHECKED DRAWN DATE	DRAWING NAME: STRUCTURAL CLEARANCE AT -GRADE AND ELEVATED STATION WITH PSD IN SIDE PLATFORMS ON LEVEL (OR CONSTANT GRADE) TANGENT TRACK DRAWING NUMBER: CMSG-6

REV.	DATE	DESCRIPTION	APPROVED

SHEET NO	SHEETS
1 of 1	A2

SCALE: 1:1

REV. 0

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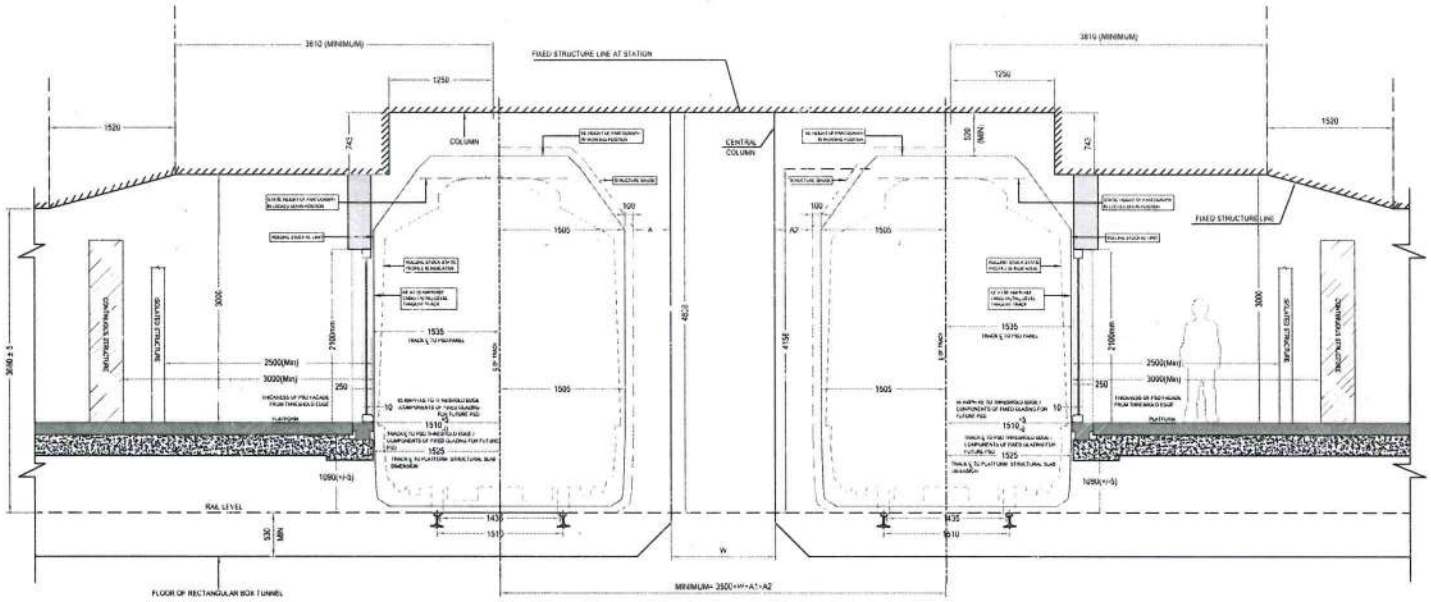
Project Directorate
Approved on
6/3/25
Railway Board



Examined and found in order
Pradeep Kr. Mishra
ADGM.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES
1. ALL DIMENSIONS ARE IN MM.
2. ADDITIONAL CLEARANCE FOR PLATFORM ON CURVES SHALL BE AS PER APPENDIX-6
3. THE STRUCTURE CLEARANCE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION
4. CLEARANCES 'A1' AND 'A2' FOR SERVICES AND PATHWAY SHALL BE AS PER REQUIRMENT AND SHALL BE APPROVED BY THE COMPETENT AUTHORITY.

CHENNAI METRO RAIL LIMITED Phase-2 Project Block5, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23782000 Fax: 044-23782266. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	DRAWING NAME: STRUCTURAL CLEARANCE AT UNDERGROUND STATION WITH PSD IN SIDE PLATFORMS RECTANGULAR BOX TUNNEL ON LEVEL OR CONSTANT GRADE TANGENT TRACK DRAWING NUMBER: CMSG-6(TNL)

SHEET NO: 1 of 1 | SHEET SIZE: A3
SCALE: NOT TO SC.
REV: 0
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Project Directorate
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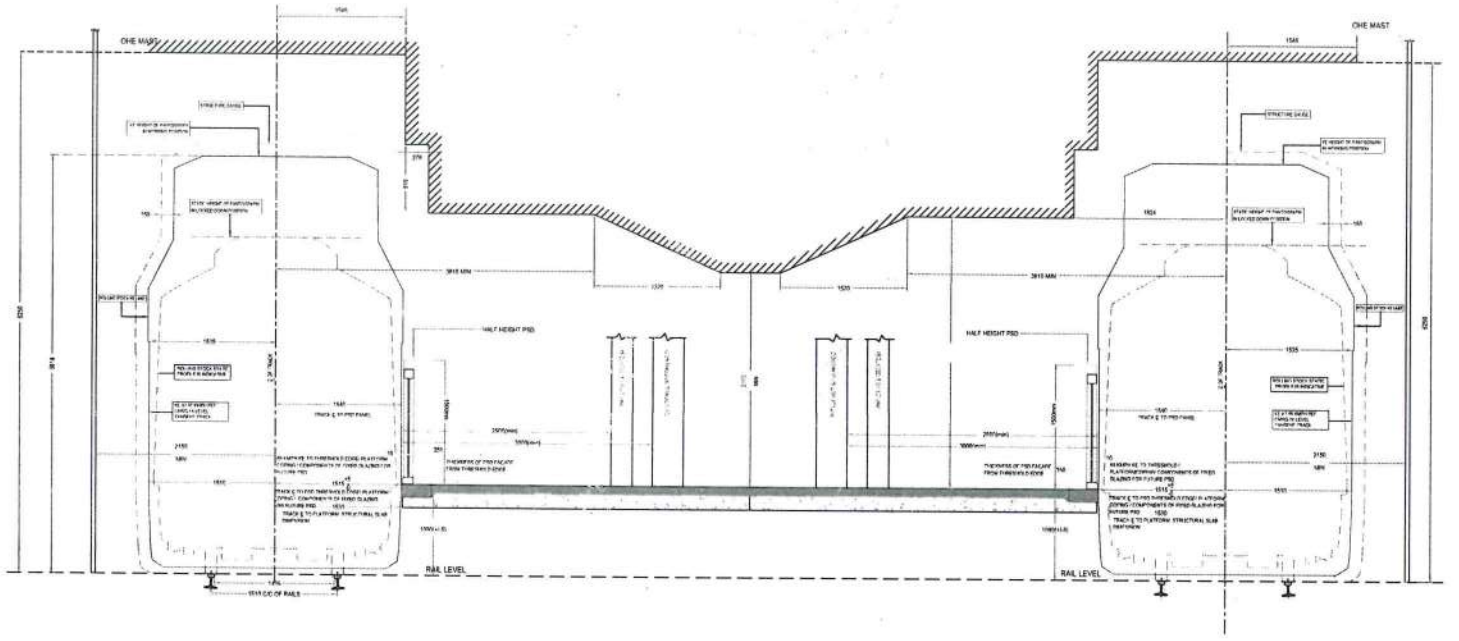
13/5/25
Railway Board



Examined and found in order
Pradeep Kr. Mishra
ADGAU.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

S. ASHOK KUMAR

NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ADDITIONAL CLEARANCE FOR PLATFORM ON CURVES SHALL BE AS PER APPENDIX-6.
3. STRUCTURE CLEARANCE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.

CHENNAI METRO RAIL LIMITED Phase-2 Project Metro6, No 327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23792056. Email- chennaimetro6@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	DRAWING NAME: STRUCTURAL CLEARANCE AT ELEVATED / AT GRADE STATION WITH PSD IN ISLAND PLATFORM ON LEVEL OR CONSTANT GRADE TANGENT TRACK DRAWING NUMBER: CMSC-7	SHEET NO: 1 of 1 A3 SCALE: NOT TO SC REV: 0

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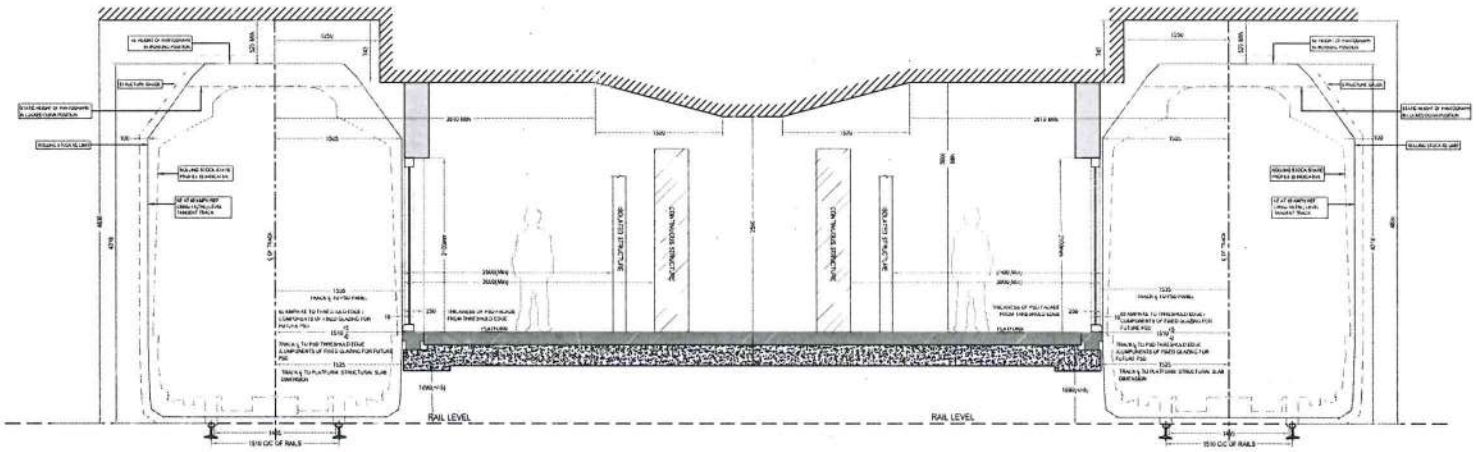
Project Directorate
Approved on
13/5/25
Railway Board



Examined and found in order
Pradeep Kr. Mishra
ADEN/I.T/CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES
1. ALL DIMENSIONS ARE IN MM.
2. ADDITIONAL CLEARANCE FOR PLATFORM ON CURVES SHALL BE AS PER APPENDIX-6.
3. THE STRUCTURE CLEARANCE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. CLEARANCES 'A1' AND 'A2' FOR SERVICES AND PATHWAY SHALL BE AS PER REQUIRMENT AND SHALL BE APPROVED BY THE COMPETENT AUTHORITY.

CHENNAI METRO RAIL LIMITED Phase-2 Project No.14/5, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23750000 , Fax: 044-23792200. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	DRAWING NAME STRUCTURAL CLEARANCE AT UNDERGROUND STATION WITH PSD IN ISLAND PLATFORM ON LEVEL OR CONSTANT GRADE TANGENT TRACK DRAWING NUMBER: CMSG-7(TNL)	SHEET NO 1 of 1 / SHEET SIZE A3 SCALE: NOT TO SC REV 0

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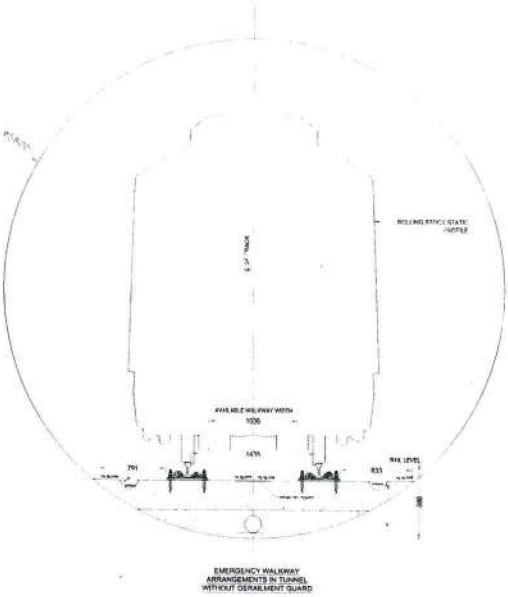
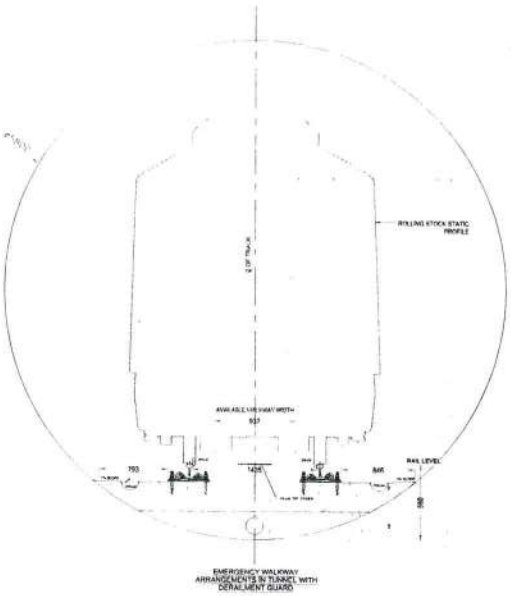
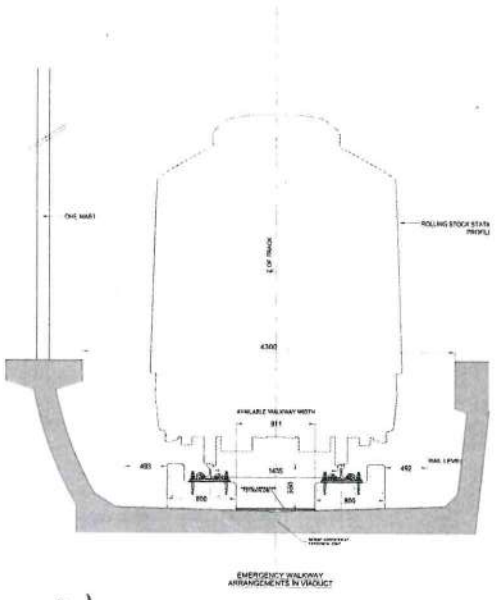
Project Directorate
Approved on
13/5/25
Railway Board



EMERGENCY WALKWAY ARRANGEMENTS IN TUNNEL WITHOUT DERAILMENT GUARD



EMERGENCY WALKWAY ARRANGEMENTS IN TUNNEL WITH DERAILMENT GUARD



EMERGENCY WALKWAY ARRANGEMENTS IN VIADUCT

P. ASHOK KUMAR

Examined and found in order
Pradeep Kr. Mishra
ADGB/U.T./DPR
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES:

1. ALL DIMENSIONS ARE IN M

CHENNAI METRO RAIL LIMITED Phase-2 Project MetroS, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000, Fax: 044-23792200. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	EMERGENCY WALKWAY ARRANGEMENTS IN TUNNEL AND VIADUCT.	SHEET NO. A3 DRAWING NUMBER: CMSG – B REV. 0

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Project Directorate
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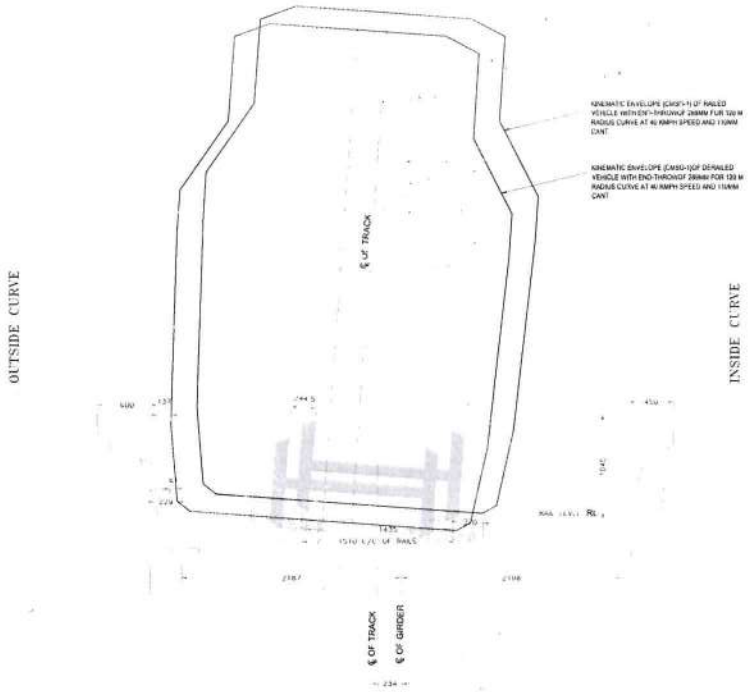
13/5/25
Railway Board



R:120 M / Ca 110 MM

NOTES:

1.ALL DIMESION ARE IN MM

2.AFTER DERAILMENT CLEARANCE OF KE TO VIADUCT WALL =137MM FOR END THROW)

3.LATERAL CLEARANCE BETWEEN RUNNING RAIL (NON GAUGE FACE) AND DERAILMENT GUARD FOR DOUBLE RESILIENT BASE PLATE ASSEMBLY FASTENING SYSTEM 250×20MM. LATERAL CLEARANCE FOR WORST CASE=270MM

4.KINEMATIC ENVELOPE CONSIDERED AS PER CMSG-1

5.WORST CASE RADIUS =120M, CANT =110MM, SPEED= 40 KMPH END THROW 289MM (APPENDIX-2B)

6.THE LATERAL SHIFT DUE TO DERAILMENT IS 244.5MM (270MM +72MM+5MM+32.5MM-135MM)

Examined and found in order
Pradeep Kr. Mishra
ADE/U.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

KINEMATIC ENVELOPE POSITION IN DERAILED CONDITION-OUT WARD

CHENNAI METRO RAIL LIMITED Phase-2 Project METROS, No:327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23792200. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES :	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	KE OF DERAILED VECHICLE FOR VIADUCT SECTION WITH SHARPEST CURVE AND MAX.CANT-DERAILED CONDITION (R120m, CANT110mm) (OUT WARD) DRAWING NUMBER: CMSG - 9A	SHEET NO: 1 SHEET SIZE: A3 REV: 0

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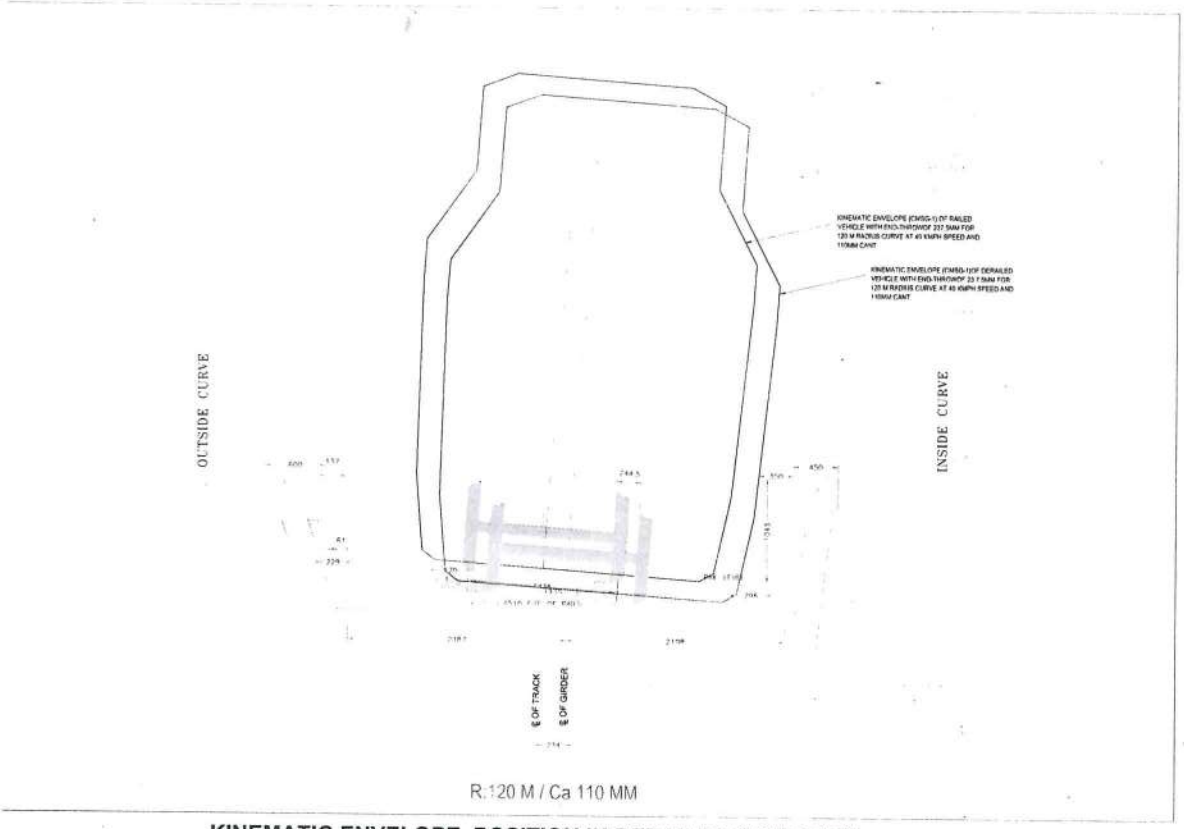
Project Directorate Approved on 13/5/2025 Railway Board



R.120 M / Ca 110 MM

KINEMATIC ENVELOPE POSITION IN DERAILED CONDITION- IN WARD

NOTES:

1.ALL DIMESION ARE IN MM

2.AFTER DERAILMENT CLEARANC OF KE TO VIADUCT WALL =350MM (FOR MID THROW)

3.LATERAL CLEARANCE BETWEEN RUNNING RAIL (NON GAUGE FACE AND DERAILMENT GUARD FOR DOUBLE RESILIENT BASE PLATE ASSEMBLY FASTENING SYSTEM 250+20MM. LATERAL CLEARANCE FC WORST CASE=270MM

4.KINEMATIC ENVELOPE CONSIDERED AS PER CMSG-1

5.WORST CASE RADIUS =120M, CANT =110MM, SPEED= 40 KMPH MID THROW 237.5MM (APPENDIX-2A)

6.THE LATERAL SHIFT DUE TO DERAILMENT IS 244.5MM (270MM +72MM+5MM+32.5MM-135MM)

Examined and found in order
Pradeep Kr. Mishra
ADEN/I.T./CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

CHENNAI METRO RAIL LIMITED Phase-2 Project MetroS, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 . Fax: 044-23792200. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV.	DATE	DESCRIPTION	APPROVED	APPROVED CHECKED DRAWN DATE	KE OF DERAILED VEHICLE FOR VIADUCT SECTION WITH SHARPEST CURVE AND MAX.CANT-DERAILED CONDITION (R120m, CANT110mm) (IN WARD) DRAWING NUMBER: CMSG-9B	SHEET NO. REV: 0	SHEET SIZE A3

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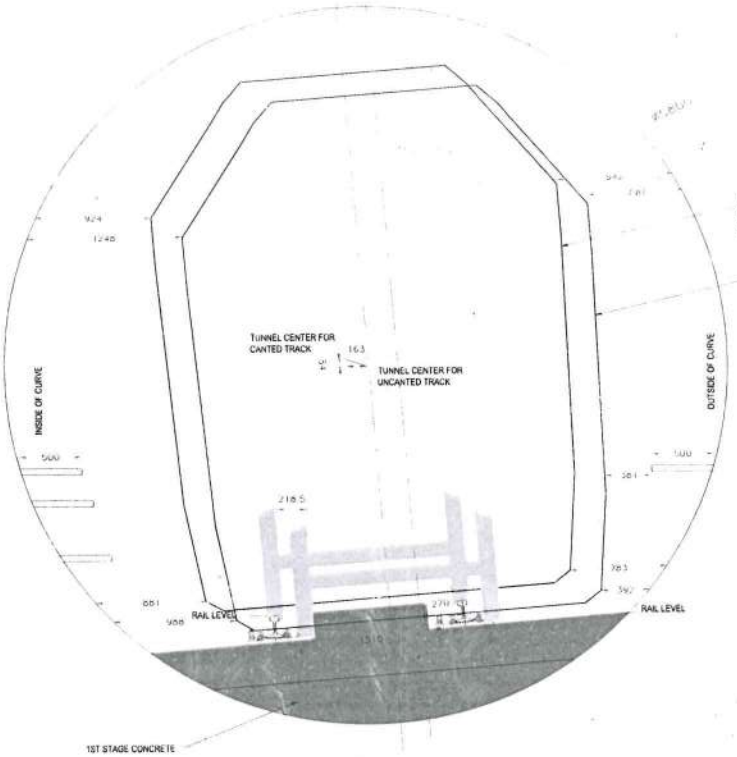


Examined and found in order
Pradeep Kr. Mishra
ADSRU,TJ/CIVIL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES:

1.ALL DIMESION ARE IN MM

2.AFTER DERAILMENT CLEARANC OF KE TO TUNNEL WALL =392MM (FOR END THROW)

3.LATERAL CLEARANCE BETWEEN RUNNING RAIL AND DERAILMENT GUARD FOR DOUBLE RESILIENT BASE PLATE ASSEMBLY FASTENING SYSTEM 250+20MM. LATERAL CLEARANCE FOR WORST CASE=270MM

4.KINEMATIC ENVELOPE CONSIDERED AS PER CMSG-1(TNL)

5.WORST CASE RADIUS =200M, CANT =120MM, SPEED=55 KMPH END THROW 173.4MM (APPENDIX-2A)

6.X&Y BEEN SHIFTED IN ACCORDANCE WITH FORMULA IN FIGURE CMSG-3

7.THE LATERAL SHIFT DUE TO DERAILMENT IS 218.5MM (270MM-51.5MM)

A. ASHOK KUMAR

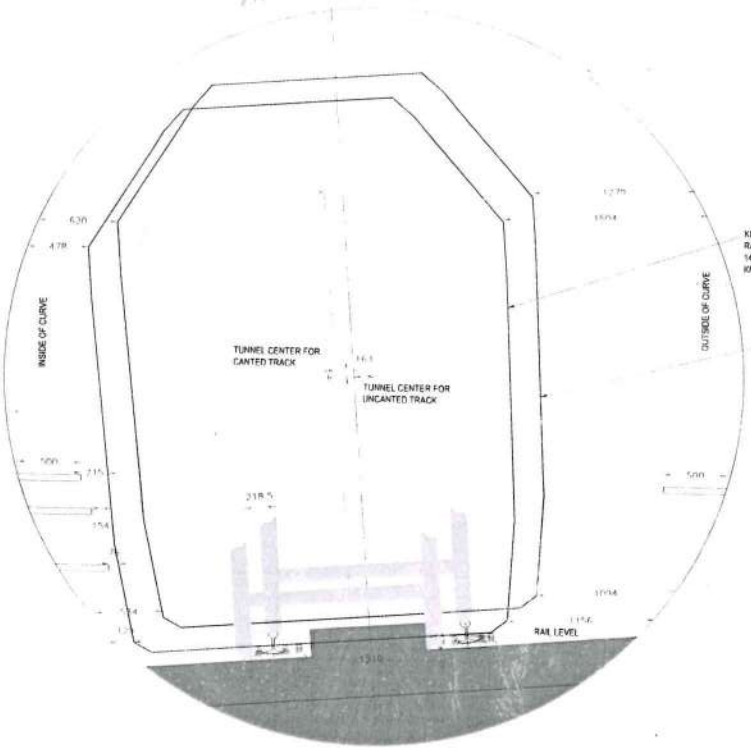
KINEMATIC ENVELOPE POSITION IN DERAILED CONDITION OUTSIDE OF CURVE

CHENNAI METRO RAIL LIMITED Phase-2 Project Metro8, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23792200. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25Kv 50Hz A.C.TRACTION	GENERAL NOTES :	APPROVED CHECKED DRAWN DATE	KE OF DERAILED VEHICLE FOR TUNNEL SECTION WITH SHARPEST CURVE AND MAX.CANT-DERAILED CONDITION (R200m, CANT 120mm) (OUTWARD) DRAWING NUMBER: CMSG - 10A

REV	DATE	DESCRIPTION	APPROVED

SHEET NO | SHEET SIZE: A3
REV: 0

Project Directorate
Approved on
13/5/25
Railway Board



CIRCULAR TUNNEL 5800 mm DIA

KINEMATIC ENVELOPE POSITION IN DERAILED CONDITION INSIDE OF CURVE

Examined and found in order
Pradeep Kr. Mishra
ADSRT/JDP/IL
R.D.S.O. (Ministry of Railways)
Manak Nagar, Lucknow-11

NOTES:

1.ALL DIMESION ARE IN MM

2.AFTER DERAILMENT CLEARANC OF KE TO TUNNEL WALL =129MM (FOR MID THROW)

3.LATERAL CLEARANCE BETWEEN RUNNING RAIL AND DERAILMENT GUARD FOR DOUBLE RESILIENT BASE PLATE ASSEMBLY FASTENING SYSTEM 250+20MM. LATERAL CLEARANCE FOR WORST CASE=270MM

4.KINEMATIC ENVELOPE CONSIDERED AS PER CMSG-1(TNL)

5.WORST CASE RADIUS =200M, CANT =120MM, SPEED= 55 KMPH MID THROW 142.5MM (APPENDIX-2A)

6.X&Y BEEN SHIFTED IN ACCORDANCE WITH FORMULA IN FIGURE CMSG-3

7.THE LATERAL SHIFT DUE TO DERAILMENT IS 218.5MM (270MM-51.5MM)

A. ASHOK KUMAR
Asst General Manager
Project Directorate
CHENNAI METRO RAIL LIMITED
Metro, No.327, Anna Salai, Nandanam, Chennai-600035

CHENNAI METRO RAIL LIMITED Phase-2 Project METRO, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23792200. Email: chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	KE OF DERAILED VEHICLE FOR TUNNEL SECTION WITH SHARPEST CURVE AND MAX.CANT-DERAILED CONDITION (R200m, CANT 120mm) (INWARD)	SHEET NO SHEET SIZE A3	
						DRAWING NUMBER: CMSG-10B	REV: 0	

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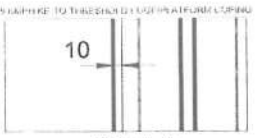
Railway Board

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. ADDITIONAL CLEARANCE FOR PLATFORM ON CURVES SHALL BE AS PER APPENDIX-5.
3. STRUCTURE CLEARANCE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.



DETAIL-A

Examined and found in order
Pradeep Kr. Mishra
ADG/ALT.CIVIL
R.D.S.O. (Ministry of Railways)

CHENNAI METRO RAIL LIMITED Phase-2 Project No.no5, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 , Fax: 044-23791200. Email- chennaimetrorail@gmail.com		STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE	DRAWING NAME STRUCTURAL CLEARANCE PLATFORM SCREEN DOOR FOR ELEVATED STATIONS DRAWING NUMBER CMSG - 11	SHEET NO 1 of 1 A3 SCALE: NOT TO SC. REV 0

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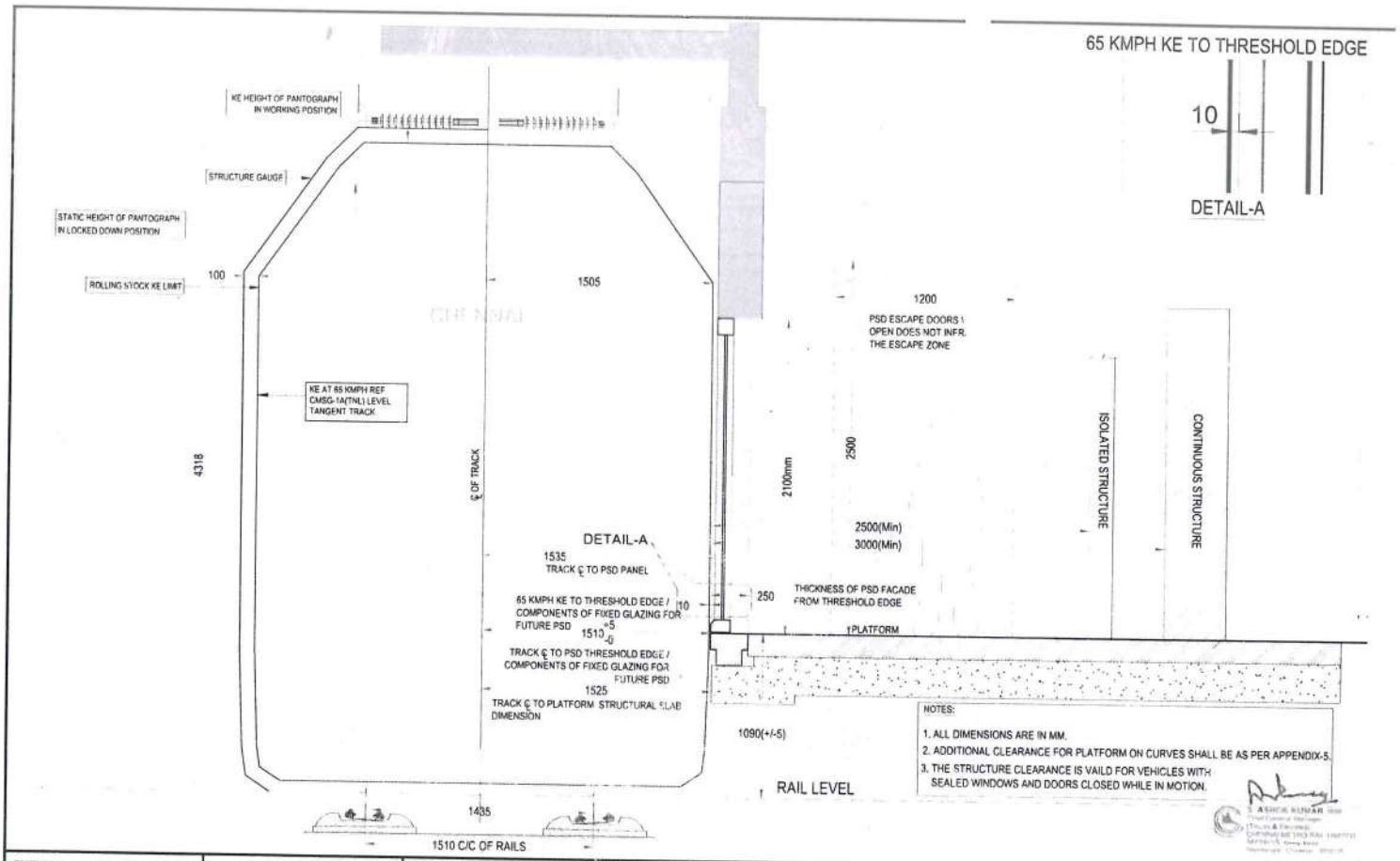
Approved on
13/5/25
Railway Board



CHENNAI METRO RAIL LIMITED Phase-2 Project Metro5, No.327, Anna Salai, Nandanam, Chennai-600035. Ph: 044-23792000 Fax: 044-23792300 Email: chennaimetrorail@gmail.com	Examined and found in order Pradeep Kr. Mishra ADDL.T.ADVN. R.D.S.O. (Ministry of Railways) Manak Nagar, Lucknow-11	STANDARD GAUGE (1435mm) 25KV 50Hz A.C.TRACTION	GENERAL NOTES	REV. DATE DESCRIPTION APPROVED	APPROVED CHECKED DRAWN DATE DRAWING NAME: STRUCTURAL CLEARANCE PLATFORM SCREEN DOOR FOR UNDERGROUND STATIONS DRAWING NUMBER: CMSG-11(TNL) SHEET NO: 1 of 1 SCALE: NOT TO SC REV: 0

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Project Directorate Approved on 13/5/25 Railway Board

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