

भारतसरकार (GOVERNMENT OF INDIA)
रेलमंत्रालय (MINISTRY OF RAILWAYS)
रेलवेबोर्ड (RAILWAY BOARD)

EF No. 2022/CE-II/CS/IRPWM2020

New Delhi, dated 30.07.2024

The General Managers (Engg.)- CR, ER, ECR, ECoR, NR, NCR, NER, NFR, NWR, SR, SCR, SER, SECR, SWR, WR, WCR and Metro Railway/Kolkata.
The General Manager (Const.), N.F. Railway, Guwahati.
The General Manager/CORE/Prayagraj.

Principal Financial Advisor, All Indian Railways.

The CAO/Const. All Indian Railways.

The General Managers (Engg.) – ICF/Chennai, RCF/Kapurthla, BLW/Varanasi, CLW/Chittranjan, Rail Wheel Factory /Yelahanka, Bangalore & PLW/Patiala.

The Director General (Track), RDSO/Alambagh, Lucknow.
Chief Commissioner of Railway Safety, Lucknow.

Managing Director, IRCON, New Delhi.

Managing Director, RITES Bhawan, 1, Leisure Valley Rd, Sector 29, Gurugram, Haryana Managing Director, DMRC, Metro Bhawan, Barakhamba lane, New Delhi.

Managing Director, CONCOR, New Delhi.

Managing Director, RVNL, August Kranti Bhawan, Bhikaji Cama Place, New Delhi.

Managing Director, DFCCIL, Pragati Maidan, Metro Station, New Delhi.

Managing Director, PIPAVAV Railway Corp. Ltd., 14th Floor, B-Wing, Statesman House 148, Barakhamba Road, Canaught Place New Delhi Central Delhi

Managing Director, MRVC, Church Gate station Building 2nd Floor, Mumbai – 400020.

Managing Director, RLDA, Unit No.702-B, 7th Floor, Konnectus Tower-2, DMRC Building, Ajmeri Gate Delhi 110002

Managing Director, Konkan Railway Corporation Ltd, Belapur Bhawan, Sector-11, CBD Belapur. Mumbai. Pin - 400614.

Director General, IRICEN, Pune.

Director General, IRIEEN, Nasik.

Director, IRISSET, Secunderabad.

Director, IRIMEE, Jamalpur.

Director General, IRITM, Vill. Kanausi, Hardoi, Manik Nagar, Lucknow.

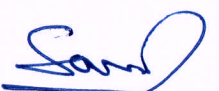
Director General, NAIR, Vadodara.

Genl. Secretaries, AIRF, NFIR, IRPOF, FROA, DAI (Railways) Rail Bhawan, New Delhi.

Sub: Correction Slip No.21 to the Indian Railways Permanent Way Manual 2020.

Ministry of Railways (Railway Board) has decided that correction/addition as indicated in the enclosed Correction Slip No.21 dated 30.07.2024, to relevant para of IRPWM-2020 be made.

Receipt of this letter may please be acknowledged.


(Saurabh Jain)
Dir. Civil Engg.(Plg.)
Railway Board

Copy to:-

Sr. PPS/PS to CRB & CEO, MF, MI, M(T&RS), M(O&BD), Secretary.
AM(CE), AM(Works), AM(Budget), AM(Traction), AM(Fin.), AM(Sig.), AM(Plg.),
AM(Mech.Engg.), AM(PU.), AM(Tele.), AM(Traffic), AM(M&BD), AM(T&C), AM(Comml.).

PED(Bridge), PED(Vigilance), PED(Safety), PED(Staff), PEDTT(M), PEDTK(M&MC), EDCE(P),
EDCE(G), EDCE(B&S), EDCE(B&S)-II, ED(L&A), ED/GS/SD, ED/Transf., ED/GS(Civil)-II,
EDV(E), ED/GS(Civil)-I, ED(Safety), EDF(X)-I, EDF(X)-II, EDTK(P&P), EDTK(MC), DTK(M),
DCE(B&S), DCE(B&S)-II, Dir./GS(Civil)-III, Dir./GS(Civil)-I, DVE-I & DVE-II



INDIAN RAILWAY PERMANENT WAY MANUAL, JUNE – 2020
ADDENDUM AND CORRIGENDUM SLIP NO. 21 DATED 30.07.2024

1. A new Note No. 5 shall be added in Notes below Table 1A of Para 103 of IRPWM, June - 2020 as under:

5. *Push trolley shall progressively be replaced with Rail-cum-Road Inspection Vehicle (RCRIV). Inspection by RCRIV would be done under block protection.*

2. Sl. No. 24 of Table 1B of Para 103 of IRPWM, June - 2020 shall be read as under:

S No	Type of Inspection	Schedule of inspection
24	Inspection of washable apron / Ballastless Track (when being used as washable apron)	Once in three months on rotation basis by SSE/P.Way (In-charge) and JE/SSE/P.Way (Sectional)

3. Para 205 (2) of IRPWM, June - 2020 shall be read as under:

205 (2) *Loop Lines* –

- (i) Renewal of passenger running loop lines and laying of new passenger running loop lines is to be done with new 60 kg rails.
- (ii) Renewal or laying of other loop lines is to be done with 60/52 kg (SH) rails. New rails can also be used for these rail renewals with the prior approval of Principal Chief Engineer.

4. A new Para 208 (5) shall be added to the existing para 208 of IRPWM, June - 2020 as under:

208 (5) Modern sleepers manufactured in fully automated Concrete Sleeper Plants with stricter quality control and lesser human intervention should be progressively used to obtain better geometrical tolerances in the concrete sleepers.

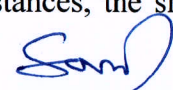
5. Para 209 (2) of IRPWM, June - 2020 shall be read as under:

209 (2) Minimum Sleeper Density-

- a) The minimum sleeper density for all track renewals (complete track renewal and through sleeper renewal), doubling, gauge conversion, new line construction works for main lines & renewal and laying of new passenger running loop lines shall be 1660 nos. per km and for other loop lines & sidings (permissible speed up to 50 kmph) it shall be 1540 nos. per km. For sidings with permissible speed more than 50 kmph minimum sleeper density shall be 1660 nos. per km.

Note: Higher sleeper density may be provided with the approval of the Principal Chief Engineer.

- (b) Where SWR track is to be laid on concrete sleepers in unavoidable circumstances, the sleeper


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spacing including at fish-plated joint, shall be kept uniform. In addition, 1 m long fishplates, be provided at fish plated joints.

6. A new Para 210 (A) shall be added to the existing para 210 of IRPWM, June -2020 as under:

210 (A) Modern Fastenings:

Approved Modern Fastenings can be used in place of ERC based fastenings in phased manner. These fastenings are capable of being supplied factory fitted on sleepers from the Concrete Sleeper Plants for laying in the field.

The Modern Fastenings shall comply with the requirements of category 'C' fastening system as per EN 13481-1:2012 and EN 13481-2:2022.

7. A new Para 211 (A) shall be added to Chapter 2 of IRPWM, June - 2020 as under:

Ballastless Track (BLT) may be used in Tunnels/ Viaducts/ Station Yards/ formation in deep cuttings as per site specific requirements.

8. Para 212 (2) (a) of IRPWM, June - 2020 shall be read as under:

212 (2) Depths of Ballast Cushion –

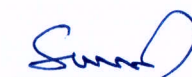
- (a) The minimum depth of the ballast cushion below the bottom of the sleepers at the rail seat for BG should be as under –

In case of	Minimum depth of the ballast cushion for all routes
Track Renewals (complete track renewals and through sleeper renewals)	300 mm (Where possible 350 mm shall be provided)
All Doubling, Gauge Conversion & New Line construction works	350 mm
Renewal and laying of new passenger running loop lines	300 mm
Other loop lines	250 mm

For higher speed, Para 202 would also be referred.

9. Para 227 (1) (b) of IRPWM, June - 2020 shall be read as under:

227 (1) (b) H-Beam steel sleeper, including its fittings, for Girder Bridges may be provided as per applicable RDSO drawings. Insulated Zero Toe Load Fastenings should be provided in track circuited area for continuation of LWR/CWR.


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10. Para 316 (3) of IRPWM, June - 2020 shall be read as under:

316 (3) Ultrasonic test:

All Flash Butt Welds made in Flash Butt Welding Plants shall be subjected to USFD Testing using Phased Array Ultrasonic Testing (PAUT) method for detecting internal flaws. All Flash Butt Welds made in field shall be subjected to ultrasonic testing by USFD machine preferably using Phased Array Ultrasonic Testing method for detecting presence of internal defects in the weld. Testing shall be done by trained personnel as per the procedure laid down in "Manual for *Ultrasonic testing of rails and Welds*" and Procedure Order issued by RDSO. Results shall be maintained as per proforma given in Annexure - 3/5 and entries made in TMS. Defective joints shall be distinctly marked and shall be cut and removed before panel is laid in track.

11. Para 323 of IRPWM, June - 2020 shall be read as under:

323 Conversion of SWR into LWR – Wherever conditions permit, conversion of SWR into LWR should be considered. The following additional precautions should be observed when converting SWR into LWR –

- (1) The rails shall be tested ultrasonically and all defective rails replaced before conversion into LWR.
- (2) Rail ends which are hogged or battered or have a history of cracks in bolthole region, shall be cropped before conversion into LWR.

12. New Para 326 (9) and 326 (10) shall be added to the existing para 326 of IRPWM, June - 2020 as under:

326 (9) Weldable CMS crossings:

CMS crossing using weldable rail legs i.e. Weldable CMS Crossings have been developed for two variants i.e., 1 in 8.5 (BG) 60kg and 1 in 12 (BG) 60kg. Weldable CMS crossings should be used in yards to continue LWRs through turnouts as per RDSO Report No. CT-48, May 2024. WCMS may also be used to avoid fish plated joints where LWR is not continued through turnout due to other reasons.

326 (10) Zero Fish Plated Track:

Fish plated joints shall be gradually eliminated on main line track to achieve Zero Fish Plated track by providing Weldable CMS crossing and welding its leg joints. Fish plated joints should also be eliminated on bridges by following the provisions contained in Para 329, 330 and 331.

13. Para 327 of IRPWM, June - 2020 shall be read as under:

327 Provision of Digital Axle Counters and Glued Joints:

Digital Axle Counters shall be provided in all new works. In other works, insulation for track circuiting in LWR/CWR can be done by providing glued joints of G3(L) type. All existing glued joints shall progressively be replaced by Digital Axle Counters.


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14. Existing Para 328 (3) shall be renumbered as Para 328 (4) and a new Para 328 (3) shall be added to the existing para 328 of IRPWM, June - 2020 as under:

328 (3) Thick Web Switch Expansion Joints (TWSEJ): On straight track, TWSEJ (RT-8822) shall be provided progressively in place of SEJ/Improved SEJ during the renewals/replacements/new works in approved temperature zones.

(4) SEJ of any type shall not be located on transition of curve.

15. A new Para 347 (1) (c) shall be added to the existing para 347 of IRPWM, June -2020 as under:

347 (1)(c) In ideal condition, stress free temperature is same as destressing temperature. However, during service, various stresses get locked up due to maintenance activities, creep of rail, deterioration of track geometry, traffic conditions etc. The locked-up stresses alter the Stress-Free Temperature (SFT) of the rail. Determination of actual SFT by use of any RDSO approved Non-Destructive Technique will be helpful in monitoring behaviour of LWR.

16. Annexure 3/8 of IRPWM, June – 2020 shall be read as under:

S No	Conditions of track	Restriction imposed in Km/h
1 (a)	When 1 meter long slotted fishplates (Fig. 3.9) with screw clamps (Fig. 3.10) & M.S. clamp (Fig. 3.11) or joggled fishplates with bolted clamps (Fig. 3.12) are used at a temporary rail joint and there is 24 hrs. watch. However, if the above arrangement is not under round the clock watch, speed restriction of 20 Km/h should be imposed, as mentioned in drawings.	30
1 (b)	Approved High Performance Rail Clamps should be used progressively for improved safety. When approved High Performance Rail Clamps are used at a temporary rail joint and there is 24 hrs. watch, a speed restriction of 50 km/h shall be imposed. However, if the above arrangement is not under round the clock watch, speed restriction of 30 Km/h should be imposed.	50
2	When sleeper fastenings on alternate sleepers are loosened before de-stressing	30
3 (a)	At fracture after emergency repairs are completed	
(i)	First train	STOP DEAD & 10
(ii)	Subsequent trains	20
3 (b)	At fracture after emergency repairs are completed with approved high performance rail clamps and there is 24 hrs watch	
(i)	First train	STOP DEAD & 10
(ii)	Subsequent trains	50
4	After emergency repairs to track after buckling	
(i)	First train	STOP DEAD & 10
(ii)	Subsequent trains	20
5	Speed restriction during consolidation period of track, after regular track	

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	maintenance operations when rail temperature exceeds $t_d + 20^\circ\text{C}$:	
(i)	When shoulder and crib compaction has been done	50
(ii)	When shoulder and crib compaction has not been done	30

17. Para 411 of IRPWM, June - 2020 shall be read as under:

411 (1) **Curves of Contrary Flexure:** On the main line curve from which a curve of contrary flexure takes off, the cant of the main line (which is the negative Super-elevation on the turnout), should be calculated from the formula given in the Schedule of Dimension and the permissible speed on the main line determined from the allowable cant deficiency and cant on the main line. The speed so determined shall be subject to limitations governed by the standard of interlocking and the sectional speed.

411 (2) For turnouts laid on curves with Thick Web Switches, pre-curving of stock and tongue rails shall be done during their manufacturing. Pre-curving and sleeper spacing shall be as given in Annexure-4/6.

18. A new Para 412 (3) shall be added to the existing para 412 of IRPWM, June - 2020 as under:

412 (3) For turnouts laid on curves with Thick Web Switches, pre-curving of stock and tongue rails shall be done during their manufacturing. Pre-curving and sleeper spacing shall be as given in Annexure-4/7.

19. Para 429 (1) (a) of IRPWM, June - 2020 shall be read as under:

429 (1) (a) Points and crossings should be laid without the 1 in 20 cant except canted turnouts as per approved designs.

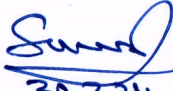
20. Para 429 (1) (g) of IRPWM, June - 2020 shall be read as under:

429 (1) (g) Correct spacing of sleepers should be ensured according to the standard layout drawings. The standard spacing of sleepers for 1 in 8.5 and 1 in 12 turnouts are given in Annexure - 4/2. For Canted Turnouts, the spacing of sleepers as per approved RDSO design shall be used.

21. Para 429 (3) (e) of IRPWM, June - 2020 shall be read as under:

429(3) (e) Maximum permissible vertical wear on wing rails or nose of crossing shall be 10mm (Except Weldable CMS Crossing for which limit will be 8 mm). However, on Rajdhani/Shatabdi routes, as a good maintenance practice, crossing and the wing rails should be planned for reconditioning/resurfacing by welding on reaching the following wear limits:

- (i) Built up/Welded Crossing – 6 mm
- (ii) CMS Crossings – 8 mm


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(iii) WCMS Crossings – 6 mm

Note –

In case of CMS/WCMS/heat-treated welded crossings, following dimensions should be deducted (to account for slope in casting of wing rails to 1 in 20 cant) from the wear measurements to find out the actual wear of wing rails and nose of crossing.

For wing rail wear

- (a) for Built up / heat-treated welded crossing – 0 mm.*
- (b) for CMS crossing of 52 kg section – 2.0 mm.*
- (c) for CMS / WCMS crossing of 60 kg section – 2.5 mm.*

For nose wear at ANC

- (d) for Built up / heat-treated welded crossing – 6.0 mm.*
- (e) for CMS crossing of 52 kg section – 8.0 mm.*
- (f) for CMS/WCMS crossing of 60 kg section – 8.5 mm.*

For nose wear at 100 mm behind ANC

- (g) for Built up crossing – 0 mm*
- (h) for heat-treated welded crossing – 3.5 mm.*
- (i) for CMS crossing of 52 kg section – 2.0 mm.*
- (j) for CMS crossing of 60 kg section – 2.5 mm.*
- (k) for WCMS crossings (1 in 12, 60 kg) – 6.0 mm*
- (l) for WCMS crossings (1 in 8.5, 60 kg) – 5.7 mm*

22. Para 430 (1) of IRPWM, June - 2020 shall be read as under:

430 (1) General – On all routes, crossings of all types can be reconditioned in-situ or outside the track using Robotic Welding Technology. However, switches shall always be reconditioned outside the track. Manual method consisting of H3B and H3C type of electrodes can be used for reconditioning of switches.

23. A new Para 433 shall be added to Chapter-4 of IRPWM, June - 2020 as under:

433 Switch Rail Grinding Machine (SRGM) can be used to ensure grinding of turnouts, level crossings, curves with check rails and other stretches where it is not possible to use main line RGM due to track structure or geometry constraints.

24. Para 14 of Annexure 4/3 of IRPWM, June - 2020 shall be read as under:

14) Wear of crossing (to be measured with Straight edge):

For calculating actual wear, following values shall be deducted from the measured wear-


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For wing rail wear

- (a) for Built up / heat-treated welded crossing – 0 mm.
- (b) for CMS crossing of 52 kg section – 2.0 mm.
- (c) for CMS / WCMS crossing of 60 kg section – 2.5 mm.

For nose wear at ANC

- (d) for Built up / heat-treated welded crossing – 6.0 mm.
- (e) for CMS crossing of 52 kg section – 8.0 mm.
- (f) for CMS/WCMS crossing of 60 kg section – 8.5 mm.

For nose wear at 100 mm behind ANC

- (g) for Built up crossing – 0 mm
- (h) for heat-treated welded crossing – 3.5 mm.
- (i) for CMS crossing of 52 kg section – 2.0 mm.
- (j) for CMS crossing of 60 kg section – 2.5 mm.
- (k) for WCMS crossings (1 in 12, 60 kg) – 6.0 mm
- (l) for WCMS crossings (1 in 8.5, 60 kg) – 5.7 mm

25. Para 10 of Annexure 4/3 (A) of IRPWM, June - 2020 shall be read as under:

10. Wear of crossing (to be measured with straight edge):

For calculating actual wear, following values shall be deducted from the measured wear-

For wing rail wear

- (a) for Built up / heat-treated welded crossing – 0 mm.
- (b) for CMS crossing of 52 kg section – 2.0 mm.
- (c) for CMS / WCMS crossing of 60 kg section – 2.5 mm.

For nose wear at ANC

- (d) for Built up / heat-treated welded crossing – 6.0 mm.
- (e) for CMS crossing of 52 kg section – 8.0 mm.
- (f) for CMS/WCMS crossing of 60 kg section – 8.5 mm.

For nose wear at 100 mm behind ANC

- (g) for Built up crossing – 0 mm
- (h) for heat-treated welded crossing – 3.5 mm.
- (i) for CMS crossing of 52 kg section – 2.0 mm.
- (j) for CMS crossing of 60 kg section – 2.5 mm.
- (k) for WCMS crossings (1 in 12, 60 kg) – 6.0 mm
- (l) for WCMS crossings (1 in 8.5, 60 kg) – 5.7 mm

26. A new Annexure-4/6 shall be added to Chapter – 4 of IRPWM, June – 2020:

Attached as Annexure-I herewith.


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27. A new Annexure-4/7 shall be added to Chapter – 4 of IRPWM, June – 2020:

Attached as Annexure-II herewith.

28. A new Para 612 (9) shall be added to the existing para 612 of IRPWM, June - 2020 as under:

612 (9) Rail Flaw: During service life of rail, various other rail flaws like head checks, spalling, shelling, squats etc. may develop which may have to be attended.

29. Para 613 (2) (g) of IRPWM, June - 2020 shall be read as under:

613 (2) (g) Train watering arrangements should be avoided on the run through main lines as far as possible. Proper drainage should be ensured in yard/station lines including washing lines, washable apron, Ballastless Track, train watering lines etc.

30. Para 613 (4) of IRPWM, June - 2020 shall be read as under:

613 (4) Repairs to wheel burns, corrugations, rail flaws: This could be carried out at site by replacing the affected length or by grinding /milling of rail.

31. A new Para 613 (5) shall be added to the existing para 613 of IRPWM, June - 2020 as under:

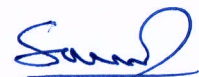
613 (5) Grinding of Rails: Rail Grinding is an important maintenance activity, which helps in improving the asset reliability, safety and service life by reducing the damage to the rail, wheel and other track components. Rail grinding machine can be used for removal of wheel burns, corrugation and other rail flaws. Rail lubrication should be used as per the provisions of para 424.

32. Para 662 (1) (b) of IRPWM, June – 2020 shall be read as under:

662 (1) (b) S&T Department shall provide adequate number of personnel for opening of signal rod, signal gears, other installations etc. to facilitate mechanized track maintenance. Opening of signal rods, signal gears etc. shall not be required where In-sleeper Point Machine has been provided.

33. Para 662 (2) (g) of IRPWM, June - 2020 shall be read as under:

662 (2) (g) Proper drainage should be ensured so as to avoid flooding of track, during rains, particularly in yards, where watering of coaches is done. It would be desirable to provide ballastless track on platform lines, where watering of coaches is done.


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34. Para 711 (6) of IRPWM, June - 2020 shall be read as under:

711 (6) Detailed guidelines on unloading of rails and related to operation of End Unloading Roller Rakes as contained in RDSO's *Guidelines for Handling and Stacking of Rails (CT-35)* shall be followed.

35. Para 717 (1) of IRPWM, June – 2020 shall be read as under:

717 (1) Renewal of Points and Crossing shall be planned under following conditions:

- (a) Wear on switches and crossing reaches as per Para 429(2)(c) and Para 429(3)€.
- (b) After it has carried the minimum total traffic as shown below or on condition basis as decided by Chief Track Engineer of the Railway for item at SN 1 & 2 below:

S. No.	Item	GMT carried	
		52 kg	60 kg
1	Fabricated Switch (ORS)	250	300
2	Thick Web Switch	500	800
3	CMS Crossing after three rounds of in-situ reconditioning using robotic welding machine	350	350
4	WCMS Crossing after three rounds of in-situ reconditioning using robotic welding machine	-	350

- (c) Renewal of Sleepers when they become due as per Para 702 (2).
- (d) When the rail section on either side is changed to a higher section in through running lines.

36. Note to Para 718 of IRPWM, June - 2020 shall be read as under:

Note: The service life of P.Way components at special locations like turnout, washable aprons, Ballastless Track being used as washable apron, Curves sharper than 5 Degree, SEJ, Gradient sharper than 1 in 100, coastal areas, station yards including approaches etc. is 50 % that of plain track or on condition basis as decided by CTE.

37. Para 864 of IRPWM, June - 2020 shall be read as under:

864 Operation of Hoppers – The hopper valves shall be operated according to the prescribed instructions under the direct supervision of the train guard or official-in-charge. As far as possible one hopper may be unloaded at a time moving at walking speed. The official-in-charge should walk on the side and instruct the labour as to when to open or close the hopper valves. The train should not be stopped, while ballast is being discharged; labour should not be moved from the platform without first stopping the train. For better control of operation of hopper valves, remote operated Electro-Mechanical gates should be used.


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38. A new chapter on Emerging Track Technology Items shall be added as CHAPTER-15 in Indian Railway Permanent Way Manual, June 2020 as under:

CHAPTER -15

EMERGING TRACK TECHNOLOGY ITEMS

1501. Canted Turnouts: Canted turnouts provide better riding quality, increased service life and enhanced safety.

Canted Turnouts may be procured on the basis of design / Functional Requirements and Specifications approved by RDSO.

1502. Modern Sleeper & Fastening System:

In modern rail networks, Railway track is dealt as a system i.e., all the components of fastenings are designed, developed and procured together thereby improving overall tolerances of fastening system. In addition, the modern fastening system effectively addresses the problems associated with the present fastening system such as liner biting corrosion, jamming and loosening of Elastic Rail Clips, crushing of Rail pads etc. Modern Fastening Systems are often complemented with Fully Automated sleeper plants to improve quality through lesser human intervention. The Production of sleepers and their machine-based inspections are integrated which results into better tolerances. Modern fastenings factory fitted on the sleepers in parked condition can be supplied from the Concrete Sleeper Plants. Modern fastening system and automated sleeper manufacturing plants should progressively be used for better quality control and higher track standards.

1503. Ballastless Track System (BLT):

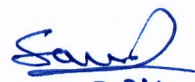
It is desirable to provide Ballastless track in Tunnels/Viaducts/Station Yards/formation in cuttings due to lesser maintenance efforts and economical life cycle costs.

BLT should be constructed as per RDSO approved "Technical eligibility and Special Conditions of Contract for Design and Construction of Ballastless track for Indian Railway".

1504. In-sleeper Point Machine:

In-sleeper point machines are designed in such a way that the point machine and other gears are completely housed in a shell which serves as sleeper. There is no need of disconnection and removal of point machines from the track for tamping of turnouts where In-Sleeper point machines are provided. RDSO approved In Sleeper point machine may be used in place of ordinary point machine to ensure seamless tamping and improved maintenance.

1505. Composite Sleepers: Due to non-availability of bridge timbers, Steel Channel / H-Beam sleepers have been provided on steel girder bridges. However, search for a material as versatile as wood is on for a long time to avoid problems of maintenance and fitment with Steel Channel / H-Beam Sleepers. Composite Sleeper is an eco-friendly option having potential of a suitable substitute for the bridge timber. RDSO approved composite sleepers may be used at special locations.


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1506. Phased Array Ultrasonic Testing (PAUT)

PAUT is an advanced non-destructive ultrasonic technique that permits the shaping and steering of the ultrasonic beam angles and enhanced beam coverage. The Phased Array beam sweeps across the entire section of the rail/weld, resulting in a recordable image that reveals defects hidden inside a rail or weld. Phased Array has advantages over conventional ultrasonic, since it shows defect representation in A-Scan, B-Scan, C-Scan and S-Scan that can produce more accurate results and provide a higher level of reproducible results which minimises human error. PAUT technology as approved by RDSO may be used for testing of rails/welds.

1507. High Performance Rail Clamp

High Performance Rail Clamps are being used in many railway systems to expedite relaxation of the speed restriction on the discontinuities of the track (rail flaw/ weld flaw/ rail fracture / weld fracture), RDSO approved High Performance Rail Clamps may be used for permitting speeds of 50 kmph and higher on track discontinuities.

1508. Rail Inspection Vehicle (RIV) is a self-propelled vehicle borne Rail Head Inspection and Analysis System for use on the tracks. The self-propelled Rail Inspection Vehicle (RIV) can be installed with Rail Head Profile Inspection & Analysis System to facilitate advance digital inspection of rails for selection of an optimum rail grinding program.

1509. Milling of Rail: Rail milling machine is meant to improve the worn profile of rail head to remove fatigued material having micro cracks of more than 0.3 mm size & other surface defects on the rail head.

1510. Replacement of existing system of inspection: In order to carry officials for inspection a Self-Propelled **Rail-cum-Road Inspection Vehicle (RCRIV)** may be used to replace existing manual push trolley in phased manner. It is capable of facilitating safe travel on electrified/non-electrified section.

1511. Advancement in Rails

New rail grades of 60E1 profile, R260, R260NC & R350HT have been developed comparable to global standards to meet the requirements of high speed and high axle load on IR network and to align with best international practices in rail manufacturing.

R260 rail has better mechanical properties as compared to 880 grade rail.

R260NC (NCC- Nickel Chromium Copper) grade rail has been developed to resist severe corrosive environment in coastal and industrial regions. Mechanical properties of R260NC rails are similar to that of R260 grade rails.

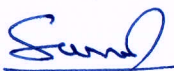
R350HT is heat treated rail suitable for higher axle load.

1512. Portable track geometry measurement system for Point & Crossing:

In order to reduce manual measurement system for Point & Crossing, Portable track geometry measurement system for Point & Crossing can be used. It will progressively replace the existing system of manual measurement. After introduction of this system, magnitude of errors in parameters measured manually will be reduced. This will also result in time saving in measurement & reduction in manpower deployed in the work.

1513. Ground Penetration Radar (GPR)

Ground Penetration Radar (GPR) survey is a non-invasive method that uses high frequency radio waves, yielding data with very high resolution in a short amount of time which can be utilized for assessing the ballast health and condition of railway track bed. The GPR system will be mounted on a dedicated vehicle and shall be deployed for scanning of ballast and top layer of formation of IR. GPR Survey will


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help in assessment of the clean/fouling condition of ballast, locations of bad formation etc. which will help in scientific and rational planning of deep screening of ballast and formation rehabilitation etc.

1514. Unattended track inspection system (UTIS) on Smart loco

Smart Loco is an onboard monitoring system, installed on Locomotive to monitor the health of various vital components of Loco and report it to a base station on real time basis and generate alerts. Unattended track inspection system (UTIS) can be mounted on Smart locomotive for assessing the track health including condition monitoring of track components, generating alerts and facilitate predictive maintenance of Railway Track on dedicated routes on Indian Railways. The unattended track inspection system may have following sub-systems;

- a) Line scan video inspection system for condition monitoring of track components.
- b) Measurement of acceleration at axle box level
- c) System for drivers view video recording.

1515. Vehicular Ultrasonic system for rail testing

The vehicular Ultrasonic test system can either be Rail Bound or Rail Cum Road type self-propelled vehicle. Self-Propelled Ultrasonic Rail Testing (SPURT) Car is rail bound vehicle equipped with advanced USFD system for detection of internal defects in rails/welds.

(a) Rail cum Road Vehicle Ultrasonic System (RCRV)

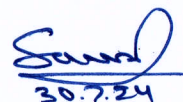
At present pedestrian Ultrasonic Flaw Detection system (SRT/DRT) is being used for detection of internal defects in Rails/Welds which is slow and subjective and depends on the expertise of the operator. With the increase in speed & frequency of trains, moving on track for this testing has become difficult.

A Rail cum Road Vehicle (RCRV) fitted with Ultrasonic Flaw Detection System is a versatile vehicle used for ultrasonic testing of rails/welds. RCRV is capable of running on road as well as on track. The design speed of the vehicle on track is about 80 kmph in transit and 40 kmph in testing mode. RCRV fitted with USFD testing system is in under development stage for Indian Railway network. The sophisticated software used in RCRV based vehicular USFD system captures, filters and analyses the testing data to produce a list of suspected defects along with their location. Confirmatory testing of the suspected defect locations is carried out using manual USFD testing system.

(b) Self-Propelled Ultrasonic Rail Testing Car (SPURT Car)

SPURT Car is capable of testing at 40 kmph. The software used in SPURT Car captures, filters and analyses the testing data to produce a list of suspected defects along with their location. Confirmatory testing of the suspected defect locations is carried out using manual USFD testing system.

Self-propelled, high-speed ultrasonic testing vehicles offer a modern solution to the limitations of the manual USFD system on the Indian Railway network.


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Pre-curving requirements and revised sleeper spacing of 1 in 8½, 1 in 12 & 1 in 16 Thick Web Switches for Contrary Flexure Turnouts

- i) The tongue and stock rails of Thick Web Switches shall be given requisite amount of pre-curving at manufacturing premises only.
- ii) Sleepers will become skew due to curvature, therefore, grinding of liners for fitting on some of the sleepers may be required.
- iii) Pre-curving and sleeper spacing details have been specified for various groups of curvatures applicable for various curvature ranges. The details pertaining to relevant range shall be used for providing pre-curving and sleeper spacing.

a) 1 in 8½, BG 60kg Thick Web Switch in Contrary Flexure Turnout

Curvature Group	Applicable range of degree of curvature
Straight	up to 0.5°
1°	> 0.5° & up to 1.5°
2°	> 1.5° & up to 2.5°
3°	> 2.5° & up to 3.5°
4°	> 3.5° & up to 4.5°
5°	> 4.5° & up to 5.5°
6°	> 5.5° & up to 6.5°
7°	> 6.5° & up to 7.5°
8°	> 7.5° & up to 8.0°

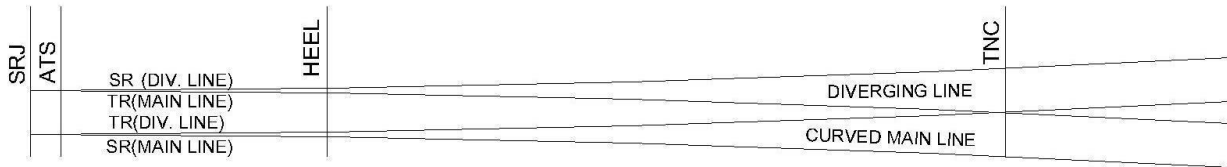
b) 1 in 12, BG 60kg Thick Web Switch in Contrary Flexure Turnout

Curvature Group	Applicable range of degree of curvature
Straight	up to 0.5°
1°	> 0.5° & up to 1.5°
2°	> 1.5° & up to 2.5°
3°	> 2.5° & up to 3.5°
4°	> 3.5° & up to 4.5°
5°	> 4.5° & up to 5.0°

c) 1 in 16, BG 60kg Thick Web Switch in Contrary Flexure Turnout

Curvature Group	Applicable range of degree of curvature
Straight	up to 0.5°
1°	> 0.5° & up to 1.5°
2°	> 1.5° & up to 2.5°
3°	> 2.5° & up to 3.5°
4°	> 3.5° & up to 4.5°
5°	> 4.5° & up to 5.0°

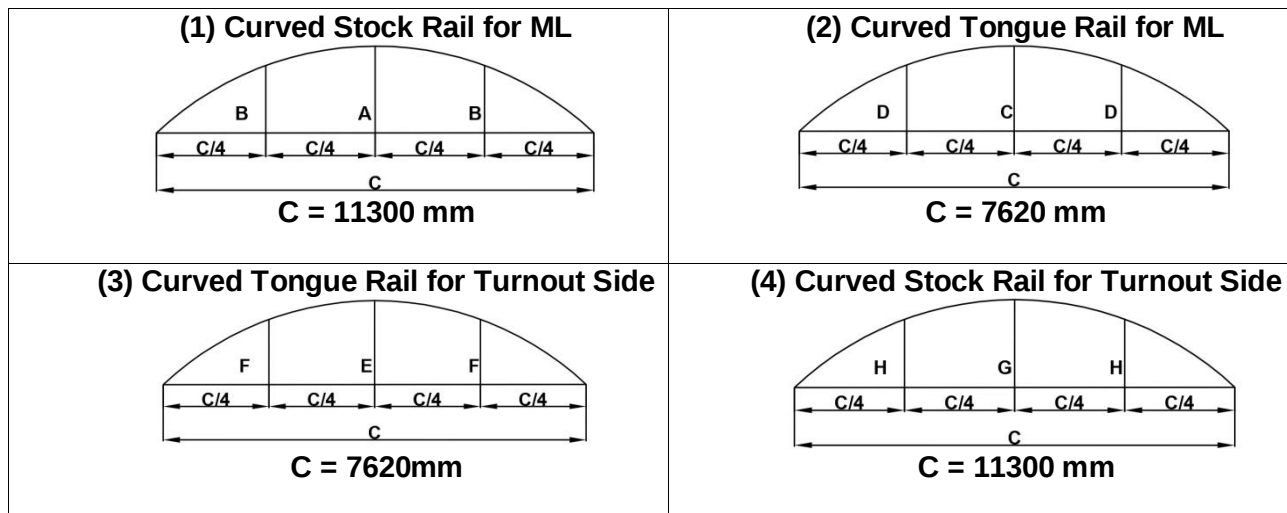
**Pre-curveding of Tongue Rails (TR) & Stock Rails (SR) for 1 in 8½, BG 60kg Turnout
with Zu-1-60/60E1A1 Thick-Web Switches for Contrary Flexure**



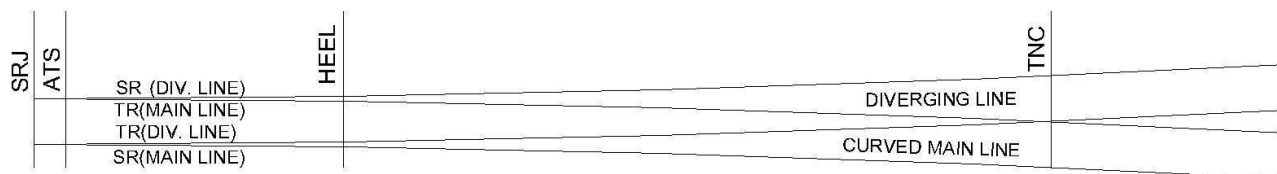
Applicable range of degree of curvature	Versine in mm for Main Line Track				Versine in mm for Diverging Track			
	For Stock Rail		For Tongue Rail		For Tongue Rail		For Stock Rail	
	A (MID)	B (QTR)	C (MID)	D (QTR)	E (MID)	F (QTR)	G (MID)	H (QTR)
Up to 0.5°	0	0	0	0	-31	-23	-69	-52
> 0.5° & up to 1.5°	9	7	4	3	-27	-20	-60	-45
> 1.5° & up to 2.5°	18	14	8	6	-23	-17	-51	-38
> 2.5° & up to 3.5°	27	21	12	9	-19	-14	-42	-31
> 3.5° & up to 4.5°	36	27	17	12	-15	-11	-32	-24
> 4.5° & up to 5.5°	46	34	21	16	-11	-8	-23	-17
> 5.5° & up to 6.5°	55	41	25	19	-6	-5	-14	-11
> 6.5° & up to 7.5°	64	48	28	22	-2	-2	-5	-4
> 7.5° & up to 8.0°	73	55	33	25	2	1	4	3

Note : Negative versines of tongue and stock rails of diverging track indicates that curvature of tongue and stock rails of diverging track are in the reverse direction to the curvature of tongue and stock rails of main line track.

Contrary Flexure Turnout:-



**Pre-curving of Tongue Rails (TR) & Stock Rails (SR) for 1:12, BG 60kg Turnout
with Zu-1-60/60E1A1 Thick-Web Switches for Contrary Flexure**



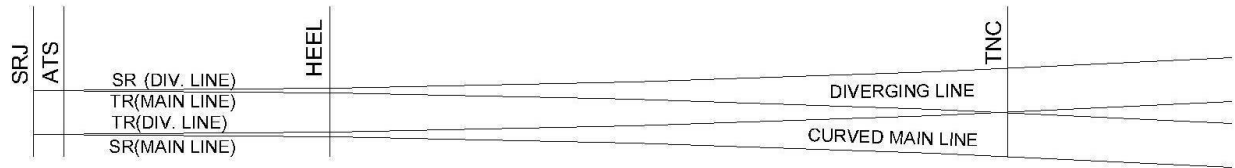
Applicable range of degree of curvature	Versine in mm for Main Line Track				Versine in mm for Diverging Track			
	For Stock Rail		For Tongue Rail		For Tongue Rail		For Stock Rail	
	A (MID)	B (QTR)	C (MID)	D (QTR)	E (MID)	F (QTR)	G (MID)	H (QTR)
Up to 0.5°	0	0	0	0	-44	-33	-40	-30
> 0.5° & up to 1.5°	10	8	11	8	-33	-25	-30	-22
> 1.5° & up to 2.5°	20	15	22	17	-22	-16	-20	-15
> 2.5° & up to 3.5°	30	23	33	25	-11	-8	-10	-7
> 3.5° & up to 4.5°	40	30	45	33	0	0	0	0
> 4.5° & up to 5.0°	50	38	56	42	12	9	10	8

Note : Negative versines of tongue and stock rails of diverging track indicates that curvature of tongue and stock rails of diverging track are in the reverse direction to the curvature of tongue and stock rails of main line track.

Contrary Flexure Turnout

(1) Curved Stock Rail for ML C = 11856 mm	(2) Curved Tongue Rail for ML C = 12480 mm
(3) Curved Tongue Rail for Turnout Side C = 12480 mm	(4) Curved Stock Rail for Turnout Side C = 11856 mm

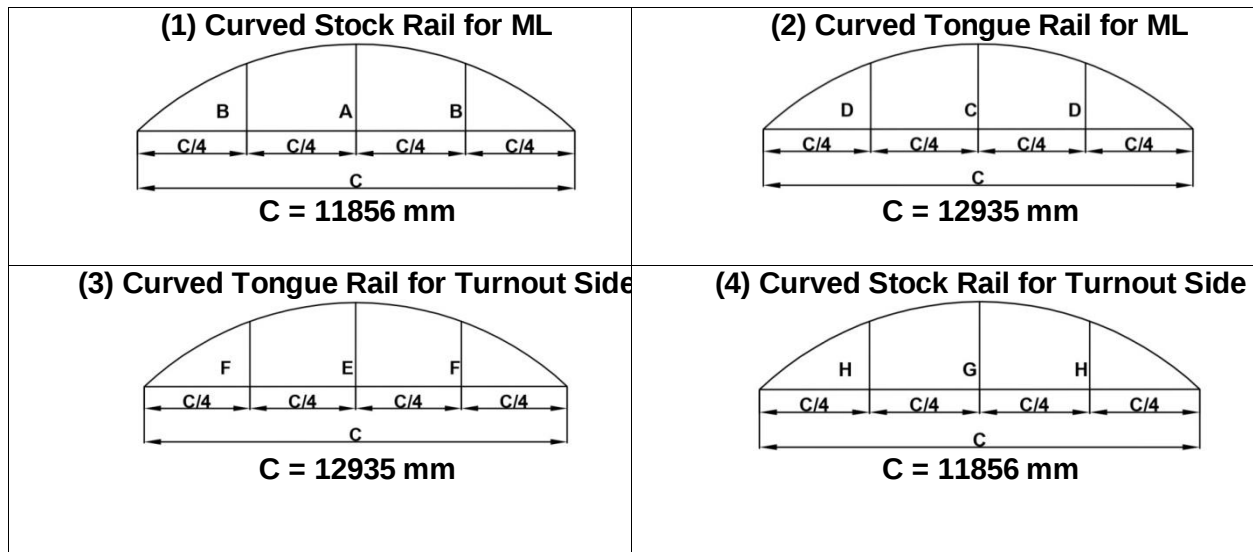
**Pre-curving of Tongue Rails (TR) & Stock Rails (SR) for 1:16, BG 60kg Turnout
with Zu-1-60/60E1A1 Thick-Web Switches for Contrary Flexure**



Applicable range of degree of curvature	Versine in mm for Main Line Track				Versine in mm for Diverging Track			
	For Stock Rail		For Tongue Rail		For Tongue Rail		For Stock Rail	
	A (MID)	B (QTR)	C (MID)	D (QTR)	E (MID)	F (QTR)	G (MID)	H (QTR)
up to 0.5°	0	0	0	0	-26.5	-20	-22.5	-17
> 0.5° & up to 1.5°	10	8	12	9	-15	-11	-12	-9
> 1.5° & up to 2.5°	20	15	24	18	-3	-2	-2	-2
> 2.5° & up to 3.5°	30	23	36	27	9	7	8	6
> 3.5° & up to 4.5°	40	30	48	36	21	16	18	13
> 4.5° & up to 5.0°	50	38	60	45	33	25	28	21

Note : Negative versines of tongue and stock rails of diverging track indicates that curvature of tongue and stock rails of diverging track are in the reverse direction to the curvature of tongue and stock rails of main line track.

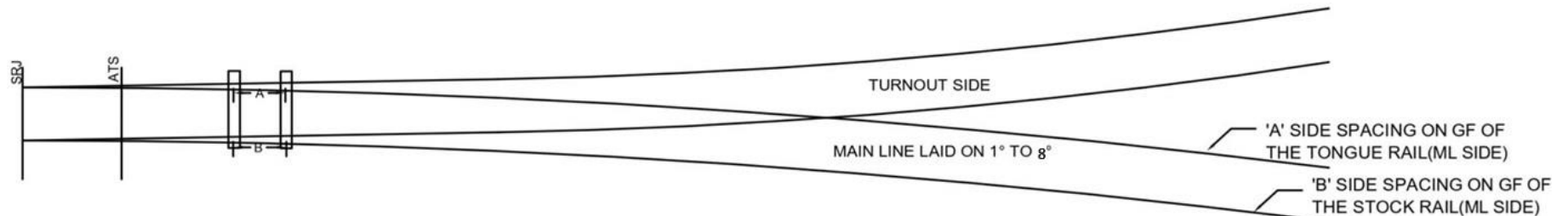
Contrary Flexure Turnout



Sleeper Spacing for 1 in 8½, BG, 60kg TWS (Contrary Flexure Turnout)																				
Location / Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°		Curvature of ML 6°		Curvature of ML 7°		Curvature of ML 8°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
SRJ		0		0		0		0		0		0		0		0		0		0
	268		268		268		268		268		268		268		268		268		268	
1		268		268		268		268		268		268		268		268		268		268
	600		600		600		600		600		600		600		600		600		600	
2		868		868		868		868		868		868		868		868		868		868
	600		600		600		600		600		600		600		600		600		600	
3		1468		1468		1468		1468		1468		1468		1468		1468		1468		1468
	745		745		745		745		745		745		745		745		745		745	
4		2213		2213		2213		2213		2213		2213		2213		2213		2213		2213
	560		560		560		560		560		560		560		560		560		560	
5		2773		2773		2773		2773		2773		2773		2773		2773		2773		2773
	660		600		600		600		600		600		600		600		600		600	
6		3433		3373		3373		3373		3373		3373		3373		3373		3373		3373
	600		600		600		600		600		600		600		600		600		600	
7		4033		3973		3973		3973		3973		3973		3973		3973		3973		3973
	600		600		600		600		600		600		600		600		600		600	
8		4633		4573		4573		4573		4573		4573		4573		4573		4573		4573
	600		600		600		600		600		600		600		600		600		600	
9		5233		5173		5173		5173		5173		5173		5173		5173		5173		5173
	600		600		600		600		600		600		600		600		600		600	
10		5833		5773		5773		5773		5773		5773		5773		5773		5773		5773
	600		600		600		600		600		600		600		600		600		600	
11		6433		6373		6373		6373		6373		6373		6373		6373		6373		6373
	600		600		600		600		600		600		600		600		600		600	
12		7033		6973		6973		6973		6973		6973		6973		6973		6973		6973
	600		600		600		600		600		600		600		600		600		600	
13		7633		7573		7573		7573		7573		7573		7573		7573		7573		7573
	564		600		592		584		576		569		561		553		545		537	
14		8197		8173		8165		8157		8149		8142		8134		8126		8118		8110
	597		600		599		599		598		598		597		597		596		595	
15		8794		8773		8764		8756		8747		8740		8731		8723		8714		8705
	598		600		599		599		598		598		597		597		596		595	
16		9392		9373		9363		9355		9345		9338		9328		9320		9310		9300
	598		600		599		599		598		598		597		597		596		595	
17		9990		9973		9962		9954		9943		9936		9925		9917		9906		9895
	598		600		599		599		598		598		597		597		596		595	
18		10588		10573		10561		10553		10541		10534		10522		10514		10502		10490
	597		600		599		599		598		598		597		597		596		595	
19		11185		11173		11160		11152		11139		11132		11119		11111		11098		11085
	598		600		599		599		598		598		597		597		596		595	

Sleeper Spacing for 1 in 8½, BG, 60kg TWS (Contrary Flexure Turnout)																				
Location / Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°		Curvature of ML 6°		Curvature of ML 7°		Curvature of ML 8°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
20		11783		11773		11759		11751		11737		11730		11716		11708		11694		11680
	598		600		599		599		598		598		597		597		596		595	
21		12381		12373		12358		12350		12335		12328		12313		12305		12290		12275
	598		600		599		599		598		598		597		597		596		595	
22		12979		12973		12957		12949		12933		12926		12910		12902		12886		12870
	597		600		599		599		598		598		597		597		596		595	
23		13576		13573		13556		13548		13531		13524		13507		13499		13482		13465
	598		600		599		599		598		598		597		597		596		595	
24		14174		14173		14155		14147		14129		14122		14104		14096		14078		14060
	598		600		599		599		598		598		597		597		596		595	
25		14772		14773		14754		14746		14727		14720		14701		14693		14674		14655
	598		600		599		599		598		598		597		597		596		595	
26		15370		15373		15353		15345		15325		15318		15298		15290		15270		15250
	597		600		599		599		598		598		597		597		596		595	
27		15967		15973		15952		15944		15923		15916		15895		15887		15866		15845
	598		600		599		599		598		598		597		597		596		595	
28		16565		16573		16551		16543		16521		16514		16492		16484		16462		16440
	598		600		599		599		598		598		597		597		596		595	
29		17163		17173		17150		17142		17119		17112		17089		17081		17058		17035
	598		600		599		599		598		598		597		597		596		595	
30		17761		17773		17749		17741		17717		17710		17686		17678		17654		17630
	597		600		600		599		598		598		597		596		596		596	
31		18358		18373		18349		18340		18315		18308		18283		18274		18250		18226
	598		600		600		599		598		598		597		596		596		596	
32		18956		18973		18949		18939		18913		18906		18880		18870		18846		18822
	598		600		600		599		598		598		597		596		596		596	
33		19554		19573		19549		19538		19511		19504		19477		19466		19442		19418
	598		600		600		599		598		597		597		596		596		596	
34		20152		20173		20149		20137		20109		20101		20074		20062		20038		20014
	597		600		600		599		599		597		597		596		596		596	
35		20749		20773		20749		20736		20708		20698		20671		20658		20634		20610
	598		600		600		599		599		597		597		596		596		596	
36		21347		21373		21349		21335		21307		21295		21268		21254		21230		21206
	598		600		600		599		599		597		597		596		596		596	
37		21945		21973		21949		21934		21906		21892		21865		21850		21826		21802
	598		600		600		599		599		597		597		596		596		596	
38		22543		22573		22549		22533		22505		22489		22462		22446		22422		22398
	597		600		600		598		599		597		597		596		596		596	
39		23140		23173		23149		23131		23104		23086		23059		23042		23018		22994
	598		600		600		598		599		597		598		596		596		596	

Sleeper Spacing for 1 in 8½, BG, 60kg TWS (Contrary Flexure Turnout)																					
Location / Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)				
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°		Curvature of ML 6°		Curvature of ML 7°		Curvature of ML 8°		
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	
40		23738		23773		23749		23729		23703		23683		23657		23638		23614		23590	
	598		600		600		598		599		597		598		596		596		596		
41		24336		24373		24349		24327		24302		24280		24255		24234		24210		24186	
	598		600		600		598		599		597		598		596		596		596		
42		24934		24973		24949		24925		24901		24877		24853		24830		24806		24782	
	550		550		550		550		550		550		550		550		550		550		
43		25484		25523		25499		25475		25451		25427		25403		25380		25356		25332	
	550		550		550		550		550		550		550		550		550		550		
44		26034		26073		26049		26025		26001		25977		25953		25930		25906		25882	
	550		550		550		550		550		550		550		550		550		550		
45		26584		26623		26599		26575		26551		26527		26503		26480		26456		26432	
	550		550		550		550		550		550		550		550		550		550		
46		27134		27173		27149		27125		27101		27077		27053		27030		27006		26982	
	550		550		550		550		550		550		550		550		550		550		
47		27684		27723		27699		27675		27651		27627		27603		27580		27556		27532	
	550		550		550		550		550		550		550		550		550		550		
48		28234		28273		28249		28225		28201		28177		28153		28130		28106		28082	
	550		550		550		550		550		550		550		550		550		550		
49		28784		28823		28799		28775		28751		28727		28703		28680		28656		28632	
	550		550		549		549		548		548		547		547		546		546		
50		29334		29373		29348		29324		29299		29275		29250		29227		29202		29178	
	550		550		549		549		548		548		547		547		546		546		
51		29884		29923		29897		29873		29847		29823		29797		29774		29748		29724	
	550		550		549		549		548		548		547		547		546		546		
52		30434		30473		30446		30422		30395		30371		30344		30321		30294		30270	
	550		550		550		549		549		548		548		547		546		546		
53		30984		31023		30996		30971		30944		30919		30892		30868		30840		30816	
	550		550		550		549		549		548		548		546		547		545		
54		31534		31573		31546		31520		31493		31467		31440		31414		31387		31361	



[illegible]

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	For all locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
13		6749		6749		6749		6749		6749		6749		6749
	550		550		550		550		550		550		550	
14		7299		7299		7299		7299		7299		7299		7299
	550		550		550		550		550		550		550	
15		7849		7849		7849		7849		7849		7849		7849
	550		550		550		550		550		550		550	
16		8399		8399		8399		8399		8399		8399		8399
	550		550		550		550		550		550		550	
17		8949		8949		8949		8949		8949		8949		8949
	550		550		550		550		550		550		550	
18		9499		9499		9499		9499		9499		9499		9499
	550		550		550		550		550		550		550	
19		10049		10049		10049		10049		10049		10049		10049
	550		550		550		550		550		550		550	
20		10599		10599		10599		10599		10599		10599		10599
	526		550		539		529		518		507		497	
21		11125		11149		11138		11128		11117		11106		11096
	549		550		549		549		548		548		547	
22		11674		11699		11687		11677		11665		11654		11643
	549		550		549		549		548		548		547	
23		12223		12249		12236		12226		12213		12202		12190
	549		550		549		549		548		548		547	
24		12772		12799		12785		12775		12761		12750		12737
	549		550		549		549		548		548		547	
25		13321		13349		13334		13324		13309		13298		13284
	549		550		549		549		548		548		547	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	For all locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
26		13870		13899		13883		13873		13857		13846		13831
	549		550		549		549		548		548		547	
27		14419		14449		14432		14422		14405		14394		14378
	549		550		549		549		548		548		547	
28		14968		14999		14981		14971		14953		14942		14925
	549		550		549		549		548		548		547	
29		15517		15549		15530		15520		15501		15490		15472
	549		550		549		549		548		548		547	
30		16066		16099		16079		16069		16049		16038		16019
	549		550		549		549		548		548		547	
31		16615		16649		16628		16618		16597		16586		16566
	549		550		549		549		548		548		547	
32		17164		17199		17177		17167		17145		17134		17113
	549		550		549		549		548		548		547	
33		17713		17749		17726		17716		17693		17682		17660
	549		550		549		549		548		548		547	
34		18262		18299		18275		18265		18241		18230		18207
	549		550		549		549		548		548		547	
35		18811		18849		18824		18814		18789		18778		18754
	549		550		549		549		548		548		547	
36		19360		19399		19373		19363		19337		19326		19301
	548		550		549		549		548		548		547	
37		19908		19949		19922		19912		19885		19874		19848
	549		550		549		549		548		548		547	
38		20457		20499		20471		20461		20433		20422		20395
	549		550		549		549		548		548		547	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	For all locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
39		21006		21049		21020		21010		20981		20970		20942
	549		550		549		549		548		548		547	
40		21555		21599		21569		21559		21529		21518		21489
	549		550		549		549		548		548		547	
41		22104		22149		22118		22108		22077		22066		22036
	549		550		549		549		548		548		547	
42		22653		22699		22667		22657		22625		22614		22583
	549		550		549		549		548		548		547	
43		23202		23249		23216		23206		23173		23162		23130
	549		550		549		549		548		548		547	
44		23751		23799		23765		23755		23721		23710		23677
	549		550		550		549		548		548		547	
45		24300		24349		24315		24304		24269		24258		24224
	549		550		550		549		548		548		547	
46		24849		24899		24865		24853		24817		24806		24771
	549		550		550		549		548		548		547	
47		25398		25449		25415		25402		25365		25354		25318
	549		550		550		549		549		548		547	
48		25947		25999		25965		25951		25914		25902		25865
	549		550		550		549		549		548		547	
49		26496		26549		26515		26500		26463		26450		26412
	549		550		550		549		549		548		548	
50		27045		27099		27065		27049		27012		26998		26960
	549		550		550		549		549		548		548	
51		27594		27649		27615		27598		27561		27546		27508
	549		550		550		549		549		548		548	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Contrary Flexure Turnout)

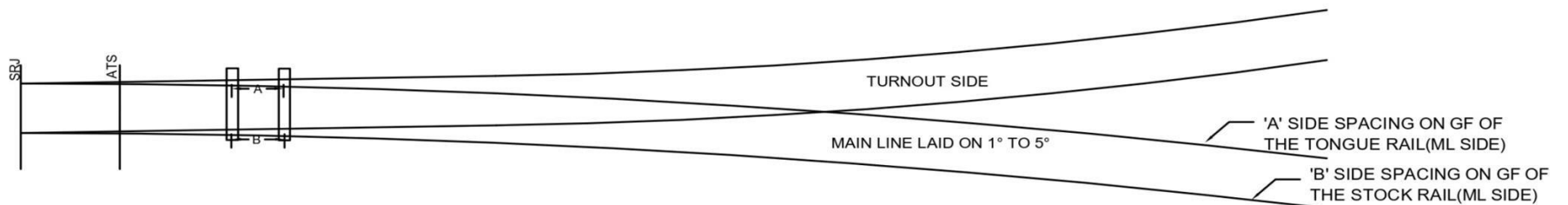
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	For all locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
52		28143		28199		28165		28147		28110		28094		28056
	549		550		550		549		549		548		548	
53		28692		28749		28715		28696		28659		28642		28604
	549		550		550		549		549		548		548	
54		29241		29299		29265		29245		29208		29190		29152
	549		550		550		549		549		548		548	
55		29790		29849		29815		29794		29757		29738		29700
	549		550		550		549		549		548		548	
56		30339		30399		30365		30343		30306		30286		30248
	549		550		550		549		549		548		548	
57		30888		30949		30915		30892		30855		30834		30796
	549		550		550		549		549		548		548	
58		31437		31499		31465		31441		31404		31382		31344
	549		550		550		549		549		548		548	
59		31986		32049		32015		31990		31953		31930		31892
	549		550		550		549		549		548		548	
60		32535		32599		32565		32539		32502		32478		32440
	549		550		550		549		549		548		548	
61		33084		33149		33115		33088		33051		33026		32988
	549		550		550		549		549		547		548	
62		33633		33699		33665		33637		33600		33573		33536
	549		550		550		548		549		547		548	
63		34182		34249		34215		34185		34149		34120		34084
	549		550		550		548		549		547		548	
64		34731		34799		34765		34733		34698		34667		34632
	549		550		550		548		549		547		548	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	For all locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
65		35280		35349		35315		35281		35247		35214		35180
	550		550		550		550		550		550		550	
66		35830		35899		35865		35831		35797		35764		35730
	550		550		550		550		550		550		550	
67		36380		36449		36415		36381		36347		36314		36280
	550		550		550		550		550		550		550	
68		36930		36999		36965		36931		36897		36864		36830
	550		550		550		550		550		550		550	
69		37480		37549		37515		37481		37447		37414		37380
	550		550		550		550		550		550		550	
70		38030		38099		38065		38031		37997		37964		37930
	550		550		550		550		550		550		550	
71		38580		38649		38615		38581		38547		38514		38480
	550		550		550		550		550		550		550	
72		39130		39199		39165		39131		39097		39064		39030
	550		550		550		550		550		550		550	
73		39680		39749		39715		39681		39647		39614		39580
	550		550		550		550		550		550		550	
74		40230		40299		40265		40231		40197		40164		40130
	550		550		549		549		548		548		547	
75		40780		40849		40814		40780		40745		40712		40677
	550		550		549		549		548		548		547	
76		41330		41399		41363		41329		41293		41260		41224
	550		550		549		549		548		548		547	
77		41880		41949		41912		41878		41841		41808		41771
	550		550		549		549		548		548		547	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	For all locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
78		42430		42499		42461		42427		42389		42356		42318
	550		550		549		549		548		548		547	
79		42980		43049		43010		42976		42937		42904		42865
	550		550		550		549		549		548		547	
80		43530		43599		43560		43525		43486		43452		43412
	550		550		550		549		549		548		548	
81		44080		44149		44110		44074		44035		44000		43960
	550		550		550		549		549		548		548	
82		44630		44699		44660		44623		44584		44548		44508
	550		550		550		549		549		547		548	
83		45180		45249		45210		45172		45133		45095		45056



[illegible]

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)														
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
12		6879		6879		6879		6879		6879		6879		6879
	600		600		600		600		600		600		600	
13		7479		7479		7479		7479		7479		7479		7479
	600		600		600		600		600		600		600	
14		8079		8079		8079		8079		8079		8079		8079
	600		600		600		600		600		600		600	
15		8679		8679		8679		8679		8679		8679		8679
	600		600		600		600		600		600		600	
16		9279		9279		9279		9279		9279		9279		9279
	600		600		600		600		600		600		600	
17		9879		9879		9879		9879		9879		9879		9879
	600		600		600		600		600		600		600	
18		10479		10479		10479		10479		10479		10479		10479
	600		600		600		600		600		600		600	
19		11079		11079		11079		11079		11079		11079		11079
	600		600		600		600		600		600		600	
20		11679		11679		11679		11679		11679		11679		11679
	583		600		588		576		565		553		541	
21		12262		12279		12267		12255		12244		12232		12220
	599		600		599		599		598		598		597	
22		12861		12879		12866		12854		12842		12830		12817
	600		600		599		599		598		598		597	
23		13461		13479		13465		13453		13440		13428		13414
	599		600		599		599		598		598		597	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)														
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
24		14060		14079		14064		14052		14038		14026		14011
	599		600		599		599		598		598		597	
25		14659		14679		14663		14651		14636		14624		14608
	600		600		599		599		598		598		597	
26		15259		15279		15262		15250		15234		15222		15205
	599		600		599		599		598		598		597	
27		15858		15879		15861		15849		15832		15820		15802
	599		600		599		599		598		598		597	
28		16457		16479		16460		16448		16430		16418		16399
	600		600		599		599		598		598		597	
29		17057		17079		17059		17047		17028		17016		16996
	599		600		599		599		598		598		597	
30		17656		17679		17658		17646		17626		17614		17593
	600		600		599		599		598		598		597	
31		18256		18279		18257		18245		18224		18212		18190
	599		600		599		599		598		598		597	
32		18855		18879		18856		18844		18822		18810		18787
	599		600		599		599		598		598		597	
33		19454		19479		19455		19443		19420		19408		19384
	600		600		599		599		598		598		597	
34		20054		20079		20054		20042		20018		20006		19981
	599		600		599		599		598		598		597	
35		20653		20679		20653		20641		20616		20604		20578
	599		600		599		599		598		598		597	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)														
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
36		21252		21279		21252		21240		21214		21202		21175
	600		600		599		599		598		598		597	
37		21852		21879		21851		21839		21812		21800		21772
	599		600		599		599		598		598		597	
38		22451		22479		22450		22438		22410		22398		22369
	599		600		599		599		598		598		597	
39		23050		23079		23049		23037		23008		22996		22966
	600		600		599		599		598		598		597	
40		23650		23679		23648		23636		23606		23594		23563
	599		600		599		599		598		598		597	
41		24249		24279		24247		24235		24204		24192		24160
	600		600		599		599		598		598		597	
42		24849		24879		24846		24834		24802		24790		24757
	599		600		599		599		598		598		597	
43		25448		25479		25445		25433		25400		25388		25354
	599		600		599		599		598		598		597	
44		26047		26079		26044		26032		25998		25986		25951
	600		600		599		599		598		598		597	
45		26647		26679		26643		26631		26596		26584		26548
	599		600		599		599		598		598		597	
46		27246		27279		27242		27230		27194		27182		27145
	599		600		599		599		598		598		597	
47		27845		27879		27841		27829		27792		27780		27742
	600		600		599		599		598		598		597	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
48		28445		28479		28440		28428		28390		28378		28339
	599		600		599		599		598		598		597	
49		29044		29079		29039		29027		28988		28976		28936
	599		600		599		599		598		598		597	
50		29643		29679		29638		29626		29586		29574		29533
	600		600		599		599		598		598		597	
51		30243		30279		30237		30225		30184		30172		30130
	599		600		599		599		598		598		597	
52		30842		30879		30836		30824		30782		30770		30727
	599		600		599		599		598		598		597	
53		31441		31479		31435		31423		31380		31368		31324
	600		600		600		599		598		598		597	
54		32041		32079		32035		32022		31978		31966		31921
	599		600		600		599		598		598		597	
55		32640		32679		32635		32621		32576		32564		32518
	600		600		600		599		598		598		597	
56		33240		33279		33235		33220		33174		33162		33115
	599		600		600		599		598		598		597	
57		33839		33879		33835		33819		33772		33760		33712
	599		600		600		599		598		598		597	
58		34438		34479		34435		34418		34370		34358		34309
	600		600		600		599		598		598		597	
59		35038		35079		35035		35017		34968		34956		34906
	599		600		600		599		598		598		597	

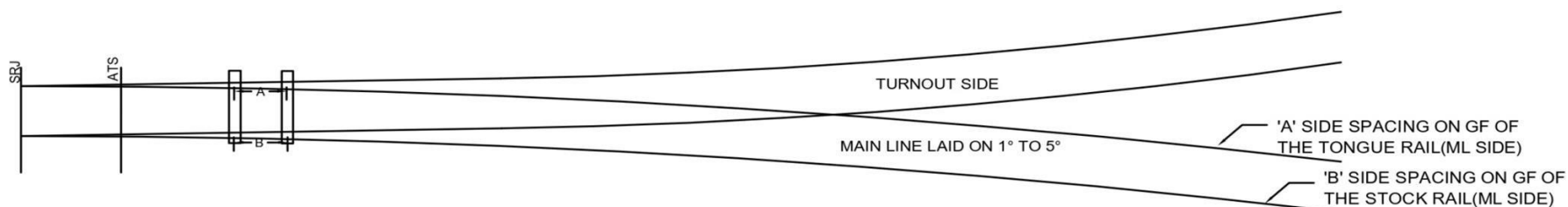
Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)														
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
60		35637		35679		35635		35616		35566		35554		35503
	599		600		600		599		598		597		597	
61		36236		36279		36235		36215		36164		36151		36100
	600		600		600		599		598		597		597	
62		36836		36879		36835		36814		36762		36748		36697
	599		600		600		599		599		597		597	
63		37435		37479		37435		37413		37361		37345		37294
	599		600		600		599		599		597		597	
64		38034		38079		38035		38012		37960		37942		37891
	600		600		600		599		599		597		597	
65		38634		38679		38635		38611		38559		38539		38488
	599		600		600		599		599		597		597	
66		39233		39279		39235		39210		39158		39136		39085
	600		600		600		599		599		597		597	
67		39833		39879		39835		39809		39757		39733		39682
	599		600		600		599		599		597		597	
68		40432		40479		40435		40408		40356		40330		40279
	599		600		600		599		599		597		597	
69		41031		41079		41035		41007		40955		40927		40876
	600		600		600		598		599		597		597	
70		41631		41679		41635		41605		41554		41524		41473
	599		600		600		598		599		597		598	
71		42230		42279		42235		42203		42153		42121		42071
	599		600		600		598		599		597		598	

[illegible]

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
84		50027		50079		50035		49991		49947		49903		49859
	600		600		600		600		600		600		600	
85		50627		50679		50635		50591		50547		50503		50459
	600		600		600		600		600		600		600	
86		51227		51279		51235		51191		51147		51103		51059
	600		600		600		600		600		600		600	
87		51827		51879		51835		51791		51747		51703		51659
	600		600		599		599		598		598		597	
88		52427		52479		52434		52390		52345		52301		52256
	600		600		599		599		598		598		597	
89		53027		53079		53033		52989		52943		52899		52853
	600		600		599		599		598		598		597	
90		53627		53679		53632		53588		53541		53497		53450
	600		600		599		599		598		598		597	
91		54227		54279		54231		54187		54139		54095		54047
	600		600		599		599		598		598		597	
92		54827		54879		54830		54786		54737		54693		54644
	600		600		599		599		598		598		597	
93		55427		55479		55429		55385		55335		55291		55241
	600		600		599		599		598		598		597	
94		56027		56079		56028		55984		55933		55889		55838
	600		600		599		599		598		598		597	
95		56627		56679		56627		56583		56531		56487		56435
	600		600		600		599		598		598		597	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Contrary Flexure Turnout)														
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 4°		Curvature of ML 5°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
96		57227		57279		57227		57182		57129		57085		57032
	600		600		600		599		598		598		597	
97		57827		57879		57827		57781		57727		57683		57629
	600		600		600		599		599		597		597	
98		58427		58479		58427		58380		58326		58280		58226
	600		600		600		599		599		597		597	
99		59027		59079		59027		58979		58925		58877		58823
	600		600		600		598		599		597		598	
100		59627		59679		59627		59577		59524		59474		59421
	600		600		600		598		599		597		598	
101		60227		60279		60227		60175		60123		60071		60019



Pre-curving requirements and revised sleeper spacing of 1 in 12 & 1 in 16 Thick Web Switches for Similar Flexure Turnouts

- i) The tongue and stock rails of Thick Web Switches shall be given requisite amount of pre-curving at manufacturing premises only.
- ii) Sleepers will become skew due to curvature, therefore, grinding of liners for fitting on some of the sleepers may be required.
- iii) Pre-curving and sleeper spacing details have been specified for various groups of curvatures applicable for various curvature ranges. The details pertaining to relevant range shall be used for providing pre-curving and sleeper spacing.

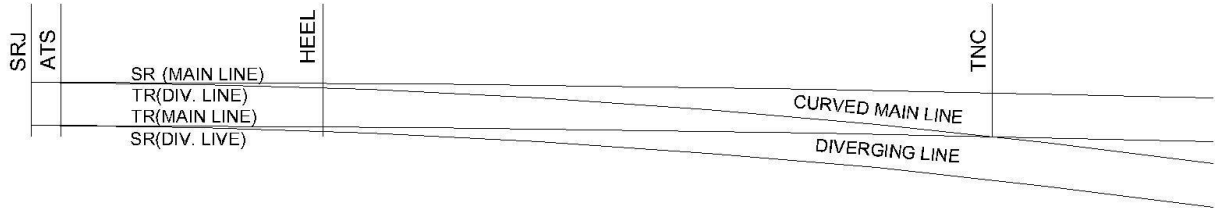
a) 1 in 12, BG 60kg Thick Web Switch in Similar Flexure Turnout

Curvature Group	Applicable range of degree of curvature
Straight	Up to 0.5°
1°	> 0.5° & up to 1.5°
2°	> 1.5° & up to 2.0°

b) 1 in 16, BG 60kg Thick Web Switch in Similar Flexure Turnout

Curvature Group	Applicable range of degree of curvature
Straight	Up to 0.5°
1°	> 0.5° & up to 1.5°
2°	> 1.5° & up to 2.5°
3°	> 2.5° & up to 3.5°
3.75°	> 3.5° & up to 3.75°

Pre-curving of Tongue Rails (TR) & Stock Rails (SR) for 1 in 12, BG 60kg Turnout with Zu-1-60/60E1A1 Thick-Web Switches for Similar Flexure

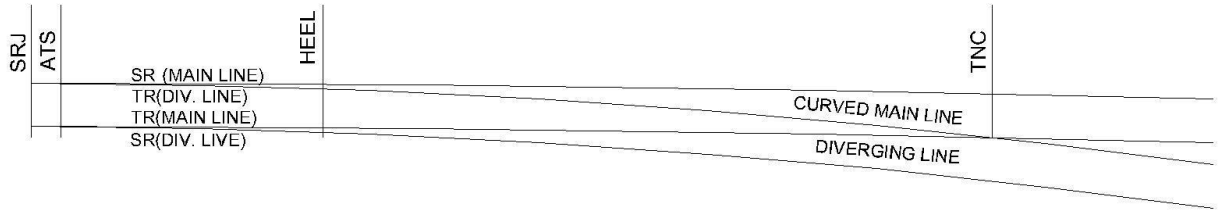


Applicable range of degree of curvature	Versine in mm for Main Line Track				Versine in mm for Diverging Track			
	For Stock Rail		For Tongue Rail		For Tongue Rail		For Stock Rail	
	A (MID)	B (QTR)	C (MID)	D (QTR)	E (MID)	F (QTR)	G (MID)	H (QTR)
Up to 0.5°	0	0	0	0	44	33	40	30
> 0.5° & up to 1.5°	10	8	11	8	55	41	50	38
> 1.5° & up to 2.0°	20	15	22	17	66	50	60	45

Similar Flexure Turnout

(1) Curved Stock Rail for ML C = 11856 mm	(2) Curved Tongue Rail for ML C = 12480 mm
(3) Curved Tongue Rail for Turnout Side C = 12480 mm	(4) Curved Stock Rail for Turnout Side C = 11856 mm

Pre-curveding of Tongue Rails (TR) & Stock Rails (SR) for 1 in 16, BG 60kg Turnout with Zu-1-60/60E1A1 Thick-Web Switches for Similar Flexure



Applicable range of degree of curvature	Versine in mm for Main Line Track				Versine in mm for Diverging Track			
	For Stock Rail		For Tongue Rail		For Tongue Rail		For Stock Rail	
	A (MID)	B (QTR)	C (MID)	D (QTR)	E (MID)	F (QTR)	G (MID)	H (QTR)
Up to 0.5°	0	0	0	0	27	20	22	17
> 0.5° & up to 1.5°	10	8	12	9	39	29	33	24
> 1.5° & up to 2.5°	20	15	24	18	51	38	43	32
> 2.5° & up to 3.5°	30	23	36	27	63	47	53	40
> 3.5° & up to 3.75°	38	28	45	34	71	54	60	45

Similar Flexure Turnout

(1) Curved Stock Rail for ML C = 11856 mm	(2) Curved Tongue Rail for ML C = 12935 mm
(3) Curved Tongue Rail for Turnout Side C = 12935 mm	(4) Curved Stock Rail for Turnout Side C = 11856 mm

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Similar Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
SRJ		0		0		0		0
	150		150		150		150	
1		150		150		150		150
	457		457		457		457	
2		607		607		607		607
	505		505		505		505	
3		1112		1112		1112		1112
	745		745		745		745	
4		1857		1857		1797		1797
	492		492		492		492	
5		2349		2349		2349		2349
	550		550		550		550	
6		2899		2899		2899		2899
	550		550		550		550	
7		3449		3449		3449		3449
	550		550		550		550	
8		3999		3999		3999		3999
	550		550		550		550	
9		4549		4549		4549		4549
	550		550		550		550	
10		5099		5099		5099		5099
	550		550		550		550	
11		5649		5649		5649		5649
	550		550		550		550	
12		6199		6199		6199		6199
	550		550		550		550	
13		6749		6749		6749		6749
	550		550		550		550	
14		7299		7299		7299		7299
	550		550		550		550	
15		7849		7849		7849		7849
	550		550		550		550	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Similar Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
16		8399		8399		8399		8399
	550		550		550		550	
17		8949		8949		8949		8949
	550		550		550		550	
18		9499		9499		9499		9499
	550		550		550		550	
19		10049		10049		10049		10049
	550		550		550		550	
20		10599		10599		10599		10599
	526		550		561		571	
21		11125		11149		11160		11170
	549		550		551		551	
22		11674		11699		11711		11721
	549		550		551		551	
23		12223		12249		12262		12272
	549		550		551		551	
24		12772		12799		12813		12823
	549		550		551		551	
25		13321		13349		13364		13374
	549		550		551		551	
26		13870		13899		13915		13925
	549		550		551		551	
27		14419		14449		14466		14476
	549		550		551		551	
28		14968		14999		15017		15027
	549		550		551		551	
29		15517		15549		15568		15578
	549		550		551		551	
30		16066		16099		16119		16129
	549		550		551		551	
31		16615		16649		16670		16680
	549		550		551		551	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Similar Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
32		17164		17199		17221		17231
	549		550		551		551	
33		17713		17749		17772		17782
	549		550		551		551	
34		18262		18299		18323		18333
	549		550		551		551	
35		18811		18849		18874		18884
	549		550		551		551	
36		19360		19399		19425		19435
	548		550		551		551	
37		19908		19949		19976		19986
	549		550		551		551	
38		20457		20499		20527		20537
	549		550		551		551	
39		21006		21049		21078		21088
	549		550		551		551	
40		21555		21599		21629		21639
	549		550		551		551	
41		22104		22149		22180		22190
	549		550		551		551	
42		22653		22699		22731		22741
	549		550		551		551	
43		23202		23249		23282		23292
	549		550		551		551	
44		23751		23799		23833		23843
	549		550		550		551	
45		24300		24349		24383		24394
	549		550		550		551	
46		24849		24899		24933		24945
	549		550		550		551	
47		25398		25449		25483		25496
	549		550		550		551	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Similar Flexure Turnout)

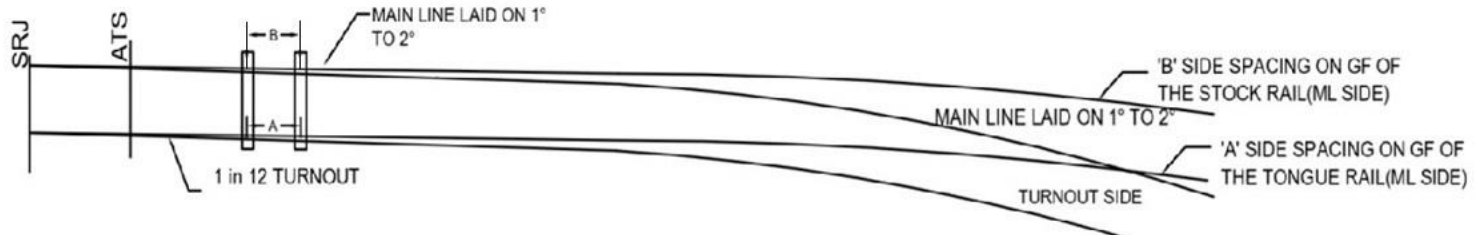
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
48		25947		25999		26033		26047
	549		550		550		551	
49		26496		26549		26583		26598
	549		550		550		551	
50		27045		27099		27133		27149
	549		550		550		551	
51		27594		27649		27683		27700
	549		550		550		551	
52		28143		28199		28233		28251
	549		550		550		551	
53		28692		28749		28783		28802
	549		550		550		551	
54		29241		29299		29333		29353
	549		550		550		551	
55		29790		29849		29883		29904
	549		550		550		551	
56		30339		30399		30433		30455
	549		550		550		551	
57		30888		30949		30983		31006
	549		550		550		551	
58		31437		31499		31533		31557
	549		550		550		551	
59		31986		32049		32083		32108
	549		550		550		551	
60		32535		32599		32633		32659
	549		550		550		551	
61		33084		33149		33183		33210
	549		550		550		551	
62		33633		33699		33733		33761
	549		550		550		552	
63		34182		34249		34283		34313
	549		550		550		552	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Similar Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
64		34731		34799		34833		34865
	549		550		550		552	
65		35280		35349		35383		35417
	550		550		550		550	
66		35830		35899		35933		35967
	550		550		550		550	
67		36380		36449		36483		36517
	550		550		550		550	
68		36930		36999		37033		37067
	550		550		550		550	
69		37480		37549		37583		37617
	550		550		550		550	
70		38030		38099		38133		38167
	550		550		550		550	
71		38580		38649		38683		38717
	550		550		550		550	
72		39130		39199		39233		39267
	550		550		550		550	
73		39680		39749		39783		39817
	550		550		550		550	
74		40230		40299		40333		40367
	550		550		551		551	
75		40780		40849		40884		40918
	550		550		551		551	
76		41330		41399		41435		41469
	550		550		551		551	
77		41880		41949		41986		42020
	550		550		551		551	
78		42430		42499		42537		42571
	550		550		551		551	
79		42980		43049		43088		43122
	550		550		550		551	

Sleeper Spacing for 1 in 12, BG, 60kg TWS (Similar Flexure Turnout)

Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
80		43530		43599		43638		43673
	550		550		550		551	
81		44080		44149		44188		44224
	550		550		550		551	
82		44630		44699		44738		44775
	550		550		550		551	
83		45180		45249		45288		45326



Sleeper Spacing for 1 in 16, BG, 60kg TWS (Similar Flexure Turnout)												
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 3.75°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
SRJ		0		0		0		0		0		0
	244		244		244		244		244		244	
1		244		244		244		244		244		244
	568		568		568		568		568		568	
2		812		812		812		812		812		812
	745		745		745		745		745		745	
3		1557		1557		1557		1557		1557		1557
	522		522		522		522		522		522	
4		2079		2079		2079		2079		2079		2079
	600		600		600		600		600		600	
5		2679		2679		2679		2679		2679		2679
	600		600		600		600		600		600	
6		3279		3279		3279		3279		3279		3279
	600		600		600		600		600		600	
7		3879		3879		3879		3879		3879		3879
	600		600		600		600		600		600	
8		4479		4479		4479		4479		4479		4479
	600		600		600		600		600		600	
9		5079		5079		5079		5079		5079		5079
	600		600		600		600		600		600	
10		5679		5679		5679		5679		5679		5679
	600		600		600		600		600		600	
11		6279		6279		6279		6279		6279		6279
	600		600		600		600		600		600	
12		6879		6879		6879		6879		6879		6879
	600		600		600		600		600		600	
13		7479		7479		7479		7479		7479		7479
	600		600		600		600		600		600	
14		8079		8079		8079		8079		8079		8079
	600		600		600		600		600		600	
15		8679		8679		8679		8679		8679		8679
	600		600		600		600		600		600	
16		9279		9279		9279		9279		9279		9279
	600		600		600		600		600		600	
17		9879		9879		9879		9879		9879		9879
	600		600		600		600		600		600	
18		10479		10479		10479		10479		10479		10479
	600		600		600		600		600		600	
19		11079		11079		11079		11079		11079		11079
	600		600		600		600		600		600	
20		11679		11679		11679		11679		11679		11679
	583		600		612		624		635		644	
21		12262		12279		12291		12303		12314		12323
	599		600		601		601		602		602	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Similar Flexure Turnout)												
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 3.75°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
22		12861		12879		12892		12904		12916		12925
	600		600		601		601		602		602	
23		13461		13479		13493		13505		13518		13527
	599		600		601		601		602		602	
24		14060		14079		14094		14106		14120		14129
	599		600		601		601		602		602	
25		14659		14679		14695		14707		14722		14731
	600		600		601		601		602		602	
26		15259		15279		15296		15308		15324		15333
	599		600		601		601		602		602	
27		15858		15879		15897		15909		15926		15935
	599		600		601		601		602		602	
28		16457		16479		16498		16510		16528		16537
	600		600		601		601		602		602	
29		17057		17079		17099		17111		17130		17139
	599		600		601		601		602		602	
30		17656		17679		17700		17712		17732		17741
	600		600		601		601		602		602	
31		18256		18279		18301		18313		18334		18343
	599		600		601		601		602		602	
32		18855		18879		18902		18914		18936		18945
	599		600		601		601		602		602	
33		19454		19479		19503		19515		19538		19547
	600		600		601		601		602		602	
34		20054		20079		20104		20116		20140		20149
	599		600		601		601		602		602	
35		20653		20679		20705		20717		20742		20751
	599		600		601		601		602		602	
36		21252		21279		21306		21318		21344		21353
	600		600		601		601		602		602	
37		21852		21879		21907		21919		21946		21955
	599		600		601		601		602		602	
38		22451		22479		22508		22520		22548		22557
	599		600		601		601		602		602	
39		23050		23079		23109		23121		23150		23159
	600		600		601		601		602		602	
40		23650		23679		23710		23722		23752		23761
	599		600		601		601		602		602	
41		24249		24279		24311		24323		24354		24363
	600		600		601		601		602		602	
42		24849		24879		24912		24924		24956		24965
	599		600		601		601		602		602	
43		25448		25479		25513		25525		25558		25567
	599		600		601		601		602		602	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Similar Flexure Turnout)												
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 3.75°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
44		26047		26079		26114		26126		26160		26169
	600		600		601		601		602		602	
45		26647		26679		26715		26727		26762		26771
	599		600		601		601		602		602	
46		27246		27279		27316		27328		27364		27373
	599		600		601		601		602		602	
47		27845		27879		27917		27929		27966		27975
	600		600		601		601		602		602	
48		28445		28479		28518		28530		28568		28577
	599		600		601		601		602		602	
49		29044		29079		29119		29131		29170		29179
	599		600		601		601		602		602	
50		29643		29679		29720		29732		29772		29781
	600		600		601		601		602		602	
51		30243		30279		30321		30333		30374		30383
	599		600		601		601		602		602	
52		30842		30879		30922		30934		30976		30985
	599		600		601		601		602		602	
53		31441		31479		31523		31535		31578		31587
	600		600		600		601		602		602	
54		32041		32079		32123		32136		32180		32189
	599		600		600		601		602		602	
55		32640		32679		32723		32737		32782		32791
	600		600		600		601		602		602	
56		33240		33279		33323		33338		33384		33393
	599		600		600		601		602		602	
57		33839		33879		33923		33939		33986		33995
	599		600		600		601		602		602	
58		34438		34479		34523		34540		34588		34597
	600		600		600		601		602		602	
59		35038		35079		35123		35141		35190		35199
	599		600		600		601		602		602	
60		35637		35679		35723		35742		35792		35801
	599		600		600		601		602		602	
61		36236		36279		36323		36343		36394		36403
	600		600		600		601		602		602	
62		36836		36879		36923		36944		36996		37005
	599		600		600		601		601		602	
63		37435		37479		37523		37545		37597		37607
	599		600		600		601		601		602	
64		38034		38079		38123		38146		38198		38209
	600		600		600		601		601		602	
65		38634		38679		38723		38747		38799		38811
	599		600		600		601		601		602	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Similar Flexure Turnout)												
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 3.75°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
66		39233		39279		39323		39348		39400		39413
	600		600		600		601		601		602	
67		39833		39879		39923		39949		40001		40015
	599		600		600		601		601		602	
68		40432		40479		40523		40550		40602		40617
	599		600		600		601		601		603	
69		41031		41079		41123		41151		41203		41220
	600		600		600		602		601		603	
70		41631		41679		41723		41753		41804		41823
	599		600		600		602		601		603	
71		42230		42279		42323		42355		42405		42426
	599		600		600		602		601		603	
72		42829		42879		42923		42957		43006		43029
	600		600		600		602		601		603	
73		43429		43479		43523		43559		43607		43632
	599		600		600		602		601		603	
74		44028		44079		44123		44161		44208		44235
	599		600		600		602		601		603	
75		44627		44679		44723		44763		44809		44838
	600		600		600		602		601		603	
76		45227		45279		45323		45365		45410		45441
	600		600		600		602		601		603	
77		45827		45879		45923		45967		46011		46044
	600		600		600		600		600		600	
78		46427		46479		46523		46567		46611		46644
	600		600		600		600		600		600	
79		47027		47079		47123		47167		47211		47244
	600		600		600		600		600		600	
80		47627		47679		47723		47767		47811		47844
	600		600		600		600		600		600	
81		48227		48279		48323		48367		48411		48444
	600		600		600		600		600		600	
82		48827		48879		48923		48967		49011		49044
	600		600		600		600		600		600	
83		49427		49479		49523		49567		49611		49644
	600		600		600		600		600		600	
84		50027		50079		50123		50167		50211		50244
	600		600		600		600		600		600	
85		50627		50679		50723		50767		50811		50844
	600		600		600		600		600		600	
86		51227		51279		51323		51367		51411		51444
	600		600		600		600		600		600	
87		51827		51879		51923		51967		52011		52044
	600		600		601		601		602		602	

Sleeper Spacing for 1 in 16, BG, 60kg TWS (Similar Flexure Turnout)												
Location/ Sleeper No.	C/C spacing of sleepers to be measured along gauge face of tongue rail of mainline (A)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)		C/C spacing of sleepers to be measured along gauge face of stock rail of mainline (B)	
	All locations		Mainline - Straight		Curvature of ML 1°		Curvature of ML 2°		Curvature of ML 3°		Curvature of ML 3.75°	
	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing	Spacing	Cumulative Spacing
88		52427		52479		52524		52568		52613		52646
	600		600		601		601		602		602	
89		53027		53079		53125		53169		53215		53248
	600		600		601		601		602		602	
90		53627		53679		53726		53770		53817		53850
	600		600		601		601		602		602	
91		54227		54279		54327		54371		54419		54452
	600		600		601		601		602		602	
92		54827		54879		54928		54972		55021		55054
	600		600		601		601		602		602	
93		55427		55479		55529		55573		55623		55656
	600		600		601		601		602		602	
94		56027		56079		56130		56174		56225		56258
	600		600		601		601		602		602	
95		56627		56679		56731		56775		56827		56860
	600		600		600		601		602		602	
96		57227		57279		57331		57376		57429		57462
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97		57827		57879		57931		57977		58031		58064
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98		58427		58479		58531		58578		58632		58666
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99		59027		59079		59131		59179		59233		59268
	600		600		600		602		601		603	
100		59627		59679		59731		59781		59834		59871
	600		600		600		602		601		603	
101		60227		60279		60331		60383		60435		60474

