GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

2025/Proj./CMRL/C-1/PH-II/30/132 New Delhi, dated 29.07.2025

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

Sub: Approval of Track Structure (Annexure C-1) for Chennai Metro Phase-II Project of Chennai Metro Rail Limited (CMRL).

Ref: Track Structure (Annexure C-1) documents uploaded on RDSO's online portal by CMRL on 09.07.2025 along with compliance

Chennai Metro Rail Limited (CMRL)'s request for approval of Track Structure (Annexure C-1) for Chennai Metro Phase II Project of CMRL has been examined in consultation with RDSO and approval of Railway Board is hereby conveyed for the same.

Accordingly, approved copy of Track Structure (Annexure C-1) is enclosed.

Encl: As above

29.7.

(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/38/CMRL/P02/Civil dated 18.07.2025
2. **OSD/UT & Ex-Officio Joint Secretary** , Ministry of Housing & Urban Affairs (MoHUA), Nirman Bhavan, New Delhi-110011

CHENNAI METRO RAIL LIMITED

PART A: COMPLIANCE MATRIX FOR "TECHNICAL STANDARDS OF TRACK STRUCTURE FOR METRO RAILWAYS AS PER ANNEXURE-C1

1. Scope

The Scope is to formulate the track structure Design Basis, with broad parameters for getting the Ministry of Railways approval for the stipulated and desirable technical standards/specifications for a Chennai Metro Rail Limited Phase II project consisting of corridor 3, corridor 4 and corridor 5.

2. OPERATING ENVIRONMENT

Track Structure should fulfill generally the following conditions:

Sl. No.	Standards stipulated	CMRL Specification	CMRL Compliance
2.1	Gauge – standard gauge – 1435mm.	Standard Gauge-1435 mm	Complied
2.2	Rail Seat inclination (slope): 1 in 20	1 in 20	Complied
2.3	Speed potential – 110 kmph (max.)	Maximum 90 Kmph	Complied
2.4	Static axle loads – 20 T (max.)	Maximum 16 T	Complied
2.5	Design rail temperature range (-)10 degree Celsius to (+) 70 degree Celsius.	(+)11 degree Celsius to (+) 68 degree Celsius.	Complied
2.6	Maximum Curvature and Ruling gradient	○ Maximum gradient on Main line viaduct is (between Butt road-Alandur on Corridor5) 3.98 % (including compensation for curve) & underground approach of katcheri road station in Corridor 4 is 3.83% (including compensation for curve)	Provision in SOD for Phase II will be followed, and Will be Complied.

Examined and found in order

Director/UI/Civil
RDSO, Lucknow

29/7/20 25T

Sl. No.	Standards stipulated	CMRL Specification	CMRL Compliance
		○ Maximum gradient at Depot is Level ○ Maximum gradient at Station is level. ○ Maximum gradient on Turnout is 2.64% between Poonammallee Bypass station and Poonammallee station	
	Minimum Vertical Curve radius is 1500m	○ Main lines (up and down) at many locations designed with a vertical radius of up to 1500m.Depot connecting track will also be provided with a radius of 1500m.	Provision in SOD for ph2 has been followed and Will be Complied.
	Minimum Horizontal curve Radius ○ Main viaduct track = 120m Mainline UnderGround track= = 200m Stations = 1000m Depot Track=100m	Main running line (Up & Down), ○ Elevated = 122m (Between Butt road-Alandur section on Corridor 5) ○ Underground section (Up & down) = 200m (near Thirumailai station on Corridor 4) ○ At passenger stations is 1003m in Allapakkam station in corridor 4 ○ Depot and other lines= 100 m	Provision in SOD ph2 will be followed and Will be Complied
		○ Many curves designed with SE of 110mm.	Provision in SOD ph2 will be followed

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Railway Board 29/7/2015

Sl. No.	Standards stipulated	CMRL Specification	CMRL Compliance
		○ Maximum Cd = 99mm provided between Ayanavaram and Otteri Metro station.	and Will be Complied.

3. TRACK STRUCTURE

3.1 General : The track structure should fulfill the following requirements:

Sl. No.	Standards stipulated	CMRL Compliance
3.1.1	The track structure should conform to/ satisfy Schedule of Dimension requirement and other maintenance instructions of Metro systems.	**Will be Complied.** The track structure will confirm the SOD of CMRL Ph2.
3.1.2	Ride comfort and running safety of track vehicle dynamics should be satisfied.	**Will be Complied.**
3.1.3	The track structure should be designed with Long welded / Continuously welded rail on main line track. (For both ballasted track as well as the ballast less track).	**Will be Complied.** Track structure will be designed with CWR on main line as well as Depot & connections.
3.1.4	The horizontal alignment shall consist of a series of straights joined to circular curves generally with transition curves. Curvature and cant shall be calculated based on the train speed for each train type on the section. Compound and reverse curves are acceptable, provided they are connected by an adequate transition curve.	**Will be Complied** ○ All the circular curves are provided with adequate length of transition of minimum 15m on either end. Reverse/Circular curve will also be provided with adequate transition of minimum 15m is ensured. ○ Cant is designed based on the speed to comply with CMRL Phase 2 SOD provisions of rate of change of cant(40mm/sec), rate of change of cant

Project Directorate Received on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
		deficiency(40mm/sec) and cant gradient(1 in 440).
3.1.5	The vertical alignment should be designed to achieve a smooth profile line with gradual changes.	**Will be Complied:** The vertical alignment of all vertical curves will be designed to achieve a smooth profile line with gradual changes.
	Changes in the profile should be connected by vertical curves, which shall be as generous in length as the location allows.	**Will be Complied:** Changes in profile will be connected by vertical curves of as large as radius as the locations allowed, minimum radius being 1500m.
	Vertical curves including its transition shall not be located at stations within the length of platform.	**Will be Complied:** Vertical curves will not be located at stations within the length of the platform.
	A vertical curve within the length of transition and Turnouts is also not desirable.	**Will be Complied:** Vertical curve will not be provided within the length of transition & turnouts.
	Vertical curve radius is constrained by the need to limit the vertical acceleration for passenger ride comfort.	**Will be Complied**
	Check rail should be provided on Curves where radius is 190 m or less on standard gauge	**Will be complied. Check rails are being provided on curves where the radius is 190m or less as per the SOD ph2. No check rail for curves in depot planned**

3.2 The technical standards for track structure deals with the following components:

i. Rail and Welding
ii. Sleeper and fastening for ballasted track.

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

29/7/2025

iii. Track slab for ballast less track
iv. Fastening system for ballast less track
v. Insulated Glued joint.
vi. Turnout, scissors crossover
vii. Switch Expansion Joints
viii. Gradients

4. Rail and Rail Welding

Sl. No.	Standards stipulated	CMRL Compliance
4.1	**Rails**	
4.1.1	**For Main line Track**	
4.1.1.1	The rail used on main line on curves and approaches of Stations shall be 60E1, 1080 grade Head Hardened.	**Will be Complied.** 60E1, 1080 grade Head Hardened rails will be used on main line, including stations.
4.1.1.2	At other locations on straight line of main line, the use of 60E1, 1080 grade HH / 60E1, 880/60E1, R260 grade rail shall be decided by Metro Railway depending upon speed, axle load and other factors pertaining to safety and life of rail. However, on curves with small straight track in between, the 60E1, 1080 grade Head hardened rail should be continued on straight patches also.	**Will be Complied.** 60 E1 , 1080 grade HH rails will be used on straight as well.
4.1.1.3	It is essential to have preventive rail grinding arrangements in case 60E1, 1080 HH rails are used.	**Will be Complied:** Noted and rail grinding will be done to ensure proper rail wheel interaction.
4.1.2	**For Depot Lines**	
	The rail used on depot lines can be non- head hardened and	**Will be Complied**

Project Directorate Railway Board 29/7/2015

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	shall be 60E1,880 grade/60E1,R260 grade.	The rails used on Depot will be 60E1, 880 grade. For Turn out 60E1 , 1080 grade rail will be used.
4.1.3	**Specifications**	
4.1.3.1	The rail shall be class 'A' rails as per IRS-T-12-2009 specification with latest amendments. However, any suitable length of rail more than 13 m considered appropriate by metro on consideration of transportation and handling can be adopted, provided the rails are ultimately welded into long welded rails.	**Will be Complied:** Class 'A' rails will be used as per IRS-T-12-2009 Reprint: October-2021 (Covering up to ACS No.-5) with 18m long rails duly considering the transportation and handling in Chennai alignment and provided the rails will be ultimately welded into long welded rails.
4.1.3.2	The rail shall be manufactured and tested in accordance with IRS-T-12-2009 (with latest amendment). The chosen manufacturers shall be required to submit their inspection and test plan for approval by Metro railway as per IRS-T-12-2009. Metro railways will ensure that the inspection and test plan approved by them strictly conforms to the requirement of IRS specifications.	**Will be Complied.** **Will be Complied.**
4.2	**Welding of Rails**	
4.2.1	The welding of rails should conform to Indian Railway specifications and technical instructions issued from time to time.	**Will be Complied**

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate
Railway Board
29/7/2025

Sl. No.	Standards stipulated	CMRL Compliance
4.2.2	The present instructions are contained in following documents:	–
4.2.2.1	**Alumino Thermit Welding:**	
	(i) Indian Railway Standard specifications for Alumino Thermit Welding of Rails (IRST-19-2021, with latest amendments)	**Will be Complied.** Indian Railway Standard specifications for Alumino Thermit Welding of Rails (IRST-19- 2021 with version no.-07) and Manual for Fusion Welding of Rails by the Alumino-Thermic Process revised manual 2022 with latest amendments Will be Complied.
	(ii) Manual For Fusion Welding Of Rails By The Alumino-Thermic Process: Revised-2012 with latest amendments	
4.2.2.2	**Flash Butt Welding**	
	Manual for Flash Butt welding of rails, January 2012 with latest amendments.	**Will be Complied**- Manual for Flash Butt welding of rails, Reprint: April -2022 (up to ACS No.-04)
4.2.2.3	Special attention is required by metros for provision of these instructions regarding procurement, execution of works and areas requiring prior approval / standardization by RDSO.	**Will be Complied.** Only RDSO approved FB welding machines will be used in mainline and Depots.
4.3	**Ultrasonic Testing of Rail and Welds:**	
	The rails and welds shall be ultrasonically tested in field as per requirement of concerned specification/ manual/ instructions. The testing shall be ensured as per provisions of "Manual for Ultrasonic Testing of Rail and Welds- Revised 2022" with latest amendments. The provisions, as given in the	**Complied:** All rail were tested in the factory by on-line testing equipment & defective rails isolated by cutting & removing the defective rails. Rails & flash but welding joints and Alumino thermic welded joints will be ultrasonically tested in field as per the provisions of "Manual for Ultrasonic Testing of Rail and Welds-

Project Directorate Railway Board 29/7/2025

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	"IRS specification for Ultrasonic testing of Rails/Welds, Revised-2020 (Document No:T-53)" shall also be followed.	Revised 2022" with latest amendments. The provisions of "IRS specification for Ultrasonic testing of Rails/Welds (Provisional), Revised-2022" will also be followed.

5. Sleeper and fastening for Ballasted track.

Sl. No.	Standards stipulated	CMRL Compliance
5.1	**Sleepers – Standard Gauge**	
	PSC sleeper for standard gauge will be designed by Metro Railways following in principal guidelines of Indian Railway and the same shall be approved by Metro.	**Complied.** Standard gauge PSC sleeper were designed as per Indian Railway standards and guidelines and approved by CMRL.
5.2	**Fastening system**	
	The elastic fastening system prevalent on Indian Railways shall be used duly ensuring the Inspection protocol for fastening components laid down for IR. In case of use of elastic fastening other than in use on IR, prior approval shall be obtained from Railways.	**Will be Complied.** Elastic fastening system (ERC mark III-T3701, GRP T-3711, GFN liners RT 3701) prevalent on Indian Railways is used. These fastenings are tested and certified by RDSO approved agencies.

Project Directorate Railway Board 29/7/2025

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

6. TRACK SLAB FOR BALLSTLESS TRACK

Sl. No.	Standards stipulated	CMRL Compliance
6.1	Track shall be laid on cast in situ/precast reinforced plinth or slab, herein referred to as the 'track slab'. The track slab shall be designed as plinth beam or slab type ballastless track structure with derailment guards. It shall accommodate the base plates of the fastening system.	**Will be Complied:** Track slabs are designed as plinth beam or slab type ballastless track structure with derailment guards. It shall accommodate the base plates of the fastening systems on which the fastening and rails are fitted and shall perform all the stipulated functions.
6.2	In general, track slab (including sleeper, if any) on which the fastening and rail are to be fitted shall perform the following functions:	....
i	Resist the track forces. (Static and dynamic)	**Will be Complied.** The track slab will resist the track forces.
ii	Have adequate edge distance of concrete beyond the anchor bolts to provide resistance against edge failure	**Will be Complied.** Minimum Edge distance of 110mm will be provided
iii	Provide a level base for uniform transmission of track/rail forces.	**Will be Complied.** The track slab provides a level base for uniform transmission of track/rail forces.
iv	Have geometrical accuracy and enable installation of track to the tolerances laid down.	**Will be Complied.** Ensured through Track plinth geometry/slab and fastening system adjustably.
v	Ensure drainage.	**Will be Complied.** Drainage provision will be ensured.
vi	Resist weathering.	Will be Ensured. – To resist weathering, adequate concrete cover based on the exposure conditions (severe) M35 grade concrete are being used in the RCC. Quality control

Project Directorate Railway Board

Examined and found in order

29/7/2025

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
		inclusive of frequent permeability test, RCPT is being done in concrete samples.
vii	Be construction friendly, maintainable and quickly repairable in the event of a derailment. The 'Repair and Maintenance methods' shall be detailed in a Manual to be prepared and made available.	**Will be Complied.** The plinth/slab track are construction friendly, easily maintainable, and repairable. Further, concrete repair procedure are available in the maintenance manual.
viii	Ensure provision for electrical continuity between consecutive plinths/slabs by an appropriate design.	**Will be Complied.** Electrical continuity for slab/plinth are being ensured by welding the rebars and further ensured on the gap by welding the 50x6mm GI plate connected by suitable copper cable.
ix	Plinth beam or slab of ballastless track should be suitable for embankment or viaduct or tunnel/Underground structure.	**Complied.** Plinth beam or slab of Ballastless track are suitable for embankment or viaduct or tunnel/Underground structure. And designed for 16 T axle load of standard gauge rolling stock.
x	Proper design of expansion joints suitable for joints of viaduct structure.	**Will be Complied.** Suitable expansion joints will be provided in the viaduct structure.
xi	Design should be suitable for curves as per SOD of Metro system.	**Will be Complied.** The design is suitable for curves as per approved Phase II SOD and Annexure C-02 fastening system approved vide Railway Board letter No. 2024/Proj./CMRL/C1-C2/30/84, Dated 08.10.2024.
xii	Design of subgrade/ embankment for slab should be furnished to ensure	The entire length of track slab /Plinth on embankment/Underground/viaduct

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate
29/7/2025
Railway Board

Sl. No.	Standards stipulated	CMRL Compliance
	durability and functional stability in service.	are designed as per design basis report for Chennai Metro approved by RDSO vide letter no. 2023/Proj./CMRL/PH-II/DBR/30/55 dated 31.10.2023.
xiii	Design should be suitable and incorporate provision of utilities e.g. cable, wires, ducts, water channels, etc.	**Will be Complied.** Design is suitable and have the provision to incorporate utilities like cable, wires ducts, water channels etc. Drawings for Cable duct provision in Elevated and UG section are attached for reference.
	The detailed design calculations of track slab along with detailed structural drawings as approved by metro authorities shall be furnished for record.	**Complied.** The detailed design calculations of track slab along with detailed structural drawings are submitted as per checklist item No.3.

7. CHECK RAIL

Sl. No.	Standards stipulated	CMRL Compliance
7.1	Check rails/ Restraining Rails should be provided on curves on main line where radius is 190m or less on Standard gauge. The clearance of check rail/ restraining rails shall be suitably decided after requisite studies. The detailed design calculations/ studies in this regard shall be furnished for record.	Check rails will be provided on curves with radius 190 m or less on main line. Design Calculation / Studies are furnished *as per checklist item No.4.*
7.2	Check rails/ Restraining Rails shall not be mandatory for	**Will be Complied.** As per SOD, Check rail / Restraining rail has not been

Project Directorate Railway Board 29/7/2023

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	curves in depots, yards and non-passenger lines where speed is not more than 25 kmph. However, decision in this regards may be taken by Metro themselves based on layout and maintenance requirement.	proposed for curves in depots and non-passenger lines where speed is not more than 25 kmph.

8. DERAILMENT GUARDS

Sl. No.	Standards stipulated	CMRL Compliance
8.1	The derailment guard should be provided inside/outside of running rail on viaduct as well as in tunnel having multiple tracks and at grade section locations specified by the Metro railway. For single track tunnel, location for providing derailment guard is given in note. In tunnels, 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.	**Will be Complied for Viaduct.** Track Plinths / Turnout slabs will be provided with reinforced concrete derailment guard on the outside of the running rails. **Will be Complied for Tunnel.** Derailment guard will be provided on the Inside of the running rails as per SOD
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.	**Will be Complied**
2.	Exit of tunnel: 50 m from inside of tunnel portal to 200 m outside the tunnel.	

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

29/7/2025

Sl. No.	Standards stipulated	CMRL Compliance
3.	In curved track having radius 500 m or less including transition portion but excluding locations where check rail is provided	
4.	Covering locations of all important installations e.g. Location of any sub-station or hazardous structures inside the tunnel, etc damage to which in the assessment of 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 the risk assessment analysis for derailment in tunnels and ensure that the maintenance practices in the maintenance manual are as per the risk assessment mitigation plan.	**Will be Complied.**
8.2	The lateral clearance between the running rail and the derailment guard shall be 210 ±30 mm. It shall not be lower than 25 mm below the top of the running rail and should be clear of the rail fastenings to permit installation, replacement, and maintenance. Metro	**Will be Complied.** **Will be Complied:** The derailment guard will not be lower than 25mm below the top of the running rail and the arrangement of derailment guard permits fastening installation, replacement, and maintenance.

Project Directorate Received on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	Administration should ensure that KE is not infringing the structure gauge, in case of derailment in single track tunnel, so long the wheels of any derailed vehicle are within the main rail and derailment guard."	
	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+-20mm.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."	**Will be Complied**
8.3	Derailment guard shall be designed such that in case of derailment:	
(i)	The wheels of a derailed vehicle under crush load, moving at maximum speed are retained on the viaduct or tunnel.	**Will be Complied:** The designed derailment guard ensures retaining the wheels of the derailed vehicle under crush load moving at maximum speed.
(ii)	Damage to track and supporting structures is minimum.	**Will be Complied:** The designed derailment guard will ensure minimum damage to track and supporting structures in case of derailment.

Project Directorate Received on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	The detailed design calculations of derailment guards along with detailed structural drawings shall be furnished for record.	**Will be Complied:** Design calculations of derailment guards along with detailed structural drawings are enclosed herewith *as per check list 5.*

9. GLUED INSULATED RAIL JOINT

Sl. No.	Standards stipulated	CMRL Compliance
9.1	Normally glued joint should be avoided.	Glued joints are not provided since CBTC (Communication based Train control) system will be used.
9.2	Wherever inescapable, G3 (L) type of glued insulated rail joint shall be used as per RDSO drawing no.T-2572. The glued joints shall be manufactured and tested in accordance with RDSO's 'Manual for Glued Insulated Rail Joints-1998' with all amendments.	

10.Turnouts, Scissors Crossover

10.1 Standards of Turnouts

10.1.1Main lines

On main lines, the turnouts and diamond crossing shall be of the following standards:

Sl. No.	Standards stipulated	CMRL Compliance
	Standard Gauge	
	a) 1 in 9 type or flatter turnout (desirable)	**Will be Complied.** 1 in 9, 300 m Radius are proposed.
	b) 1 in 7 types turn out (minimum)	**Will be Complied.** 1 in 7,140 Radius and 190 Radius are proposed.

Project Directorate Railway Board 29/7/2025

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	c) Scissors cross-over of 1in9 / 1 in 7 types consisting of 4 turnouts and 1 diamond crossing	**Will be Complied.**1 in 9 R300 and 1 in 7 R190 are proposed

10.1.2 Depots and non – running lines

On depots and other non – running lines, the turnouts and diamond crossing shall be of the following standards:

Sl. No.	Standards stipulated	CMRL Compliance
(i)	**Standard Gauge**	
	a) 1 in 7 type or flatter turnout	**Will be Complied.** 1 in 7 ~~type~~ 140 m Radius, 1 in 9 190m Radius and 1 in 9 R300 turnouts are used.
	b) Scissors cross-over of 1 in 7 types consisting of 4 turnouts and 1 diamond crossing	**Will be Complied:** 1in 9, Radius 190m and 1 in 7 Radius 140m Scissor cross overs are used.
	c) 1 in 7 derailing switch / 1 in 7 type symmetrical split turnout	**Will be Complied**
10.1.3	If any Metro railway decides to use sharper angle layout, they should establish the adequacy of the speed potential of the turnout for the purpose for which it is used and the negotiability of the turn out by the rolling stock with a safety margin.	**Will be Complied.** Minimum 1 in 7/Radius 190m are followed.

10.1.4 The requirement for turnouts as specified in the following clauses shall include switch devices, crossings and associated check and lead rails as appropriate.

Sl. No.	Standards stipulated	CMRL Compliance
(a)	Turnouts (switches, lead, crossings, and associated closure & check rails) shall be suitable for installation on PSC sleepers for	**Will be Complied.**

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Approved on 29/7/2023 Railway Board

Sl. No.	Standards stipulated	CMRL Compliance
	ballasted track or concrete slab for ballastless track.	
(b)	Turnouts shall be manufactured to allow for installation of continuously welded track.	**Will be Complied.**
(c)	Turnout shall be compatible with proposed rolling stock and its operational characteristics.	**Will be Complied.**
(d)	The assembly must ensure continuous electrical contact with the train and all the points shall be operated by electric motors.	**Will be Complied.**
(e)	The CMS crossing to be used on mainline shall be subjected to explosive hardening.	**Will be Complied.**
(f)	All turnouts shall be laid with cant with a rail slope as that of main line towards centre of track.	**Will be Complied.**
(g)	All turnouts and their components shall be designed to minimize electrical leakage from running rails to the ground.	**Will be Complied.**
(h)	Scissor crossover should be designed for Track centres not infringing SOD.	**Will be Complied.**

Project Directorate Approved on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

10.2 TYPE AND GEOMETRY OF TURNOUT

Detailed design of all turnouts, scissors crossover should comply with the following geometrical parameters (s).

Sl. No.	Standards stipulated	CMRL Compliance
(a)	**Standard Gauge**	
(i)	**1 in 9 Turnout**	
	The design shall be tangential with a switch angle not exceeding 0°20'00''. It is desirable that the radius of lead rail of turnout is not less than 300m. The lead curve of 190 m radius may be laid as an exception. All clearances shall be in accordance with relevant provisions of SOD.	**Will be Complied.** The switch entry angle will not exceed 0°20'00''. Turnouts with lead curve radius of 300m/190m radius will be used. All clearances will be within relevant provisions of SOD.
(ii)	**1 in 7 Turnout**	
	The design shall be tangential with a switch angle not exceeding 0°20'00''. It is desirable that the radius of lead rail of turnout is not less than 190m. Lead curve of 140 m radius may be laid as an exception. All clearances shall be in accordance with relevant provisions of SOD.	**Will be Complied.** The switch entry angle will not exceed 0°20'00''. Turnouts with lead curve radius of 190m/140m radius will be used. All clearances will be within relevant provisions of SOD.
(iii)	**Scissor Crossover** The basic geometry of the turnouts of scissors crossover shall be same as that of corresponding ordinary turnouts as mentioned in clause 10.2 (a)(i) & (ii) above.	**Will be Complied** The basic geometry of scissor crossover will be the same as that of corresponding turnouts.

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Railway Board 29/7/2023

Sl. No.	Standards stipulated	CMRL Compliance
10.3 OPERATING REQUIREMENT OF TURNOUT, SCISSOR CROSSOVER		
	Track layout design shall permit trains to operate at maximum capability wherever possible. Turnouts and crossover shall be selected such that they do not form a restriction to the operating speed on main line. Switches and crossings shall not be located on transition curves or vertical curves.	**Noted and Will be Complied**
10.3.1	**Speed:** The turnout shall be designed for the speed on the mainline side equal to the speed as on mainline track. The minimum speed potential of the various turnouts and scissors crossover on the Turnout side should be as follows:	**Will be Complied.** Speed of mainline side on turnouts will be designed equal to main line.
10.3.1.1	**STANDARD GAUGE**	
(i)	1 in 9 type turnout with 300 m radius (speed potential of 45Kmph)	**Will be Complied**
(ii)	1 in 7 / 1 in 9 type turnout with 190 m radius (speed potential of 35Kmph)	**Will be Complied**
(iii)	1 in 7 type turnout with 140 m radius (speed potential of 25 Kmph)	**Will be Complied**
(iv)	Scissors crossover 1 in 9 type with 300 m radius (speed potential of 45 Kmph)	**Will be Complied**
(v)	Scissors crossover 1 in 9/1 in 7 type with 190 m radius(speed potential of 35Kmph)	**Will be Complied.**
(vi)	Scissors crossover 1 in 7 type with 140 m radius (speed potential of 25 Kmph)	**NA**
(vii)	1 in 7 type symmetrical split turnout (speed potential of 45Kmph)	**NA**

10.4 TECHNICAL SPECIFICATION

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate
Received on
29/7/2025
Railway Board

Sl. No.	Standards stipulated	CMRL Compliance
10.4.1	**General**	
(a)	All the points shall be capable of being operated by electric motors in accordance with the signaling specification.	**Will be Complied.**
(b)	The top surfaces of PSC sleeper/RCC slab supporting rail seat of turnouts and scissors crossover shall be flat without any cant/slope.	**Will be Complied.**
(c)	The track form of the turnout shall have uniform resilience as that of the adjoining track form.	**Will be Complied.** The turnout track will have uniform resilience as that of adjoining track form.
(d)	The fixation of turnouts, scissor cross-over on track slab shall be through base plates/bearing plates.	**Will be Complied.** The fixations of turnouts/scissors on track slab will be through base plates/bearing plates.
10.4.2	**Rails**	
1	The rails used in turnouts shall be 1080 grade Head Hardened. However, rails used in turnouts on depot and other non-running lines may be of 880 grades.	**Will be Complied.** The rails used in turnouts (in main line & Depots) are of 60 Kg 1080 grade Head Hardened Rails.
2	The rails used for manufacturing of turnouts shall satisfy the following conditions:	
(a)	The rails shall be manufactured and tested in accordance with IRS/T-12-2009 with latest amendment.	**Complied.** The rails are manufactured and tested in accordance with IRS T-12-2009 Reprint-2021(Covering up to ACS No.- 05)
(b)	The section of rails shall be 60E1 ~~(UIC60)~~ for stock, lead and 60E1A1 ~~(ZU1-60)~~ /60E1A4 for switch rail.	**Complied.** Stock and lead rails are of 60E1 , switch rails are of 60E1A1.
(c)	The rails shall qualify as Class 'A' rails as per IRS/T-12-2009.	**Complied.** The rails are of Class 'A' quality confirming to IRS T-12-2009 -Reprint-2021(Up to ACS No.- 05)

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Approved 24/12/2025 Railway Board

Sl. No.	Standards stipulated	CMRL Compliance
(d)	The rails shall be with ends un-drilled.	**Will be Complied.** The rail ends will be undrilled.
(e)	The rails shall be of grade 1080HH and be suitable for being welded by alumino- thermic or flash butt welding technique.	**Will be Complied.** The rails are of grade 1080HH and suitable for welding by AT/FBW Technique.
10.4.3	**Switches**	
1	Each switch device shall consist of two stock rails, one left hand and one right hand and two switch rails, one left hand and one right hand. Switches shall be manufactured to suit to special asymmetrical section switch rail type 60E1A1 ~~(ZU1-60)~~.	**Will be Complied.** Switches will be manufactured to suit asymmetrical section of 60E1A1 ~~(ZU1-60)~~ rails and having two switches and stock rails each one on left- and right-hand side.
2	The switch rail shall be one piece with no weld or joint within the switch rail length.	**Will be Complied.** The switch rails are one piece and no weld or joint within the switch rail length.
3	The end of the asymmetrical switch rail shall be forged to 60E1 ~~(UIC60)~~ rail profile with minimum length of 500 mm. The forged 60E1A1 ~~(ZU1-60)~~ switch rail end shall be suitable for welding or installation of insulated rail joint.	**Will be Complied.** End of asymmetrical switch rail is forged to 60E1 ~~(UIC-60)~~ rail profile with minimum length of 60 Kg profile for 500mm, the forged 60E1A1 ~~(ZU1-60)~~ switch rail end is suitable for welding or installation of insulated joint.
4	Slide chairs in the switch portion shall be coated with an appropriate special coating, so as to reduce the point operating force and to eliminate the requirement of lubrication of sliding surfaces during service.	**Will be Complied.** Appropriate coating will be given.
5	Switches shall provide suitable flange way clearance between the stock rail and the switch rail with the	**Will be Complied.** Minimum 60mm flange way clearance between stock rail and switch rail

Project Directorate Railway Board 29/7/2015

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	switch rail in open position (minimum 60mm). The 1 in 12 and 1 in 9 (with radius of 300 mts) and flatter turnouts shall be provided with second drive or other suitable arrangement to ensure minimum gap of 60mm at JOH as well as proper housing of switch rail with stock rail up to JOH.	in the open position will be provided. **Will be Complied** The minimum gap of 60mm at JOH will be ensured. Turnout 1 in 9 300m radius is provided with second drive connecting rod with the point machine to ensure minimum gap of 60mm at JOH as well as proper housing of switch rail with stock rail up to JOH.
	1 in 8.5, 1 in 9turnouts (with radius of 190m)and 1 in 7 and sharper turnouts may not be provided with second drive arrangement, however minimum gap of 60mm at JOH as well as proper housing of switch rail with stock rail up to JOH should be ensured.	**Will be Complied.** Minimum gap of 60mm at JOH as well as proper housing of switch rail with stock rail up to JOH will be ensured.
	The normal opening of switch at toe of switch shall be kept as 160mm.	**Will be Complied.** The opening of switch at toe is 160mm.
6	The switch manufacturer shall include provision for all holes required to main drive machines, stretcher bars and detection equipment to suit the requirements of the signaling and switch operating system duly chamfered to avoid stress concentration at the edge of the holes.	**Will be Complied.** All holes required for the main drive machines and detection equipment to suit the requirements of the signaling and switch operating system are provided by the switch manufacturer and duly chamfered to avoid stress concentration at the edges of the holes.
7	The switches shall be designed with an anti-creep device at the heel of	**Will be Complied.** The switches are designed with an anti-creep

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Application 29/7/2025 Railway Board

Sl. No.	Standards stipulated	CMRL Compliance
	switch to withstand thermal forces of the CWR track.	device at the heel of switch to withstand thermal forces of the CWR track.
8	The switches and all slide chairs shall be same for ballasted and ballastless turnouts.	**Will be Complied.**
10.4.4	**Crossings**	
1	All crossings shall be of cast manganese steel (CMS) crossings with weldable rails of minimum 1.2m length undrilled for welding into the overall turnout.	**Will be Complied.** All the crossings will be of Cast Manganese Steel with weldable rails of minimum 1.2m undrilled for welding into the overall turnout.
2	The CMS crossings shall be manufactured from Austenitic Manganese steel as per UIC 866.	**Will be Complied.** The CMS crossings are manufactured from Austeni tic Manganese Steel as per UIC866.
3	All CMS crossings shall have welded leg extensions of 60E1 ~~(UIC60)~~ rails. This shall be achieved by flash butt welding of buffer transition rail piece of suitable thickness to CMS crossings and rail leg extension.	**Will be Complied.** All CMS crossings having welded leg extensions of 60E1 rails, achieved by FBW.
4	All CMS crossings on main line shall have a minimum initial hardness of 340 BHN.	**Will be Complied.** Minimum initial hardness of 340 BHN will be ensured.
5	All CMS crossings and their welded leg extensions for all scissor crossovers shall be suitably dimensioned so as to eliminate the necessity of providing small cut rail pieces for the purpose of inter-connection. However, the need for providing insulated glued joints from signaling requirement point of view shall be taken care of in the design, if required.	**Will be Complied.** Welded leg extensions for scissors crossovers are suitably dimensioned and the signaling requirement also taken care.

Project Directorate 29/7/2025

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
6	The provision of rail cant shall be taken care of on the top surface of the CMS crossing and the bottom surface of all CMS crossing shall be flat.	**Will be Complied** and the bottom surface of all CMS crossings are flat.
10.4.5	**Check Rails**	
1	The check rail section shall be 33C1 (UIC33) or similar without any direct connection with running rails.	**Will be Complied.** Check rail section is 33C1 (UIC33) without any direct connection with running rails.
2	Check rails shall have the facility for the adjustment of check rail clearances up-to 10mm over and above the initial designed clearance.	**Will be Complied.** Check rails will be having the facility for clearance adjustment up to 10mm over and above the initial designed clearance.
3	Each check rail end shall be flared by machining to have minimum clearance of 62mm at end.	**Will be Complied.** Flared ends will be achieved by machining and having minimum clearance of 62mm at end.
4	The check rail connections in turnouts shall be through specially designed bearing plates / brackets.	**Will be Complied.** Check rail connections in turnouts will be through specially designed bearing plates/brackets.
5	All the check rails shall be higher by 25mm above running rails. The lengths and positions of the check rail in diamond crossings shall provide safety and be compatible with the overall track layout.	**Will be Complied.** Check rails will be higher by 25mm above the running rails and length and position of the check rails in diamond crossings will be suitably designed & compatible with overall track layout.
10.4.6	**Sleeper for Turnouts, Scissor crossover (Ballasted Track)**	
10.4.6.1	Sleeper shall be of pre-stressed concrete, mono-block, suitable for installation in track both with and without signaling circuits and with and without electrification.	**Will be Complied**

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate on Railway Board 29/7/2025

Sl. No.	Standards stipulated	CMRL Compliance
10.4.6.2	Sleepers shall be designed to provide a minimum service life of fifty years under nominal axle load as that of main line for the Metro system. Rail seat pads and rail clip etc shall be designed to provide a minimum service life of 15 years.	**Will be Complied**
10.4.6.3	The sleeper base surface shall be rough cast while the top and side surface shall be smooth to prevent retention of moisture and foreign materials.	**Will be Complied**
10.4.6.4	Sleepers must be suitable for installation by track laying machines and sleeper insertion equipment of a type used for isolated sleeper laying.	**Will be Complied**
10.4.6.5	The sleeper must be able to transfer all the relevant track forces generated by train operations and the forces of rail expansion and contraction to the ballast.	**Will be Complied**
10.4.6.6	Design Requirements for PSC Sleepers:	
(A)	The sleepers should satisfy the following design requirement:	
	Design Parameters	
(i)	Rail sleeper fastening – Elastic resilient type	**Will be Complied**
(ii)	Spacing of sleepers – 600mm (max) for main line and 650 mm (max) for Depots and other non-running lines, except at few locations such as near point machine locations where it may be varied to meet the design requirements.	**Will be Complied. 650mm spacing provided in depot.**
(iii)		

Project Directorate Received on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
(iv)	Ballast cushion – 300 mm for mainline and 250mm for Depots and sidings Ballast profile suitable for LWR/CWR.	**Will be Complied,300mm Ballast cushion provided for depot.** **Will be Complied**
	Specifications and Drawings (With latest amendment)	
(i)	Special Cement – IRS-39:2021 for PSC Sleeper 53 grade OPC to BIS Specification IS-269:2015.	**Will be Complied**
(ii)	HTS wire plain and strand – BIS – 1785 (Pt-1) 1983 and BIS 6006	**Will be Complied**
(iii)	Polyethylene dowels – Drg. No. RDSO/T-3002, IRS Specification for polyethylene dowels for concrete Sleepers-Serial no. T-57:2020.	**Will be Complied**
(iv)	IRS Specification for Turnout Sleeper T- 45: 2021	**Will be Complied**
(v)	IRS Bridge code 1982	**Will be Complied**
(vi)	Code of Practice for Pre-stressed Concrete IS-1343	**Will be Complied**
(B)	**The design should satisfy the following additional requirements-**	
(i)	The connections of the slide chairs and bearing plates/special bearing plates/brackets shall be designed for easy installation and maintenance. All the fittings shall be suitably designed to ensure full compatibility & also to ensure interchangeability of slide chairs between ballasted and ballastless turnouts.	**Will be Complied**
(ii)	For attaining suitable cant of the rail, as provided on mainline,	**Will be Complied**

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Railway Board 29/7/2024

Sl. No.	Standards stipulated	CMRL Compliance
	(excluding crossing and switch portion), suitably designed pads of appropriate material shall be provided between rail pad & PSC sleeper. Also fastening system should be designed to get the desired Toe Load.	
(iv)	The detailed design of Monoblock PSC sleepers for the turnouts along with structural drawings shall be checked and approved by metro railways.	**Will be Complied**

11.SWITCH EXPANSION JOINT

Sl. No.	Standards stipulated	CMRL Compliance
1	The SEJ for ballasted track shall be laid on PSC sleepers whereas the SEJs for ballastless track, if required, shall be laid on reinforced concrete slab.	**Not applicable since SEJ is not envisaged to be used.**
2	The rail section for all SEJs shall be UIC 60, 1080 HH grade as per IRS-T-12-2009.	
3	The SEJ for ballasted track shall be designed for a maximum gap of 80 mm.	
4	The SEJ for ballastless track should be designed for the maximum gap required as per design.	
5	The ballasted SEJ shall be as per RDSO drawing T-6902 &T-6922.	
7	Sleepers used for SEJs shall be flat and cant will be provided through CI chair.	
8	The SEJ shall be suitable for two-way directional traffic.	

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Approval 29/11/2023 Railway Board

12.FASTENING SYSTEM FOR BALLASTLESS TRACK

Sl. No.	Standards stipulated	CMRL Compliance
	Provisions contained separately in "PERFORMANCE CRITERIA OF FASTENING SYSTEM FOR BALLASTLESS TRACK ON METRO RAILWAYS/MRTS SYSTEM" (Annexure C-2) be referred to.	**Noted.** **Railway Board has approved Annexure C2 for Chennai Metro Phase II vide letter No. 2024/Proj./CMRL/C1-C2/30/84, Dated 08.10.2024.**

13.NOISE AND VIBRATION

Standards stipulated	CMRL Compliance
Metro system shall be designed to ensure that noise emitted is well within the prescribed limits for the particular area. Each Metro system shall specify the prescribed limits of permissible Noise and vibration parameters as per legal and statutory requirement of India.	**Will be Complied.** Statutory requirement for noise is as per Noise-Pollution (Regulation and Control) Rules,2000. Ambient Air quality standards in respect of Noise

Area code	Category of Area/Zone	Limits In dB(A) Leg	
		Day Time	Night Time
(A)	Industrial Area	75	70
(B)	Commercial	65	55
(C)	Residential	55	45
(D)	Silence Zone	50	40

1.Day time shall mean 06.00 A.M to 06.00 P.M

2.Metro corridor in CMRL is traversing predominately in Zone B and Zone C.

3. Noise radiated from train operations and track structures can impact the

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

29/7/2025

Standards stipulated	CMRL Compliance
	ambient noise levels and airborne noise from train operations radiated at-grade and elevated structures, while ground-borne noise and vibration are of primary concern in underground operations. 4. To provide a baseline for the analysis of potential noise effects caused by the metro operations at the DPR stage, 24-hour measurements were conducted at 19 sites along the metro corridors, which include residences and other buildings. 5. Based on the noise modelling results, it was inferred that the effect of predicted day-time noise level has low impact with respect to the existing ambient noise environment. 6. Further to above Chennai Metro Rail has engaged M/s. ARTS- Austria to conduct Noise and Vibration studies in entire Phase II corridors and suggest mitigation measures wherever required, which is in progress, based on the outcome of the study necessary measures will be taken by CMRL both in underground as well elevated section to mitigate the noise and vibration due to metro train operation.

14.GRADIENTS

Sl. No.	Standards stipulated	CMRL Compliance
14.1	**The maximum grade (compensated) shall be 4%.**	Maximum grade is 3.98% will be Complied
Note: (i)	There will be no change of gradient in transition portion of curves.	Will be Complied

Project Directorate 29/7/2025

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
(ii)	The gradient will be compensated for curvature at the rate of 0.04% per degree of curve.	Will be Complied
14.2	**Maximum permissible gradient on turnouts**	
(i)	On Ballasted Track 0.25%	Ballasted Track laid only at Poonamallee depot, is with level Track.
(ii)	On Ballastless Track 3%	Gradient of 2.64% provided at Poonamallee Bybass station.
Note: (i)	There shall be no change of gradient (i.e., Vertical curve) on and within 15 m (desirable)/3.0 m (minimum) of 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.	**Will be Complied.** A minimum of 3m distance between turnout and change of grade on ballastless track will be ensured.
(ii)	There shall be no horizontal curve within 15 m (desirable)/3.0 m (minimum) of any turnout on ballastless track and 30 meters of any turnout on ballasted track.	**Will be Complied.** A minimum of 3m distance between turnout and horizontal curve on ballastless track will be ensured.
(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 stocks on such turnout must be certified- by rolling stock supplier and confirmed through oscillation trial and a suitable speed restriction should be	**Will be Complied**

Project Directorate Approved on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	imposed on main and/or diverging line based on track geometry and other considerations required. In commencement of vertical curve or another horizontal curve shall be 15 m for ballast less track. Turnout shall not be laid on transition curve.	
(iv)	The limit of turnout for above purpose shall be taken for stock rail joint (SRJ) to end (i.e., Heel) of crossing for ballast less track. For ballasted track, it shall be from SRJ to last common sleeper behind end of crossings.	**Noted**
(V)	Metro Authority need to ensure that rolling stock is fit to negotiate the maximum permissible gradient on turnout considering the location of turnout with respect to vertical/horizontal curves in vicinity.	**Noted**
(vi)	The above stipulations shall also be applicable for turnouts to be laid outside station limit, if any.	**Noted**
14.3	**Track Gradient in Platform**	
(a)	Desirable Gradient: Level	Will be Complied. Gradients at all platforms are 'level'.
(b)	Maximum Gradient: 1 in 1200	Will be Complied.
(c)	Exceptional Gradient: 1 in 400	Will be Complied.
Note: (i)	Any gradient steeper than 1 in 1200 and up to exceptional gradient of 1 in 400 shall be proposed by civil Engineering	**Noted**

Project Directorate Received on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Sl. No.	Standards stipulated	CMRL Compliance
	head and approved by Managing Director in consultation with head of safety nominated by Metro Rail Authority.	
(ii)	There shall be no change of gradient in platform track	**Will be Complied**

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate
Approved on
29/7/2025
Railway Board

Part-B: Salient features of Track Structure as adopted by Metro Railways.

i) Track

Sl No.	Components / Items	Provisions / Reference
1	Gauge	1435mm
2	Axle Load	16 T
3	Design Speed	90kmph as per SOD
4	Rail Section and Grade	Main line = 60 E1 1080 grade HH Depot line = 60 E1 grade 880
5	Rail Specifications	IRS T-12-2009:Reprint-2021(upto ACS-5)
6	Ballasted or Ballastless	Viaduct and underground mainline - Ballastless (BLT) Poonamallee Depot – Ballasted Madhavaram Depot- Ballast less
7	Rail inclination (Canting of Track)	1 in 20
8	Check Rails provision	On main line in curves with radius 190m or lesser
9	Provision of Derailment upstand/Guard	Provided on viaduct and Underground /BLT
10	Horizontal Clearance of Derailment upstand	1. 210 ± 30mm 2. For Double resilient baseplate Assembly system- 250 ± 20mm
11	Vertical location of Derailment upstand w.r.t. Rail plane	Not lower than 25mm from Rail top level (Provision in SOD)
12	Glued insulated Rail Joint provided? If Yes, type of GIRL	NO
13	Welding Of Rail (LWR /CWR)	CWR
14	Whether SEJ provided? If Yes Type of SEJ	NO
15	Type of welding	FBW and SKV (Alumino Thermic)

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Approved on 29/7/2025 Railway Board

ii) Turnouts and switches

Sl. No	Components /Items	Scissors cross over (1 in 9) 190 ballasted	Turnouts (1 in 9) 190 ballasted	Turnouts (1 in 9) 300 ballasted	Turnouts (1 in 7) 140 ballasted	Turnout (1 in 9) 190 ballastless	Turnout (1 in 7 190) ballastless	Turnout (1 in 9) 300 ballastless	Scissors cross over ballastless. (1 in 9) 300	Scissors cross over ballastless (1 in 7) 190
1	Type of turnout scissors cross over (crossing angle)	Scissors cross Over.crossing angle=6.34°	Turnout (1 in 9). crossing angle=1 in 9 (6.34°)	Turnout (1 in 9). crossing angle=1 in 9 (6.34°)	Turnout (1 in 7). crossing angle=1 in 7 (8.13°)	Turnout (1 in 9). crossing angle=1 in 9 (6.34°)	Turnout (1 in 7). crossing angle=1 in 7 (8.13°)	Turnout (1 in 9). crossing angle=1 in 9 (6.34°)	Turnout (1 in 9). crossing angle=1 in 9 (6.34°)	Turnout (1 in 7). crossing angle=1 in 7 (8.13°)
2	Canted/un canted	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)	canted (1 in 20)
3	Radius	190 m	190 m	300 m	140 m	190 m	190	300 m	300 m	190
4	Length of switches	11.470 m	11.470 m	14.390m	11.460m	11.470 m	11.470m	14.390 m	14.390 m	11.470m
5	Type of switches (thick web or otherwise)	Thick web switches	Thick web switches	Thick web switches	Thick web switches	Thick web switches	Thick web switches	Thick web switches	Thick web switches	Thick web switches
6	Switch Entry angle	(0 °8' 50")	(0 °8' 50 ")	(0 °8' 50 "	(0 °8' 50 ")	(0 °8 ' 50 ")	(0 °8' 50 ")	(0 °8'12")	(0 °8'12")	(0 °8' 50 ")
7	Speed Potential	35 Kmph	35 Kmph	45 Kmph	25 Kmph	35 Kmph	35 Kmph	45 Kmph	45 Kmph	35 Kmph
8	Location of use Main line/Depot	Depot	Depot	Depot	Depot	Main line	Main line	Main line	Main line	Main line

Project Directorate Approved on 29/7/2025 Railway Board

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

ii) Turnouts and switches

Sl. No	Components /Items	Scissors cross over (1 in 9) 190 ballasted	Turnouts (1 in 9) 190 ballasted	Turnouts (1 in 9) 300 ballasted	Turnouts (1 in 7) 140 ballasted	Turnout (1 in 9) 190 ballastless	Turnout (1 in 7 190) ballastless	Turnout (1 in 9) 300 ballastless	Scissors cross over ballastless. (1 in 9) 300	Scissors cross over ballastless (1 in 7) 190
9	Rail section used for switches	60 E1 1080HH grade rails as per IRS T-12/2009 for stock rail and (60 E1 A1 (asymmetrical)-1080HH for switch/tongue rail)	60E1 1080HH grade rails as per IRS T-12/2009 for stock rail and (60 E1 A1 (asymmetrical)-1080HH for switch/tongue rail)	60E1 1080HH grade rails as per IRS T-12/2009 for stock rail and (60 E1 A1 (asymetrical)-1080HH for switch/tongue rail)	60E1 1080HH grade rails as per IRS T-12/2009 for stock rail and (60 E1 A1 (asymetrical)-1080HH for switch/tongue rail)	60E1 1080 grade HH rails as per IRS T-12/2009 for stock rail and 60 E1 A1 (asymetrical)-1080 HH for switch/tongue rail	60E1 1080 grade HH rails as per IRS T-12/2009 for stock rail and 60 E1 A1 (asymetrical)-1080 HH for switch/tongue rail	60E1 1080 grade HH rails as per IRS T-12/2009 for stock rail and 60 E1 A1 (asymetrical)-1080 HH for switch/tongue rail	NA	60E1 1080 grade HH rails as per IRS T-12/2009 for stock rail and 60 E1 A1 (asymetrical)-1080 HH for switch/tongue rail
10	Second Drive provided	NA	NA	Provided	NA	NA	NA	Provided	Provided	NA

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate Approved Railway Board 29/7/2025

iii) Crossings

Sl No.	Components / Items	Provisions / Reference
1	Crossing: Curved or Straight	1 in 9 R190m, 1 in 9 R300m, 1 in 7 R190 m = Curved
2	Crossing: Canted or uncanted	Canted
3	Length of Weldable length extension	Minimum 1200 mm
4	Check Rail section	UIC 33
5	Height of Check rail above the rail plane	25 mm
6	Check Rail clearance at the middle	41mm to 44mm
7	Check Rail clearance at the end	Min 62 mm

Examined and found in order

Director/UT/Civil
RDSO, Lucknow

Project Directorate
29/7/2025
Railway Board