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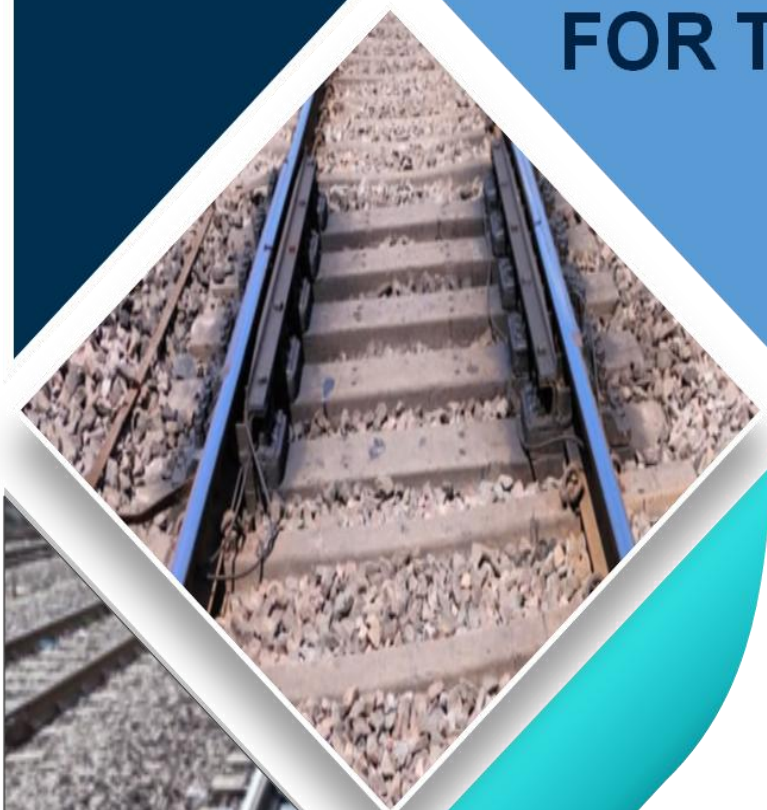
सत्यमेव जयते

GOVERNMENT OF INDIA - MINISTRY OF RAILWAYS
भारत सरकार – रेल मंत्रालय



ट्रैक मेंटेनर के लिए प्रवेश पाठ्यक्रम

INDUCTION COURSE FOR TRACK MAINTAINER



हस्त पुस्तिका भाग-3

Booklet Part-III

रेल, स्लीपर, बंधन और गिट्टी

Rail, Sleeper, Fastening and Ballast



कैमटेक/2024/सिटीएमआईसी/भाग-III/1.0

CAMTECH/2024/C/TMIC/Part-III/1.0

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EXCELLENCE IN MAINTENANCE
INDIAN RAILWAYS

Centre for Advanced Maintenance Technology (CAMTECH)
MAHARAJPURA, GWALIOR - 474005

ट्रैक मेंटेनर के लिए इंडक्शन कोर्स

हस्त पुस्तिका भाग 3: रेल, स्लीपर, बन्धन और गिट्टी

Handbook on Induction course for Track Maintainer Booklet Part III: Rails, Sleepers, Fastening & Ballast

प्रस्तावना

भारतीय रेलवे संरचना और रेल ट्रैक के रूप में देश में सिविल इंजीनियरिंग संपत्ति का बड़ा हिस्सा रखता है।

कैमटेक ने रेलवे में शामिल होने वाले ट्रैक मेंटेनर को निर्धारित प्रशिक्षण मॉड्यूल के अनुसार ट्रैक घटक के बारे में सभी जानकारी प्रदान करने का एक अच्छा प्रयास किया है।

मुझे आशा है कि यह पुस्तिका विषयों पर ज्ञान का एक मूल्यवान स्रोत साबित होगी और भारतीय रेलवे के इंजीनियरिंग विभाग में काम करने वाले ट्रैक अनुरक्षकों के लिए काफी उपयोगी होगी।

कैमटेक, ग्वालियर ***एच. के रघु***
जुलाई, 2024 ***प्रधान कार्यकारी निदेशक***

Foreword

Indian railway holds the major chunk of civil engineering assets in the country in the form of structure and rail track.

CAMTECH has made a nice attempt to provide all the information about the Track component as per prescribed training module to the Track maintainer who has initially joined the railways.

I hope this handbook will prove to be a valuable source of knowledge on topics and will be quite helpful to Track maintainers working in the engineering department of the Indian Railways.

CAMTECH, Gwalior ***H. K. Raghu.***
July, 2024 ***Principal Executive Director***

भूमिका

भारतीय रेलवे के पास पूरे भारत में फैले रेल ट्रैक का एक विशाल नेटवर्क है। एसएसई /जेई/ मेट, की-मैन, गेटमैन और ट्रैक मेंटेनर जैसे परमानेंट वे स्टाफ द्वारा पूरे ट्रैक का रखरखाव किया जाता था।

रेलवे बोर्ड ने आरबीई 3/2024 पत्र संख्या ई(एमपीपी)2019/3/46 दिनांक 09.01.2024 के माध्यम से भारतीय रेलवे के सिविल इंजीनियरिंग विभाग के ट्रैक मेंटेनर्स के इंडक्शन और रिफ्रेशर कोर्स के लिए प्रशिक्षण मॉड्यूल को मंजूरी दी गयी है। यह पुस्तिका ट्रैक मेंटेनर के इंडक्शन कोर्स के भाग-III (रेल, स्लीपर, बंधन और गिट्टी) की आवश्यकता को पूरा करने के लिए तैयार की गई है।

इस पुस्तिका को इंजीनियरिंग विभाग के नवनियुक्त ट्रैक मेंटेनर को प्रशिक्षण मॉड्यूल के अनुसार प्रशिक्षित करने के लिए उपयोगी बनाने का हर संभव प्रयास किया गया है।

भारतीय रेलवे का अधिकांश रेलपथ ब्रॉड गेज में परिवर्तित हो चुका है। इसलिए यह दस्तावेज़ ब्रॉड गेज ट्रैक को ध्यान में रखते हुए तैयार किया गया है। अन्य गेज के लिए कृपया संबंधित दस्तावेज़ देखें।

यह पुस्तिका रेलवे बोर्ड, आरडीएसओ, आईआरपीडब्ल्यूएम और भारतीय मानकों द्वारा जारी इस विषय पर उपलब्ध किसी भी मौजूदा जानकारी का स्थान नहीं लेती है। यह पुस्तक वैधानिक नहीं है और इसकी सामग्री केवल मार्गदर्शन के उद्देश्य से है। यहाँ उल्लिखित अधिकांश डेटा, रेखाचित्र और जानकारी किसी न किसी रूप में विभिन्न पुस्तकों या मुद्रित सामग्री में उपलब्ध हैं।

यह पुस्तिका श्री एस.एस.पाठक, एस.एस.ई./पी.वे/कैमटेक के ईमानदार प्रयासों का परिणाम है, जिन्होंने विभिन्न स्रोतों से सूचना, डेटा आदि एकत्रित और संकलित किया, तथा सम्पूर्ण पाठ का अध्ययन किया।

आगे के सुधारों के लिए हम अपने पाठकों के बहुमूल्य सुझावों का स्वागत करते हैं।

कैमटेक, ग्वालियर ***दीपक मेहरा***

जुलाई, 2024 ***निदेशक (सिविल)***

Preface

Indian Railway having a vast network of rail track spread all over India. Whole track were maintained by Permanent way staff like SSE/JE/Mate/Keyman, Gateman, and the Track maintainers.

Railway Board vide RBE 3/2024 letter No. E(MPP)2019/3/46 dated 09.01.2024 has approved the training modules for Induction & Refresher courses of Track Maintainers of the Civil Engineering department of Indian Railways. This handbook has been prepared to fulfil the requirement of Part-III (Rails, Sleepers, Fastening & Ballast) of induction course of track maintainer.

Every effort has been made to make this handbook useful to train the newly recruited track maintainer of the engineering department as per the training module.

Most of the tracks of Indian Railways have been converted into Broad Gauge. Hence This document is prepared keeping in mind for the Broad Gauge track. For other Gauges please refer relevant document.

This booklet does not supersede any existing information on subject issued by Railway Board, RDSO, IRPWM and Indian standards available on the subject. This book is not statutory& contents are for the purpose of guidance only. Most of the data, sketch and information mentioned here are available in some form or the other in various books or printed matter.

This booklet is the result of sincere efforts of Shri S.S.Pathak, SSE/P.Way/CAMTECH, who collected and compiled information, data, etc. from different sources, and went through the complete text.

We welcome valuable suggestions from our readers for further improvements.

CAMTECH, Gwalior ***Deepak Mehra***
July, 2024 ***Director/Civil***

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संशोधन पर्चियों का प्रकाशन
ISSUE OF CORRECTION SLIPS

इस हस्तपुस्तिका के लिए भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जाएगा:

The correction slips to be issued in future for this handbook will be numbered as follows:

केमटेक/2024/सि/टीएमआईसी/भाग-III/1.0/सीएस# XX दिनांक_____

CAMTECH/2024/C/TMIC/Part-III/1.0/CS # XX date_____

जहाँ XX संबन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)

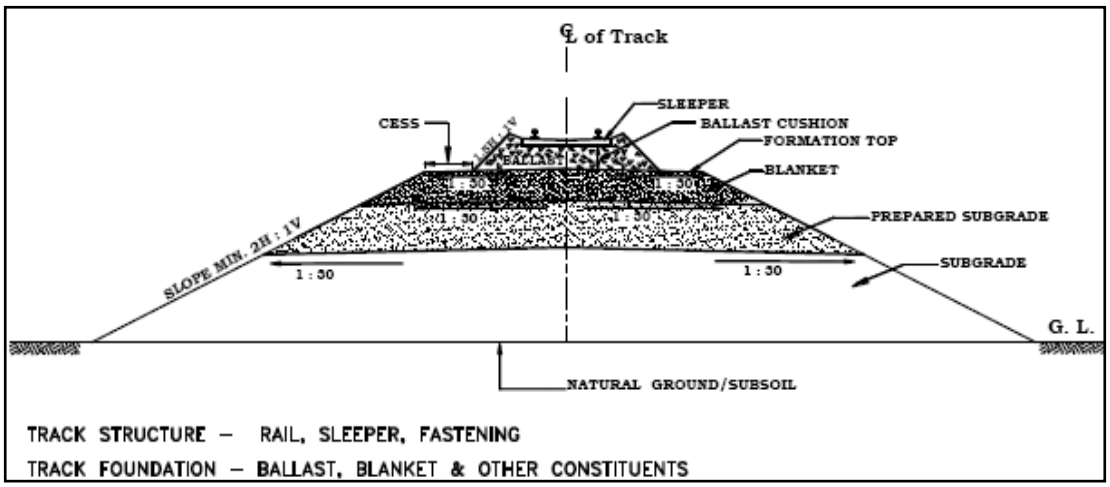
Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

प्रकाशित संशोधन पर्चियाँ
CORRECTION SLIPS ISSUED

क्र.सं./ Sr. No.	प्रकाशन दिनांक/ Date of issue	संशोधित पृष्ठ संख्या तथा मद संख्या/ Page No. and Item No. modified	टिप्पणी/ Remarks

1.0 RAILWAY TRACK OR PERMANENT WAY *[Ref: E-Learning material, Diploma Course in Railway Engineering, Institution of Permanent Way Engineers (India)]*

A Railway Track or Permanent Way is the railroad on which trains run. It consists of two parallel rails with a specified distance between them. Fishplates and bolts join the rails to each other and rails are fastened to the sleepers at a specified distance and held in position. Sleepers are embedded in a layer of ballast of specified thickness spread over the formation.



2.0 TRACK COMPONENTS *[Ref: e-Learning material, Diploma Course in Railway Engineering, Institution Of Permanent Way Engineers (India)]*

Permanent Way or track consists of (i) rails, (ii) sleepers, (iii) fittings and fastenings, (iv) ballast and (v) formation as shown in Fig above.

Each of the components of track has a basic function to perform. The rails act as girders to transmit the wheel loads of trains to the sleepers. The sleepers hold the rails in proper position and provide the correct gauge with the help of fittings and fastenings and transfer the load to the ballast. The ballast is placed on prepared ground known as formation. The sleepers are embedded in ballast, which gives a uniform level surface, provides drainage and transfers the load to larger area of formation. The formation gives a surface, where the ballast rests and transmits the total load of the track and that of the trains moving on it to the natural ground below.

3.0 RAILS

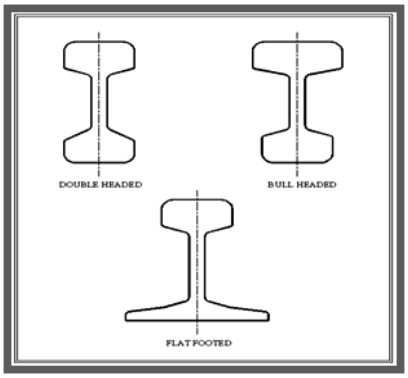
Rail is the main component of tack which provides a continuous and surface for smooth running of wheels of railway vehicles.

3.1 Functions of Rail

- Provide continuous and level surface for movement of trains.
- Provide a pathway, which is smooth and has a very less friction.
- Bear the stress developed due to vertical loads transmitted to it through axles and wheels as well as breaking forces and thermal stresses.

- Carry out the functions of transmitting the load to a large area of formation through sleeper and ballast.

3.2 Different types of rails



Double headed (DH)

Bull headed (BH)

Flat footed (FF)

The Flat-footed rails have been standardized on the Indian Railway.

3.3 Flat footed Rail Sections

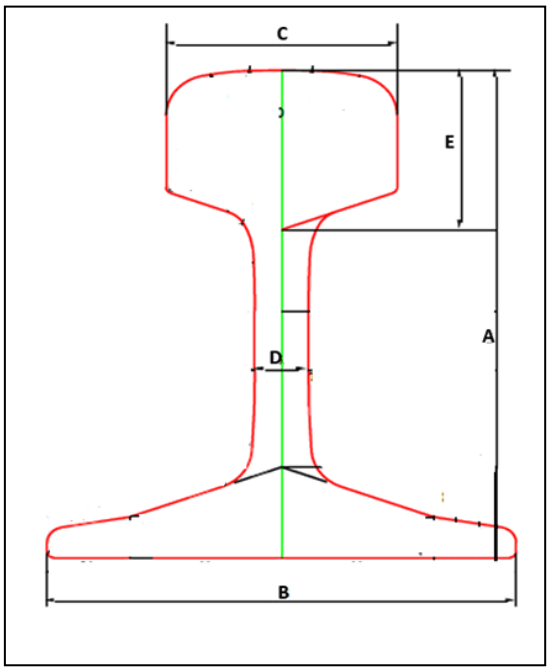
The Bottom flange of these rails is flat. The Standard section now is flat footed as it provides a better fixing arrangement to the sleepers.These rails are manufactured as per the Indian Railway Standards specification for flat bottom rail (IRS-T-12). On Indian Railways, flat-footed rails of 60 Kg/m and 52 Kg/m are being used predominantly. Some of the major rail section in use are:

3.3.1 IRS 52 kg/m

3.3.2 UIC 60kg/m

3.3.3 60E1

3.3.4 136 RE



The cross-section and key dimensions of these rail sections are reproduced below. (*Ref:*)

Rail Section	Cross-Section Area (cm2)	Weight per meter in Kg	Dimensions in mm				
			Rail Height A	Flange Width B	Head Width C	Thickness of Web D	Head Height E
IRS 52 Kg	66.15	51.89	156	136	67	15.5	51

UIC 60kg/m	76.86	60.34	172	150	74.3	16.5	51
60 E1	76.70	60.21	172	150	72	16.5	51
136 RE	86.131	67.364	185.74	152.40	74.61	17.46	49.21

Note: These are for guidance only. For details, please refer IRS specification T-12.

3.4 Marking of Rails *(Ref: Para 8 of IRS specification T-12)*

3.4.1 Brand marks are rolled in relief on one side of the web at least at every 4.0 meter interval on each rail. These brand mark usually include:

(a) The Rail section

(b) Grade of steel e.g.

i. Grade 880 : 880
ii. Grade 1080HH : 1080HH
iii. Grade 880Ni Cr Cu : 880NC
iv. Grade R260 : R260
v. Grade 1175HT : 1175HT

(c) Identification mark of the manufacturer

(d) Month (using Roman numbers) and last two digits of year of manufacture

(e) Process of steel making: e.g. for Basic oxygen - "O", for Electric - "E" etc

(f) Rolling direction



3.4.2 Mechanical Properties *(Ref: Para 8 of IRS specification T-12)*

SN	Grade	UTS	Elongation %	Running surface hardness (BHN)
i.	**880**	880	10	Min 260
ii.	**1080 HH**	1080	10	340 - 390
iii.	**880NC**	880	10	Min 260
iv.	**R260**	880 *(sample taken from Railhead.)*	10	260 - 300
v.	**1175HT**	1175 (Head)	9	350 - 390

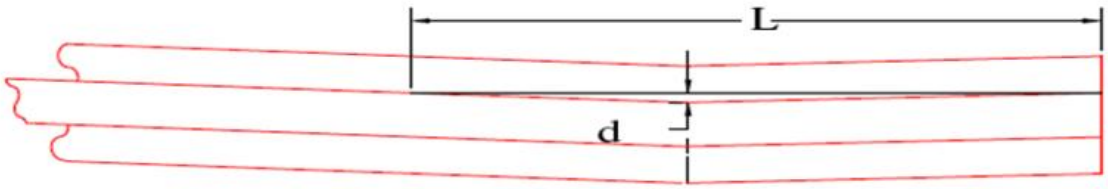
3.5 Identification of Different Qualities of Rails in the Field

3.5.1 'Prime Quality' Rails *(Ref:Para 204(1) of IRPWM)*

These rails are suitable for use in running tracks at all locations and are classified as Class 'A' and Class 'B' rails based on tolerance in end straightness as given below.

End Straightness	**TOLERANCES**	
	CLASS "A" RAIL	**CLASS "B" RAIL**
Horizontal	Deviation of 0.5 mm Measured as maximum ordinate from the chord of 2.0 M standard straight edge.	Deviation of 0.7 mm Measured as maximum ordinate from the chord of 1.5 M standard straight edge.
Vertical (up Sweep)	Deviation of 0.4 mm measured as maximum ordinate from the chord of 2.0 M standard straight edge.	Deviation of 0.5 mm measured as maximum ordinate from the chord of 1.5 M standard straight edge.
Vertical (Down Sweep)	Nil	Nil

3.5.1.1 Measurements of End Straightness *(Ref:Para 9.4.2 of IRS specification T-12)*



L= Length of straight edge specified in Table
d= Maximum tolerance specified in Table

Fig.1 TOP VIEW OF HORIZONTAL TOLERANCE AT RAIL ENDS

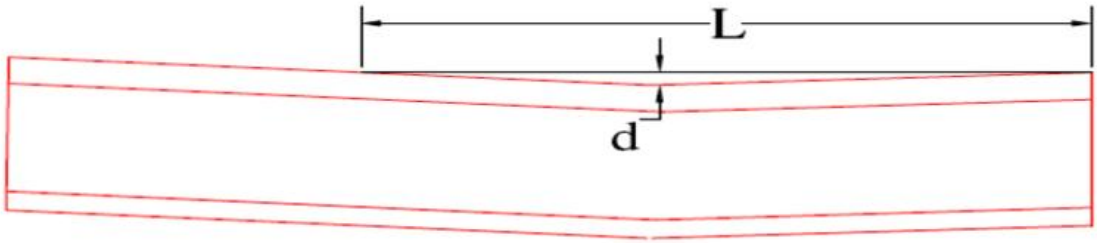


Fig.2: SIDE VIEW OF VERTICAL TOLERANCE AT RAIL ENDS

3.5.2 Industrial Use Rails (IU rails) *(Ref: Para 204(2) of IRPWM)*

(a) These rails can be used in industrial sidings with a speed restriction of 50 Kmph.

(b) IU rails can be identified by blue paint on the end face of the flange and both sides of the flange for a distance of 500 mm from each end.

(c) The letter 'IU' (Industrial Use Grade) as the case may be in 15 mm size shall be stamped on both end faces of rails in addition to colour marking.

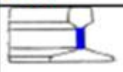
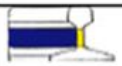
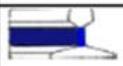
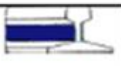
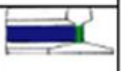
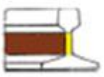
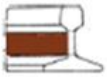
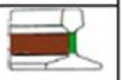
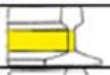
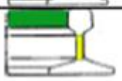
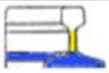
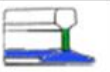
3.5.3 Second hand rails *(Ref: Para 722(2) of IRPWM)*

(a) Class II (a) Second hand rail fit to be re-laid in running lines – Ends to be painted with a daub of white.

(b) Class II (b) Second hand rail fit for use in non-running lines – Ends to be painted with a daub of yellow.

3.5.4 Colour Code *(Ref: APPENDIX – IV of IRPWM)*

The rails are painted with colour code. The colour codes are as under,

S. No.	Grade	Colour Code	13m, 18m,26m, 130m, 260m	12m,17m, 25m, 129m, 259m	11m, 16m,24m	10m, 23m
1	GR. 880	Only common length wise colour code and no paint on web surface				
2	GR.1080 H.H.	In addition to common length wise colour code, Blue paint on both sides of web surface for a distance of 500 mm from each end.				
3	Nickel Chromium Copper 880NC	In addition to common length wise colour code, *Brown* paint on both sides of web surface for a distance of 500 mm from each end.				
4	GR. R260	In addition to common length wise colour code, Yellow paint on both sides of web surface for a distance of 500 mm from each end.				
5	1175HT	In addition to common length wise colour code, Green paint on both sides of web surface for a distance of 500 mm from each end.				
6	CLASS'A' RAIL	In addition to common length wise colour code, grade code as 1, 2, 3, 4 & 5 and Green paint on gauge/non gauge face for a distance of 500 mm from each end.				
7	IU	In addition to common length wise colour code, Blue paint on end face of flange and both sides of flange for a distance of 500mm from each end.				

(a) Lengthwise colour code for new rails as given below:-

- If No paint mark on gauge/non-gauge face indicates class 'B' rails.
- Yellow paint on each end face on web region indicates 13 m, 26 m, 130 m, and 260 m length.
- Blue paint on each end face on web region indicates 12 m, 25 m, 129 m, and 259 m length.
- White paint on each end face on web region indicates 11 m, 24 m length.
- Green paint on each end face on web region indicates 10 m length.

3.6 Longer rails *(Ref:Para 204(5) of IRPWM)*

As per IRS-T-12, the standard length of rails is 13 m or 26 m. However, the manufacturer may also supply longer rails of 65 m, 130 m and 260 m length as required by purchaser.

3.7 Recommended Rail Section *(Ref:Para 205 of IRPWM)*

3.7.1 Main line – Track Renewals, Doubling, New Lines and Gauge Conversions – 60kg/m rails with minimum 90 UTS.

Note – For Gauge Conversion works & new line works having projected traffic of less than 5 GMT, 60kg/m (Second Hand) rails, if available with Railways, can be used depending upon future projected extension of lines etc.

3.7.2 Loop Lines – Renewal of loop lines is to be done with 60 kg/m (*Second Hand*) or 52 kg/m (*Second Hand*) rails. The new rails can also be used for these rail renewals with prior approval of Railway Board.

3.7.3 Private and other sidings

(1)	Sidings taking off from DFC or feeder routes to DFC or 25T axle load routes.	60 kg/m
(2)	Sidings other than (1) above; With permissible speed up to 50 Kmph.	52 kg/m (SH); or 52 kg/m (IU)
(3)	Sidings other than (i) above; With permissible speed more than 50 Kmph.	60 kg/m

4.0 Rail Fastenings

All the components, which together form the structural connection for rail joints to resist forces induced by traffic and temperature change comes under rail fastenings.

4.1 Fish Plates *(Ref: ZRTI track module ppt no. 2.1 of IRICEN)*

These are the plates(in pairs) which are provided at joints to connect the two rails end to end, provided with 6 Nos. bolts called as fish bolts.



i. Fishplates join the ends of rails using fish bolts and washers.

ii. Maintain the line and level of top table and gauge face at rail ends to resist impact and prevent deflections of the rail joints with the help of sleepers.

iii. Transfer the load from one rail to another.

iv. Provide vertical and lateral stiffness to the rail joint.

v. Allow for expansion & contraction of rail ends due to temperature variations.

vi. **List of commonly used Fishplates** *(Annexure - 2/4(A) of IRPWM)*

S. N.	Fish Plate		Bolt & nut			Single coil spring washer
	DRG No	For	DRG No	For Fish-plate	Length	
1.	T-5915	Fish Plate For 52 Kg Rail (1 Meter Long)	RDSO/ T-11501 Dia 25 mm	For 52 kg rail for use without single coil spring washer	130 mm	T-1899 bolt may be used with 52 Kg rail with Single coil spring washer (T-10773)
2.	T-5916	Fish Plate For 60 Kg Rail (1 Meter Long)	RDSO/T-1899 Dia 25 mm	For UIC 60 kg. rail	140 mm	For use without single coil spring washer

4.2 Joggled fish Plates

(Ref: Annexure - 2/4(A) of IRPWM)

Joggled fish plates with clamps or with far end bolts are used at welded joints or at rail fracture locations.



S. N.	DRG. No	For	Bolt & Nut	Remark
1	T-5551	Use on Rail-Fracture for B.G. 52 Kg.	Four Clamps T-5552/1 to be used	For temporary joining rails without any weld ordinary fish plate may be used with clamps.
2	T-5848	Use on Welded Joint for B.G.52 Kg.	T-11513 (180 mm long)	Single coil spring washer T-10773 shall be used
			T-11511, 160 mm long may be used	In case special washer are not used.
3	T-5849	Use on Welded Joint for B.G. 60 Kg.	T-11513 (180 mm long)	Single coil spring washer T-10773 shall be used.
			T-11511, 160 mm long may be used	
				In case special washer are not used.
4	EDO/T-2242 & 2243	Use on 75 mm Wide Gap A.T. Weld For 52 Kg with C.I. Block	T-11515 nearer to weld. T-11511 far end bolts	Single-coil spring washer T-10773 shall be used.
5	EDO/T-2246 & 2247	Use on 75 mm Wide Gap A.T. Weld For 60 Kg (UIC) With C.I. Block		

4.3 Combination Fish-Plates *(Ref: Annexure - 2/4(A) of IRPWM)*

A set of four combination fishplates is used at the rail joints of two different rail sections. The four fishplates are different from each other and are marked as under, apart from their drawing numbers.

- I.R. (Inside Right),
- O.R. (Outside Right),
- I.L. (Inside Left)



- O.L. (Outside Left)

S. N.	DRG No	Description	Bolt	
1	T-696 to 699	Fish Plate Combination For 60 Kg (UIC) And 52 Kg	T-700	Nearer to rail ends
			T-1899	Far end bolt 60 Kg rail side
			T-11501	Far end bolt 52 Kg rail side
2	T-6594 to 6597	Combination Joggled Fish Plates For 60 Kg. (UIC)/52 Kg Rails with C.I. Block for B.G.	T-11515	Nearer to rail ends
			T-11511	Far end bolt

(a) The following points should be ensured

(1) On either side of combination fishplates, full length of rail should be used.

(2) Combination rails prepared by welding two rail sections as per standard drawings should, preferably be used in place of combination fishplates.

4.4 Fish Plates for use with fractured Rail *(Ref: Document No.TD-M-4.2.4-1, Master List of Drawings issued by Track Design Directorate, RDSO)*

i. 1 meter long grooved fish plates for use with fractured rail for 52 kg & 60 kg (UIC) conforming to RDSO/T-5850 to 5851

ii. 1.1meter long plate for clamping fractured 60 kg UIC RAIL and 52 kg conforming to RDSO/T-3714

5.0 Sleepers*(Ref: Folder no.3 of track component of ZRTI track module, IRICEN)*

The sleeper is a load-distributing component of the track structure that is laid transversely to hold the rail. Sleepers are also called "Ties" because they tie the rails together. Nowadays, the sleepers used are pre-stressed concrete elements and are commonly known as pre-stressed concrete (PSC) sleepers.

5.1 Function of Sleepers

i. To hold Rails in tight condition
ii. To maintain correct gauge & alignment
iii. To retain packing underneath the sleepers
iv. To provide firm and even support to rails
v. To transfer the load from rails to the wider area of ballast
vi. To act as elastic medium between rails & ballast
vii. Providing longitudinal and lateral stability.

5.2 Types of Sleepers *(Ref: Para 207 of IRPWM)*

Depending on type of Material, there are following types of sleepers:-

(a) Wooden Sleepers

(b) Cast Iron Sleepers

(c) Steel Trough Sleepers

(d) Concrete Sleepers

(e) Wooden, Cast Iron and Steel Trough Sleepers have become obsolete and at present concrete sleepers are being used widely. For certain specific locations e.g. girder bridges, points and crossings etc. composite sleepers are being gradually introduced.

5.2.1 Concrete Sleepers *(Ref: Para 208 of IRPWM)*

(a) Amongst the mono-block and twin-block concrete sleeper types, Indian Railway uses the Mono-block Pre-stressed concrete sleepers predominantly. These PSC sleepers provide longitudinal & lateral stability required for LWR and due to the Flat bottom, these sleepers are suitable for mechanised tamping.



(b) Identification of Sleepers

(1) Concrete sleepers can be identified by the drawing no. and code of sleeper manufacturer with year of manufacture engraved on the top end surface of sleepers.

(2) All the PSC sleepers are tested for electrical resistance at the time of manufacture, and sleepers are marked by paint with “FTC” to indicate Fit for Track Circuiting and “NFTC” to indicate not fit for track Circuited location. This shall be noted while using the sleepers at site.

(c) When concrete sleepers are used in yards with fish-plated track/SWR, the sleeper spacing at fish-plated joint shall be kept uniform. In addition, 1 m long fishplates may preferably, be provided at such joints.

5.3 Sleeper Density *(Ref: Para 209 of IRPWM)*

The Sleeper density is expressed as the number of sleepers per km of track and is fixed taking into consideration the maximum permissible speed and the traffic density of the section.

5.3.1 Minimum Sleeper Density

(1) For all track renewals (complete track renewal and through sleeper renewal), doubling, gauge conversion, new line construction works for main lines shall be 1660 nos. per km

(2) For loop lines & sidings (permissible speed up to 50 Kmph) it shall be 1540 nos. per km.

(3) 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.

(4) Where concrete sleepers are required to be laid in unavoidable circumstances, in SWR track, the sleeper spacing including at fish-plated joint, shall be kept uniform. In addition, 1 m long fishplates, be provided at fish plated joints.

5.4 List of commonly used PSC sleepers *[Ref: Annexure - 2/4(A) of IRPWM]*

S. N.	Component	Drawing No.	Description
1.	Ordinary PSC sleepers	RT-2495	Prestressed Concrete Sleeper for 52 kg Rail designed for 22.9 t Axle load.
2.		RT- 2496	Prestressed Concrete Sleeper for 60kg/52 kg Rail designed for 22.9 t Axle load.
3.		RT-7008	For 25T axle load for 60kg & 136 RE Rail.
4.	Wider PSC Sleeper	RT-8527	For 25T Axle Load For 136RE & 60kg (UIC) Rails.
5.		RT-8746	For 25T Axle Load for 60 kg (UIC) / 60E1 & 52 kg RAILS
6.	Slack Gauge Sleeper	RT-4183 to 4186	PSC Sleeper on curve for 60kg UIC running rail and 52 kg check rail
7.		RT-8621 to 8624	Wider PSC Sleeper on curve for 25T Axle Load For 136 RE / 60Kg UIC Rails.
8.		RT-5738 to 5740	PSC Sleeper on curve for BG 52 Kg Running Rail and 52KG/90R Check Rail.
9.	Sleeper for LC	RT-4148/4148A	PSC Sleeper for Level Crossing with 60 Kg UIC OR 52 Kg Running Rail and 52 Kg Check Rail.
10.		RT-8671	Wider PSC Sleeper for Level Crossing with 60 Kg Running Rail and 52 Kg Check Rail for 25T Axle Load.
11.	Sleeper for SEJ	RT-4149	Prestressed concrete sleeper for switch expansion joint for long welded rails B.G. 52Kg/60Kg UIC.
12.		RT-8224	PSC Sleeper for Switch Expansion Joint for LWR for 25T Axle Load BG 1676 mm 60KG (UIC).
13.		RT-8838	Prestressed concrete sleeper for Thick Web Switch Expansion Joint for BG 60 Kg (UIC).
14.		RT-6253	PSC sleeper for SEJ (with 300 mm max: gap) for BG 60kg (UIC) rail on bridge approaches.
15.	Sleeper for P&C	RT-4786 to 4790	PSC Approach Sleepers FOR 60 Kg (UIC).

16.		RT-4512	Sleeper No. 1 & 2 are common for 1 in 8.5 & 1 in 12 T/Outs.
17.		RT- 4793 to 4844	Sleeper No. 3 to 54 for 1 in 8.5 T/out with 6400 mm O.R. curved switch for 90R, 52 Kg & 60 Kg. (RT- 4865) & (RT-6279).
18.		RT- 4514 to 4594	Sleeper No. 3 to 83 for 1 in 12 T/out with 10125 mm O.R. curved switch for 60 Kg. (RT- 4218) & (RT-6154).
19.		RT-4512 RT-4514 to 4517 & RT-5595 to 5690	Sleeper No. 1 Sleeper No. 2 to 5 for 1 in 16 T/out 11200 mm O.R. curved switch 60 Kg. (RT-5691) Sleeper No. 6 to 101 for 1 in 16 T/out 11200 mm O.R. curved switch 60 Kg. (RT-5691)
20.		RT-4793 to 4806 & RT-6770 to 6775	Sleeper Set for 6400 mm O.R. RH derailing switch B.G. for 52 Kg. (RT-5836) & 60 Kg. (RT- 6068)
21.		RT-5471 to 5474	Exit Sleepers
22.	Shallow Depth Sleeper	(RT-4852)	Shallow Prestressed Concrete Sleeper (160 mm depth at Rail Seat) for B.G. 60 Kg UIC /52 KG Rail.
23.		RT-8326	Shallow PSC sleeper (160mm depth at rail seat) for BG 60 Kg (UIC) Rail with 52 Kg Guard Rail.

6.0 Fastenings on PSC sleepers *(Para 210 of IRPWM)*

Only approved types of fittings and Elastic fastenings shall be used with concrete sleepers. Some of the approved type of fastenings on PSC sleepers are as under:-

6.1 Elastic Rail Clip (ERC)

(a) Elastic Rail Clip (ERC) is used for fastening the rails with PSC Sleepers.

(b) The Elastic Rail Clips used in Indian Railway are mostly Pandrol Type, and therefore many times they are referred as “Pandrol Clips”.

(c) Different types of ERCs are used in Indian Railway e.g. ERC MK-II, ERC MK-III, ERC MK-IV, ERC MK-V, Anti-Corrosive, Anti-theft ERC and J-Clip at Glued Joint/Fish Plated Joint/Joggled Fish Plated locations.

6.1.1 Some of the commonly used ERCs and their salient features

[Ref: Annexure - 2/4 (B) of IRPWM].

S.N.	ERC type	RDSO Drawing No.	Toe load (kg)	Dia. (mm)	Approximate Weight (kg)
1	ERC-J	RT-8258	650	20.64	1
2	Mk- III	RT-3701	850-1100	20.64	0.91
3	Mk-V	RT-5919	1200-1500	23/20.64	1.08
4	Anti-theft	RT-6254	850-1100	20.64	0.937





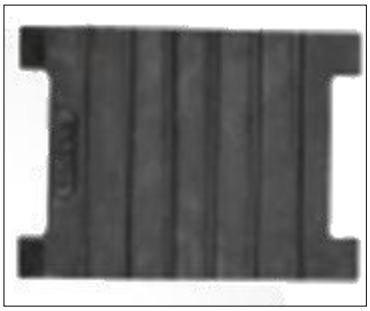
6.2 Plate Screw

Plate screws along with Rail screw are used to fasten plate/slide chairs with PSC sleepers.



Plate screw **RDSO Drawing No.** T-3912 is used in turnout assembly alongwith Single coil spring washer T-10773.

6.3 Grooved Rubber Sole Plate (GRSP) *(Ref: Para 210 of IRPWM)*



The Grooved Rubber Sole Plate Manufactured from rubber compound, absorbs high frequency vibrations, shocks and reduces noise.

6.3.1 Some of the commonly used GRSPs *[Ref: Annexure - 2/4 (B)(b)of IRPWM]*

S.N.	RDSO Drawing No.	Usage
1.	RT-3703	6 mm GRSP for 52 kg Rail and 52 kg Sleeper
2.	RT-3711	6 mm GRSP for 52/60 kg Rail and 60 kg Sleeper
3.	RT-3709	10 mm GRSP for 52/60 kg Rail and slack gauge PSC sleeper No. RT-4183-4186
4.	RT-4218, RT-4219, RT-4220	GRSP Set for Turnout 1 in 12 - 60 kg (as contained in the three drawings of Layout Assembly, Switch and Crossing)
5.	RT-4865, RT-4966, RT-4967	GRSP Set for Turnout 1 in 8.5 - 60 kg (as contained in the three drawings of Layout Assembly, Switch and Crossing)
6.	RT-6068	GRSP Set for 60 Kg for Derailing Switch (as contained in the drawing of Derailing switch)
7.	RT-5836	GRSP Set for 52 Kg for Derailing Switch (as contained in

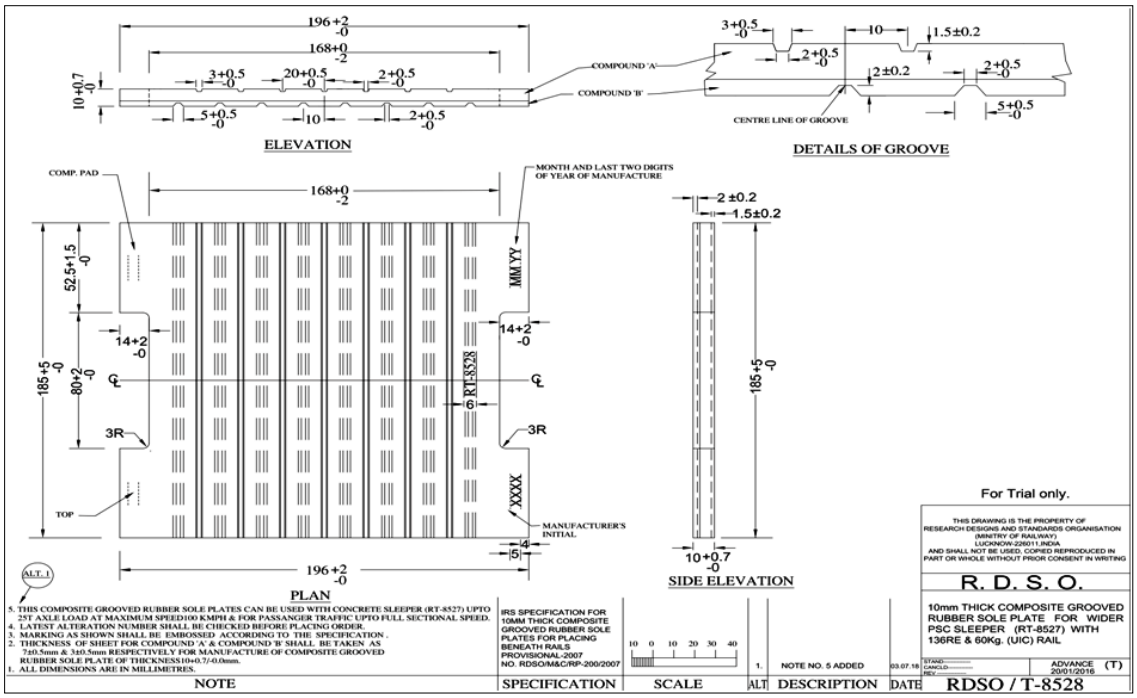
		the drawing of Derailing switch)
8.	RT-4732, RT-4733, RT-4734	GRSP Set for Turnout 1 in 12 - 52 kg (as contained in the three drawings of Layout Assembly, Switch and Crossing)
9.	RT-4865, RT-4866, RT-4867	GRSP Set for Turnout 1 in 8.5 - 52 kg (as contained in the three drawings of Layout Assembly, Switch and Crossing)
10.	RT-6154, RT-6155, RT-4220	GRSP Set for Turnout 1 in 12 with Thick Web Switch (TWS) - 60 kg (as contained in the three drawings of Layout Assembly, Switch and Crossing)
11.	RT-6279, RT-6280 RT-4967	GRSP Set for Turnout 1 in 8.5 with Thick Web Switch (TWS) - 60 kg (as contained in the three drawings of Layout Assembly, Switch and Crossing)
12.	RT-4159	6 mm thick GRSP for SEJ
13.	GRSP 8292 to 8295	6 mm thick GRSP with horns for Turnouts (1 in 12 & 1 in 8.5)

6.3.2 Composite GRSP

For improved performance Composite GRSP with two layers of different types of rubber are developed, which has the top layer having higher modulus of elasticity (harder) while bottom is of softer Material.

6.3.3 Some of the commonly used Composite GRSPs *[Ref: Annexure - 2/4 (B) (c) of IRPWM]*

S.N.	Description/Usage	RDSO Drawing No.	Thickness of CGRSP
1	For 52kg / 60 kg Rail on PSC sleeper RT-2496	RT-6618	6.2 mm
2	For 52 kg Rail on PSC sleeper RT-2495	RT-8327	6.2 mm
3	For 136RE/60 kg Rail on Wider PSC sleeper RT-8527	RT-8528	10 mm



(a) The harder layer should be kept in contact of Rail, Thus, the surface of CGRSP where the manufacturer's initials are embossed should be placed on rail seat, facing up in contact with the rail bottom.

6.3.4 Nylon Cord Reinforced GRSP *(Ref: Document No.TD-M-4.2.4-1, Master List of Drawings issued by Track Design Directorate, RDSO)*

These 6 mm thick, Nylon Cord Reinforced GRSPs are specifically designed for placing beneath CMS crossing portion of Turnouts on PSC sleepers.

For 1 in 12 Turnout		**For 1 in 8.5 Turnout**	
RDSO Drawing No.	**Sleeper No.**	**RDSO Drawing No.**	**Sleeper No.**
RT-7014/1	65	RT-8916	43
RT-7014	66	RT-8917	44
RT-7015	67	RT-8918	46
RT-7016	68	RT-8919	47
RT-7017	69	RT-8920	48
RT-7018	70	-	-
RT-7019	71	-	-
RT-7020	72	-	-
RT-7021	73	-	-
RT-7014/2	74	-	-

6.4 Liner *[Ref: Para 210(5)of IRPWM]*



6.4.1 These are the fittings used in conjunction with the GRSP/ CGRSP and rail, on both sides of the rail foot to achieve the correct track gauge to provide for the correct deflection of the ERC for the designed Toe load.

6.4.2 The combination liners allow flexibility to use lighter rail sections on the sleepers meant for heavier rail section.

6.4.3 Liners are made of two Materials namely,

(a) Glass filled Nylon (GFN) liners.

(b) Metal Liners

6.4.4 The GFN liners are generally used in track-circuited locations.

6.4.5 Cut liners to be used with ERC J clip at fish plated Joint/ Glued Joint. For details of Cut liners, RDSO drawing no. RT-4322(for 52 kg rail) & RT-4511(for 60 kg rail) may be referred.

6.4.6 Some of the commonly used Liners, *[Ref: Annexure - 2/4 (B) (d) of IRPWM]*

S. N.	Rail Section	Sleepers meant for rail section	RDSO Drg. No.	Type of Liner	Colour band
1	52 kg	52 kg	RT-3738	Metal	-
2	60 kg	60 kg	RT-3740	Metal	-
3	52kg	60 kg	RT-3741(GS)	Metal	Yellow
			RT-3742 (NGS)	Metal	Green
4	52 kg	52 kg	RT-3702	GFN	Pink
5	60 kg	60 kg	RT-3706	GFN	White
6	52kg	60 kg	RT-3707 (GS)	GFN	Yellow
			RT-3708 (NGS)	GFN	Light Green
7	60kg	136RE	RT-8616(GS)	Metal	Blue
			RT-8617(NGS)	Metal	Brown
8	60kg	136RE	RT-6938(GS)	GFN	Light Brown
			RT-6939(NGS)	GFN	Grey
9	136RE	136RE	RT-8618	Metal	-

10	136RE	136RE	RT-6937	GFN	Sky Blue

- **GS**- Stand for Gauge Side, **NGS**-Stand for Non-Gauge side

6.5 Generally used Combination of fittings on PSC sleepers where,

6.5.1 52 kg rail on PSC sleepers meant for 60 kg rail

S.N.	Sleepers meant for rail section	Rail Section	GRSP		Liners								ERC
			RDSO Drg No.	Nos.	Metal				GFN				
					Drg. No.	Position	Nos.	Color Band	Drg. No.	Position	Nos.	Color Band	
1.	60 Kg *RT-2495 & 2496*	52 Kg	RT-3711 *6 mm Thick*	2	RT-3741	Gauge face side	2	Yellow	RT-3707	Gauge face side	2	Yellow	RT-3701/ 5919
					RT-3742	Non-Gauge face side	2	Green	RT-3708	Non-Gauge face side	2	Light Green	



52 kg rail on PSC sleepers meant for 60 kg rail with Metal Liners







6.5.2 60 kg rail on PSC sleepers meant for 60 kg rail

S. N.	Sleepers meant for rail section	Rail Section	GRSP		Liners							ERC
			RDSO Drg No.	Nos.	Metal			GFN				
					Drg. No.	Position	Nos.	Drg. No.	Position	Nos.	Color Band	
1.	60 Kg *RT-2495 & 2496*	60 Kg	RT-3711 *6 mm Thick*	2	RT-3740	All four side	4	RT-3706	All side	4	White	Mk-V RT-5919


60 kg rail on PSC sleepers meant for 60 kg rail with Metal Liners


SSE/PW/BLM/MB/60kg
RT-3701
RT-3740-60kg
RT-3740-60kg
RT-3701
RT
2496


60 kg rail on PSC sleepers meant for 60 kg rail with GFN Liners


SSE/PW/BLM/MB/60kg
2023
RT-3701

6.5.3 60 kg rail on PSC sleepers meant for 136 RE rail

S.N.	Sleepers meant for rail section	Rail Section	GRSP		Liners								ERC
			RDSO Drg No.	Nos.	Metal				GFN				
					Drg. No.	Position	Nos.	Color Band	Drg. No.	Position	Nos.	Color Band	
1.	136 RE *RT-7008 for 25 T Axle Load*	60 kg	RT-7010 *10 mm Thick composite*	2	RT-8616	Gauge face side	2	Blue	RT-6938	Gauge face side	2	Light Brown	Mk-V RT-5919
					RT-8617	Non-Gauge face side	2	Brown	RT-6939	Non-Gauge face side	2	Grey	



60 kg rail on PSC sleepers meant for 136 RE rail with GFN Liners

6.5.4 136 RE rail on PSC sleepers meant for 136 RE rail

S. N.	Sleepers meant for rail section	Rail Section	GRSP		Liners							ERC
			RDSO drawing No.	Nos.	Metal			GFN				
					Drg. No.	Position	Nos.	Drg. No.	Position	Nos.	Color Band	
1.	136 RE *RT-7008 for 25 T Axle Load*	136 RE	*RT-7010 10 mm Thick composite*	2	RT-8618	All four side	4	RT-6937	All side	4	Sky Blue	Mk-V RT-5919

6.5.5 60 Kg rail on Wider PSC sleeper

S.N.	Sleepers meant for rail section	Rail Section	GRSP		Liners								ERC
			RDSO Drg No.	Nos.	Metal				GFN				
					Drg. No.	Position	Nos.	Color Band	Drg. No.	Position	Nos.	Color Band	
1.	Wider PSC sleeper RT-8527 *for 25 T Axle Load*	60 Kg	RT-8528 *10 mm Thick composite*	2	RT-8616	Gauge face side	2	Blue	RT-6938	Gauge face side	2	Light Brown	Mk-V RT-5919
					RT-8617	Non-Gauge face side	2	Brown	RT-6939	Non-Gauge face side	2	Grey	

6.5.6 136 RE rail on Wider PSC sleeper

S.N.	Sleepers meant for rail section	Rail Section	GRSP		Liners								ERC
			RDSO drawing No.	Nos.	Metal				GFN				
					Drg. No.	Position	Nos.	Color Band	Drg. No.	Position	Nos.	Color Band	
1.	Wider PSC sleeper RT-8527 *for 25 T Axle Load*	136RE	Rt-8528 *10 mm Thick composite*	2	RT-8618	All four side	4	-	RT-6937	All side	4	Sky Blue	Mk-V RT-5919

7.0 Insulated Rail joints *(Para 223 & 224 of IRPWM)*

To ensure that the flow of current is restricted to a particular section, insulated joints are provided at both ends of the section.

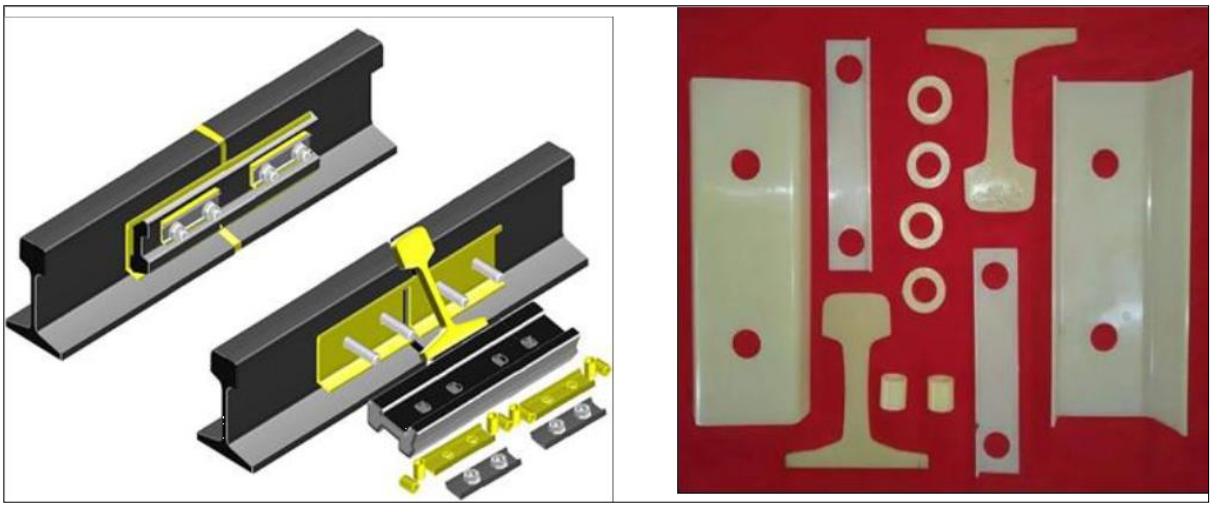
Two types of these joints are presently in use.

7.1 Nylon Insulated Rail Joints (Block Joints)

7.1.1 The standard insulated joint in normal use, is made out of ordinary fishplates duly planed on the fishing planes for accommodating channel type insulation between rails and fishplates with ferrules/ bushes over the fish bolts and end posts between the rail ends.

7.1.2 In this type, the metallic components of the rail joints as supplied by the Civil Engineering Department for this purpose are not the usual ones. The fish bolts have to be of 140 mm length. Also, four steel backing plates have to be provided for support over the nylon backing plates held by fish bolts.

7.1.3 The insulation components are supplied by the S&T department, which have to be inserted in the rail joint when Track Circuit is being installed and also whenever they get crushed resulting in insulation failure.



7.2 Glued Insulated Rail Joints

7.2.1 Glued insulated joints have been developed using resin adhesives. These joints consist of web-fitting fishplates glued to the rails with a high polymer adhesive and bolted with high tensile steel bolts. The insulation is provided by special type of insulating side channels, bushes and end posts made of fiberglass cloth roving.



7.2.2 There are two kinds of glued joints,

- G3L (with six bolts) for usage in LWR/CWR
- G3S (with four bolts) for usage in SWR/FR track

7.2.3 **Marking of Glued Joints**

The details of glued joint number, month, year of manufacturing and the code of the manufacturer is embossed on the gauge and non- gauge face sides of the head of the rail as per provision of the Manual for Glued Insulated Rail Joints.

7.2.4 List of commonly used Glued Joints

S. N.	RDSO Drawing No.	Description
1	T-2572	Glued Insulated Rail Joint for B.G. 60kg (UIC)-G3(L)
2	T-2576	Glued Insulated Rail Joint for B.G. 60kg (UIC)-G3(S)
3	T-671	Glued Insulated Rail Joint for B.G. 52kg G3(L)
4	T-1259	Glued Insulated Rail Joint for B.G. 52kg G3(S)

7.2.5 Glued Joints are weak link in track as their life is substantially lower than rails and its failure rates are also much higher Insertion of Glued joints require AT welds, which are also weak joints and need attention/testing & replacements from time to time.

7.2.6 To enhance the safety and service life of rails along with the reduction of asset failures, the Railway Board (ME, MT.R and MS&T) has decided that: For all future works in Block sections, glued joints shall be avoided by providing digital axle counters with design redundancy for Block Proving Application (BPAC), Intermediate Block Signalling (IBS) Application and Automatic Block Signalling (ABS) Applications. *(Ref: Rly Bd Letter No. 2018/CE-11/TK/S&T/AGJ & DH dated 20.08.2020.)*

8.0 Switch Expansion Joint *(Para 225 of IRPWM)*

8.1 An expansion joint installed at each end of LWR/CWR to permit expansion/contraction of the adjoining breathing lengths due to temperature variations.



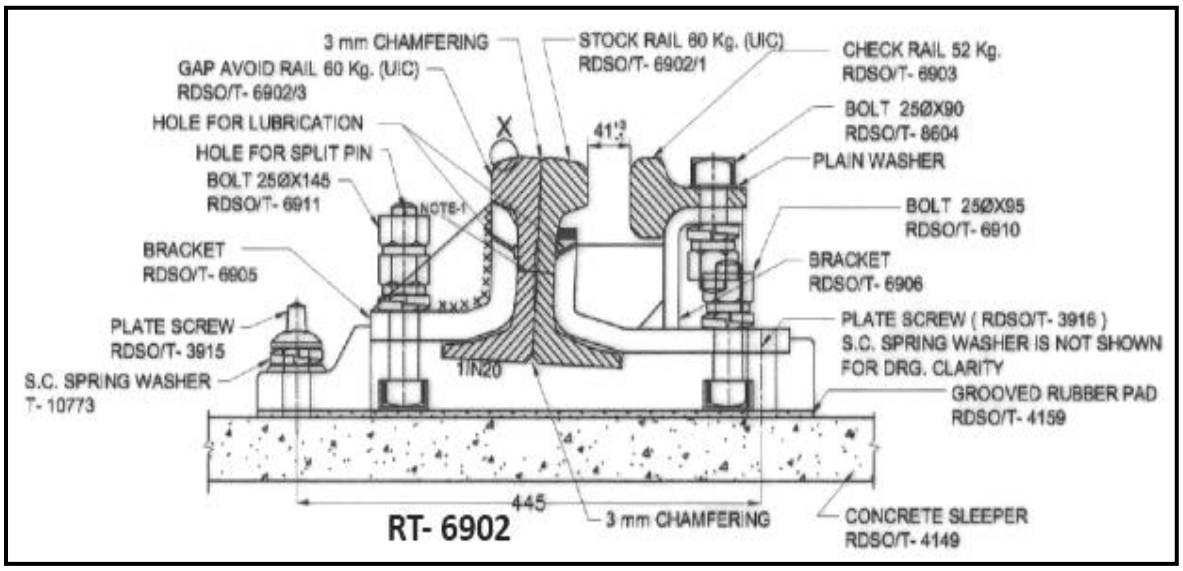
8.2 Normally, SEJ are provided for same rail sections. In case SEJ is required to be provided between the junction of two different rail sections such as 52 Kg rail and 60 Kg rail, Combination SEJ as per standard RDSO drawing No. RT-

6782 with 80 mm gap shall be provided between the junction of 52 Kg rail and 60 Kg rail.

8.3 List of commonly used Switch Expansion Joint on concrete sleepers, ***[Ref: Annexure - 2/4 (B) (e) of IRPWM]***

S. N.	RDSO Drawing No.	Rail section	Maximum Design Gap	Type
1	RT-4160	52 Kg/m	80 mm	Conventional
2	RT-4165	60 Kg/m	80 mm	Conventional
3	RT- 6902	60 Kg/m	80 mm (Single Gap)	Improved SEJ
4	RT- 6914	52kg/m	80 mm (Single Gap)	Improved SEJ
5	RT- 6922	60 Kg/m	65 mm (Double Gap)	Improved SEJ
6	RT- 6930	52kg/m	65 mm (Double Gap)	Improved SEJ

8.4 The following fittings shall be provided to the 60Kg Switch Expansion Joint (RT-6902).

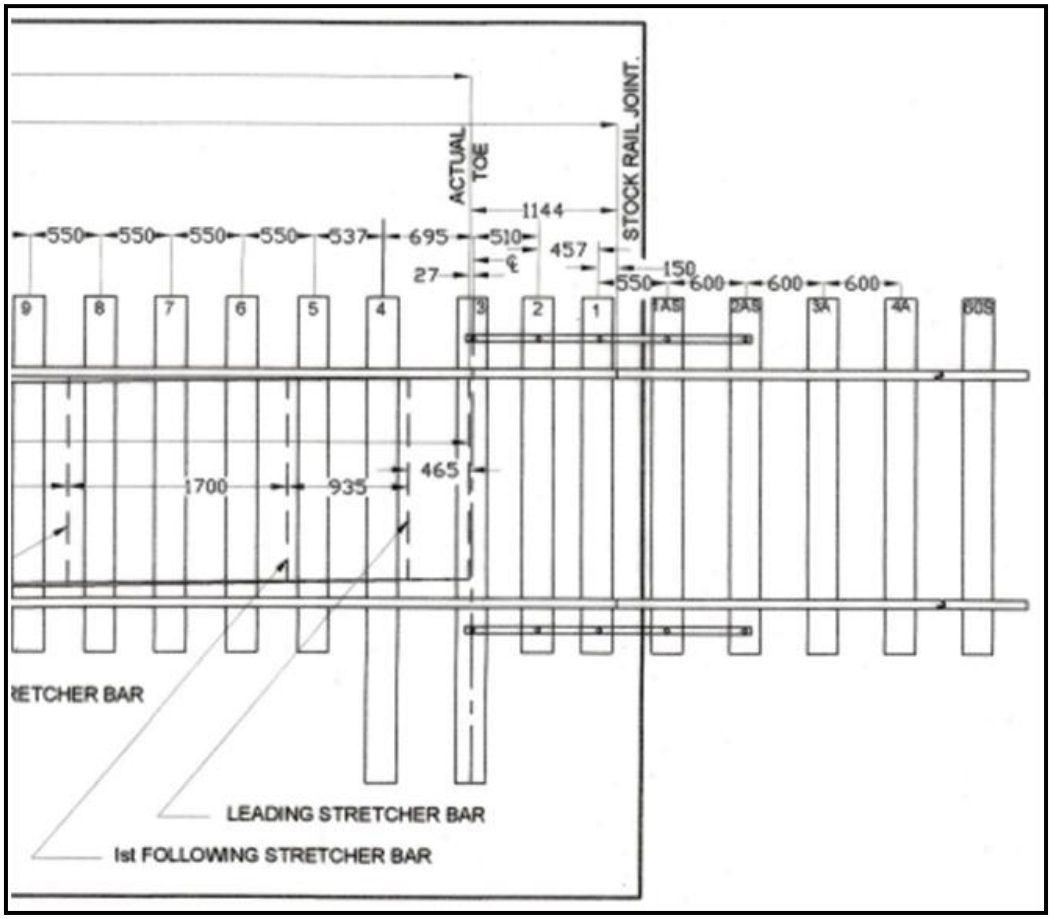


8.5 The quantities of fitting required per SEJ (RT-6902) **are indicated in the table below,** *(Ref: RDSO drawing no. T-6902 for improved SEJ)*

S.N.	RDSO DRG No.	Component	Numbers
1.	T-4168	C.I. Chair	4
2.		Split Pin dia 6.3 X 40 mm long	40
3.		Plain washer for 25 mm dia bolt	10
4.	T-8817	Unified Hardened washer	4
5.	T-8818	Unified Hardened washer	4
6.	T-10773	Single coil spring washer	56
7.	T-3915	Plate Screw	36
8.	T-3916	Plate Screw	20
9.	T-4159	Grooved Rubber Sole Plate	14
10.	T-3711	Grooved Rubber Sole Plate	34
11.	T-6911	Bolt size dia 25x145 mm long with single coil spring washer	30
12.	T-6910	Bolt size dia 25x95 mm long with single coil spring washer	20
13.	T-8604	Bolt size dia 25x90 mm long with single coil spring washer	10
14.	T-8816	High Strength Friction Grip Bolt with Nut 27X150 mm	8
15.	T-6908	M.S. Bracket (Sleeper No.8/9) NGF side	2
16.	T-6907	M.S. Bracket(Sleeper No.12/13) NGF side	2
17.	T-6906	M.S. Bracket (Sleeper No.8/9, 12/13, & 9,10, 11/10, 11, 12) GF side	10
18.	T-6905	M.S. bracket (Sleeper No.9, 10, 10/11,11, 12) NGF side	6
19.	T-6904	C.I. Chair	10

9.0 Position of Approach Sleepers on Turn outs & their Fittings *(Ref: RDSO drawing no. T-4219)*

The approach sleeper in advance of switch portion should be provided without fail, they are for gradual elimination of slope of rail top (1 in 20).



9.1 The quantities of fitting required per Approach are indicated in the table below, *(Ref: RDSO drawing no. T-4218)*

Fittings on Approach Sleepers					
Sleeper No.	**Nylon cord Reinforced GRSP RT-8889**	**Insulating Liners RT-3706**	**ERC RT-3701**	**MS Plate RT-3902**	**Plate Screw RT-3912**
60S	2	4	4	1	6
60-4A	2	4	4	1	6
60-3A	2	4	4	1	6
60-2AS	2	4	4	1	6
60-1AS	2	4	4	1	6

Indications:-

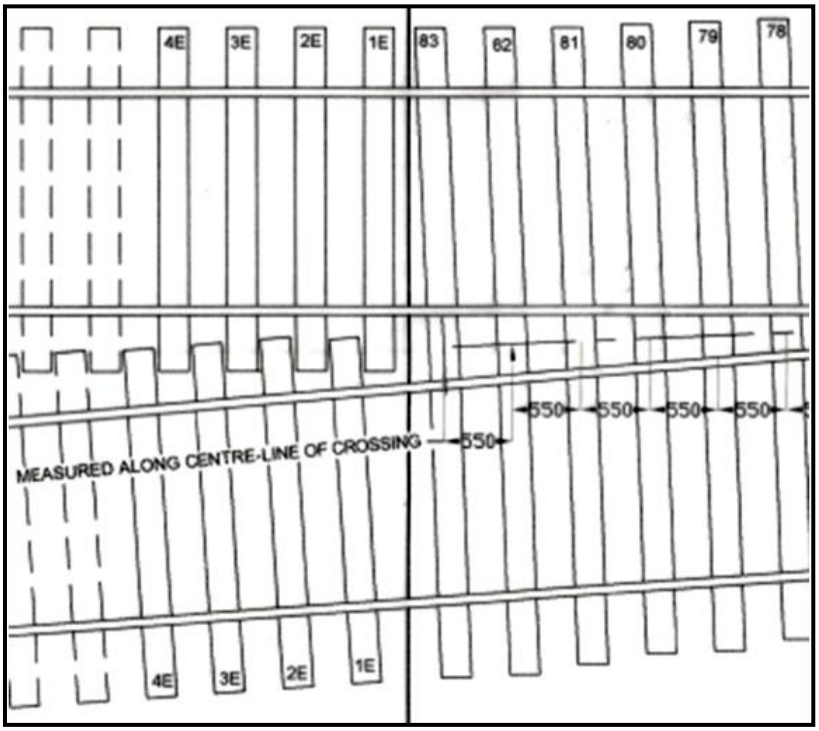
60 60Kg rail section

S Sleepers with signal fittings

A Approach sleepers

10.0 Position of Exit Sleepers on Turnouts & their Fittings *(Ref: RDSO drawing no. T-4220)*

The exit sleepers behind the crossing portion should also be provided for gradual introduction of rail slope (1 in 20).

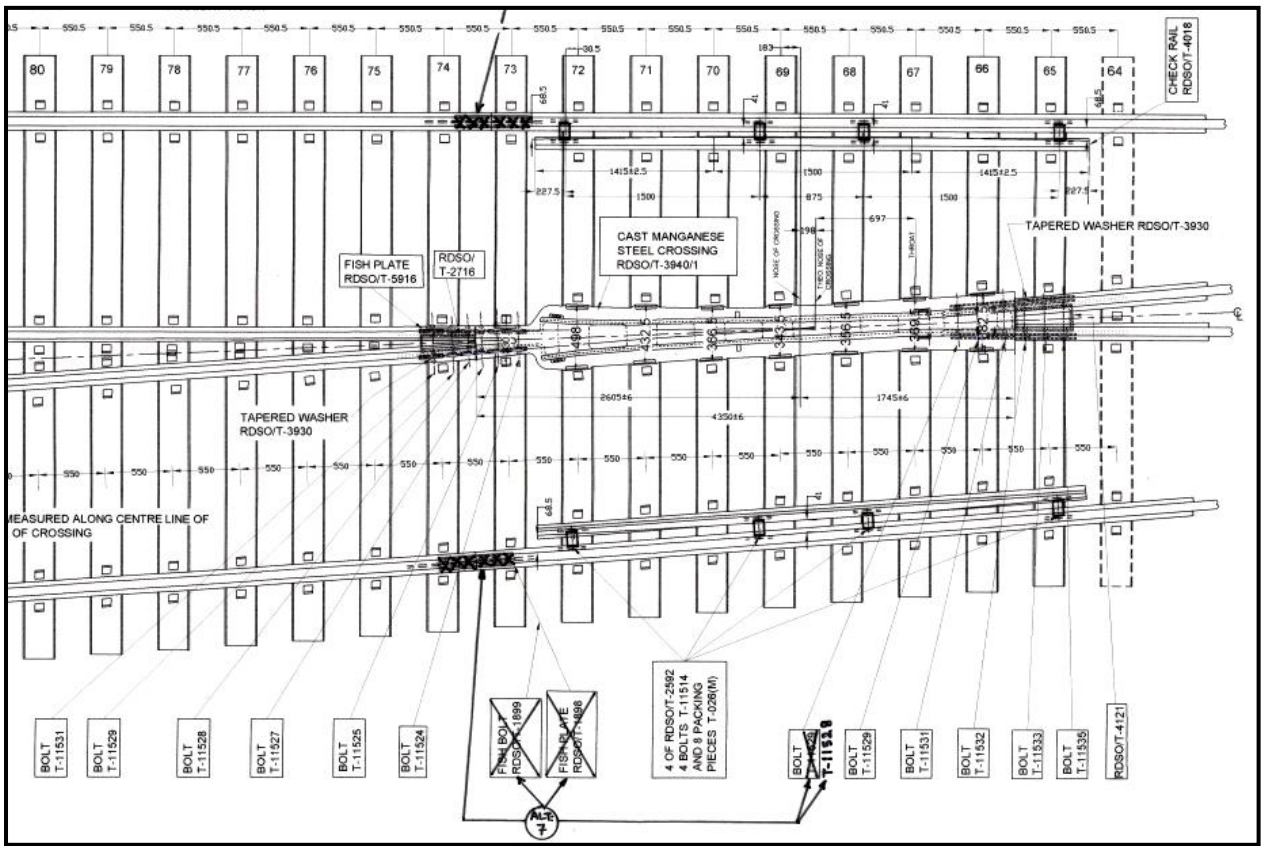


10.1 The quantities of fitting required per Exit are indicated in the table below, *(Ref: RDSO drawing no. T-4218)*

Fittings on Exit Sleepers			
Sleeper No.	**Nylon cord Reinforced GRSP RT-8889**	**Insulating Liners RT-3706**	**ERC RT-3701**
1E x 2	4	8	8
2E x 2	4	8	8
3E x 2	4	8	8
4E x 2	4	8	8

Where, E - Exit sleepers

11.0 Position of Fish plates and Bolts in 1 in 12 CMS crossing B.G. for 60 Kg *(Ref: RDSO drawing no. T-4220)*

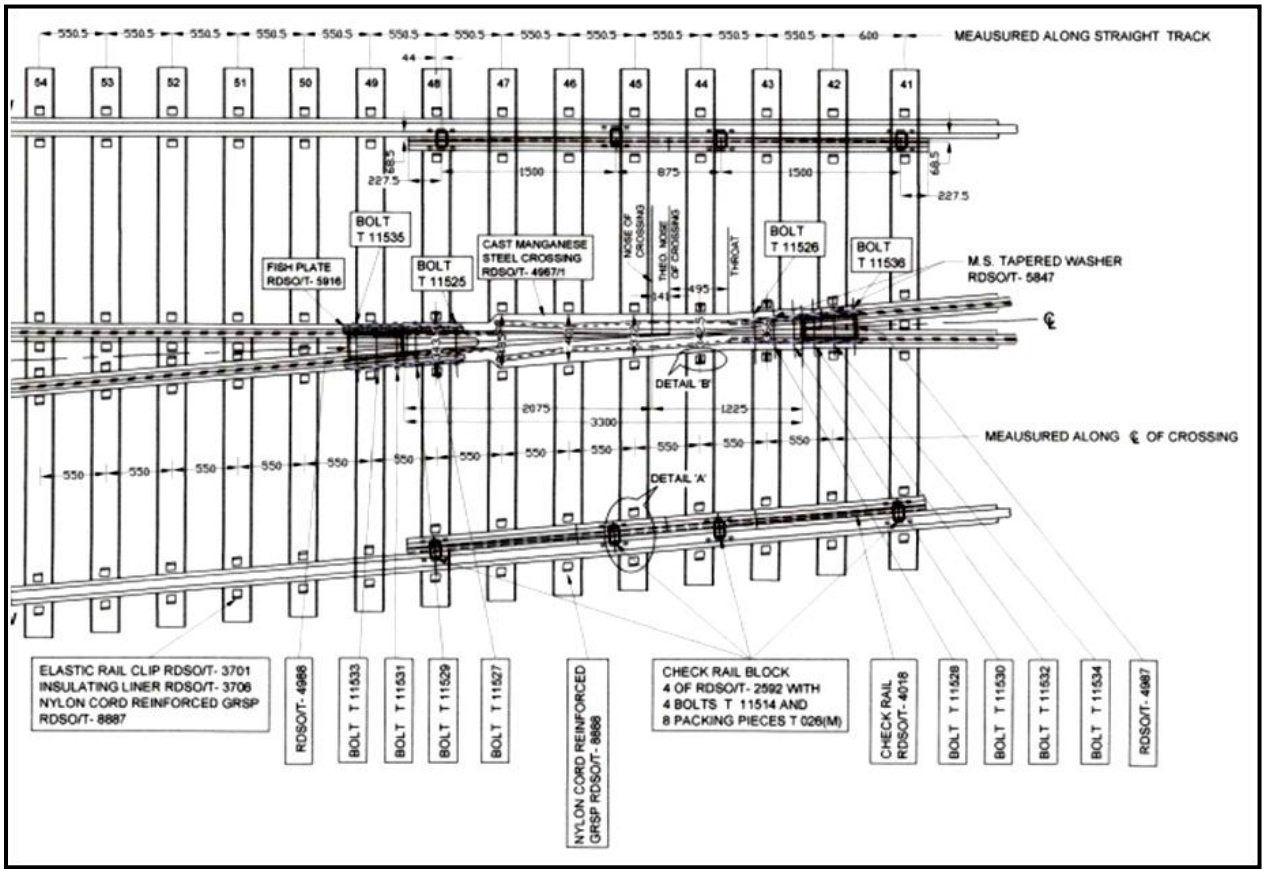


11.1 The quantities of fitting required per 1 in 12 CMS crossing B.G. for 60 Kg are indicated in the table below, *(Ref: RDSO drawing no. T-4220)*

RDSO Drg No.	Component	Length	Nos.
RT-5916	Fishplates	1 m Long	4
T-11535	25 mm dia Bolt	400 mm	1
T-11533	25 mm dia Bolt	380 mm	1
T-11532	25 mm dia Bolt	370 mm	1
T-11531	25 mm dia Bolt	360 mm	2
T-11529	25 mm dia Bolt	340 mm	2
T-11528	25 mm dia Bolt	330 mm	2
T-11527	25 mm dia Bolt	320 mm	1
T-11525	25 mm dia Bolt	300 mm	1
T-11524	25 mm dia Bolt	290 mm	1
T-11514	25 mm dia Bolt	190 mm	8
T-3930	Tapered washer	To be used with crossing bolts	24

12.0 Position of Fish plates and Bolts in 1 in 8.5 CMS crossing B.G. for 60 Kg

(Ref: RDSO drawing no. T-4967)



12.1 The quantities of fitting required per 1 in 8.5 CMS crossing B.G. for 60 Kg in the table below, *(Ref: RDSO drawing no. T-4967)*

RDSO Drg No.	Component	Length	Nos.
RT-5916	Fishplates	1 m Long	4
T-11536	25 mm dia Bolt	410 mm	1
T-11535	25 mm dia Bolt	400 mm	1
T-11534	25 mm dia Bolt	390 mm	1
T-11533	25 mm dia Bolt	380 mm	1
T-11532	25 mm dia Bolt	370 mm	1
T-11531	25 mm dia Bolt	360 mm	1
T-11530	25 mm dia Bolt	350 mm	1
T-11529	25 mm dia Bolt	340 mm	1

T-11528	25 mm dia Bolt	330 mm	1
T-11527	25 mm dia Bolt	320 mm	1
T-11526	25 mm dia Bolt	310 mm	1
T-11525	25 mm dia Bolt	300 mm	1
T-11514	25 mm dia Bolt	190 mm	8
T-5847	Tapered washer	To be used with crossing bolts	24

13.0 Ballast

It is used to bear the compression load of the sleepers, rails, and rolling stock and to facilitate drainage. Ballast also physically holds the track in place as the trains roll over it.

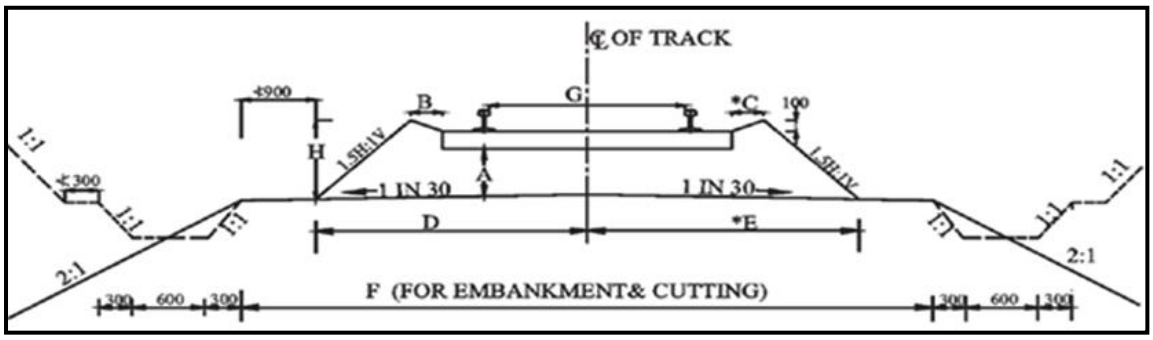
Crushed Stone ballast to be used on all lines including points and crossings shall be conforming to RDSO specifications for Track Ballast No. IRS -GE -1, June 2016 with latest amendments.

13.1 Ballast Profile *(Ref: Para 212 of IRPWM)*

The following ballast profiles shall be provided for the various groups of track for LWR/CWR and other than LWR/CWR as given in the sketch below.

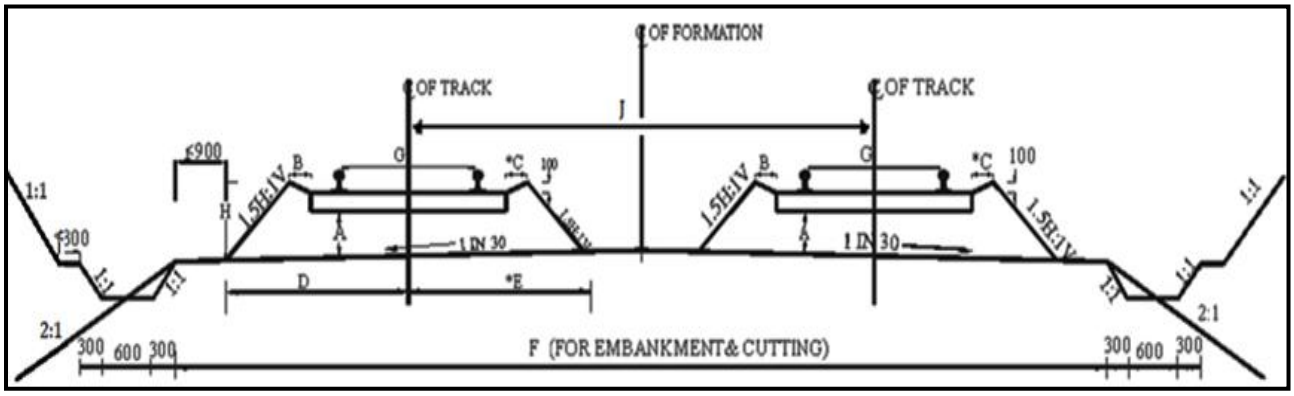
The approximate quantity of ballast required per metre run of track for standard ballast sections is indicated in the table below.

13.1.1 Ballast Profile for LWR Track (Single Line BG) for PRC Sleepers *[Ref: Annexure - 2/2(A) of IRPWM*



G Gauge	Type of Sleeper	A	B	C*	D	E*	F	H	Quantity of Ballast per meter in	
									Straight Track (M^3)	Curved Track (M^3)
1676 mm	PRC	250	350	500	2693	2851	7850	646	2.030	2.120
		300	350	500	2772	2930	7850	698	2.304	2.401
		350	350	500	2851	3009	7850	751	2.585	2.690

13.1.2 Ballast Profile for LWR Track (Double Line BG) for PRC Sleepers *[Ref: Annexure - 2/2(C) of IRPWM]*

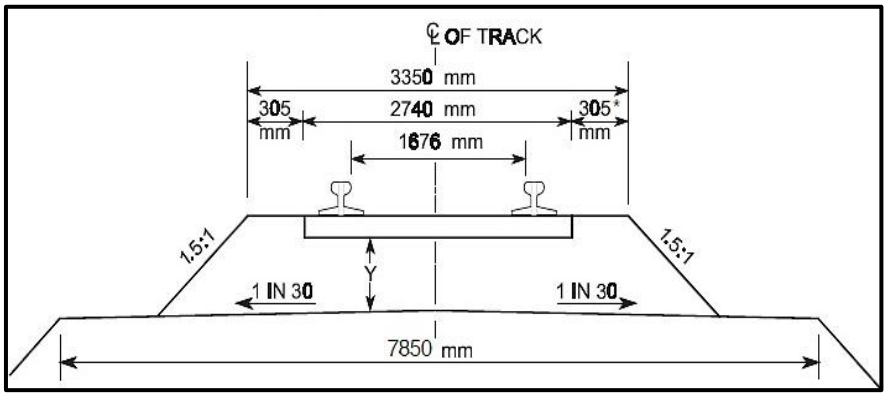


G Gauge	Type of Sleeper	A	B	C*	D	E*	F	H	Quantity of Ballast per meter in	
									Straight Track (M^3)	Curved Track (M^3)
1676 mm	PRC	250	350	500	2785	2943	13160	707	2.030	2.120
		300	350	500	2864	3022	13160	760	2.304	2.401
		350	350	500	2943	3101	13160	812	2.585	2.690

Note:

- *Suitable dwarf walls shall be provided in case of cuttings, if necessary for retaining ballast.*
- ***On outer side of curves only.***
- *Super elevation has not been considered in calculation of ballast quantity for curved track.*
- *All dimensions are in mm.*

13.1.3 Standard Ballast Profile for BG (Other Than LWR/CWR) *[Ref: Annexure - 2/2(B) of IRPWM]*



S. N.	Depth of Ballast Cushion	Quantity of Ballast per Meter	
		On Straight and Curves of Radius flatter than 600 M	Curves of Radius sharper than 600 M
1	250 mm	1.769 M^3	1.820 M^3
2	300 mm	2.022 M^3	2.078 M^3
3	350 mm	2.282 M^3	2.344 M^3

Note :

- *In the case of ordinary fish plated track: * To be increased on the outside of curves to 400 mm in the case of curves sharper than 600 M radius.*
- *In short welded panel Track* To be increased to 400 mm on outside of all curves, flatter than 875 M radius and to 450 mm, in the case of curves sharper than 875 M radius.*
- *** To be increased to 550 mm on the outside of turn in curves of turnouts in passenger yards.*
- *Super elevation has not been considered in calculation of ballast quantity for curved track.*

13.2 Depths of Ballast Cushion *(Para 212 (2) of IRPWM)*

(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
Loop Lines	250 mm

(b) For higher speed, Total 300 mm, clean 150 mm.

(c) Sidings

Private and Other Sidings	For permissible speed up to 50 Kmph.	300 mm
	For permissible speed more than 50 Kmph	350 mm

Minimum depth of clean ballast cushion at all times for mechanised maintenance under the rail seat of the PSC sleepers shall not be less than 150 mm.

***

RBE No. 03/2024

भारत सरकार Government of India
रेल मंत्रालय Ministry of Railways
(रेलवे बोर्ड) (Railway Board)

No. E (MPP)/2019/03/46 **New Delhi, dated: 09.01.2024**

The General Manager,
All Zonal Railways/PUs
Metro Railway, Kolkata
CORE, Allahabad
DG/RDSO/Lucknow
CAO/DMW/ Patiala
CAO/COFMOW/New Delhi
ED/CAMTECH/Gwalior

DG/NAIR/Vadodara
DG/IRITM/Lucknow
DG/IRIEEN/Nasik
DG/IRICEN/Pune
DG/IRISET/Secunderabad
DG/IRIMEE/Jamalpur
DG/ IRIFM/ Secunderabad
DG/ JRRPF/ Lucknow

Sub: Revised Training Modules of Non- Gazetted Staff of Civil Engineering Department.

Vide Board's letter no. E (MPP) 2019/03/46 dt. 24.12.2021 (RBE no. 94/2021), revised training module of non- gazetted staff of civil engineering department was circulated to all Zonal Railways/ PUs and uploaded on railnet under heading **MPP Training Circulars**.

2. IRICEN has now submitted the revised training module for Induction & Refresher training course of Track Maintainers, which has been reviewed in Board's office and the same has been approved by Board (Member/Infrastructure).

3. Accordingly, the revised training modules for Induction & Refresher training of Track Maintainers, have been scanned and uploaded under **MPP Training Circulars** and can be viewed or downloaded from **Railnet/Indian Railways website.**

4. This disposes of NR's letter no.1-WO/Training of Non-Gazetted P Way Staff dated 05.09.2022

5. Kindly acknowledge receipt.

Encl. : (Revised Training Modules – 05 pages)

अमित
9/1/24

(Amit Singh Mehra)
Director/Man Power Planning

No. E (MPP)/2019/03/46 **New Delhi, dated: 09.01.2024**

Copy to:

1) The General Secretary, NFIR, 3 Chelmsford Road, New Delhi for information (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

2) The General Secretary, AIRF, 4 State Entry Road, New Delhi for information (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

3) The Secretary General, FROA, R.No.256-A, Rail Bhavan, New Delhi for information (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

4) The Secretary General, IRPOF, R.No.268, Rail Bhavan, New Delhi for information (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

5) All Members, Department Council & Secretary Staff side National Council 13-C, Ferozeshah Road, New Delhi (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

6) The Secretary General, AIRPF Association, Room No.256-D, Rail Bhavan, New Delhi (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

7) General Secretary, All India SC & ST Railway Employees Association, 171/B-3, Basant Lane Railway Colony, New Delhi (Copy may be downloaded from E(MPP) Training Circulars/Railnet/Internet).

For Principal Executive Director (IR) /Railway Board

No. E (MPP)/2019/3/46 **New Delhi, dated: 09.01.2024**

Copy to:

i) PS & ED(PG) to MR, MoSR (D) & MoSR (J)

ii) PSO/Sr.PPS to CRB, MF, M(Infra.), M(TRS), M(O&BD), DG(HR), DG(RHS) & DG(RPF)

iii) Sr.PPS/PPS/PS to AM(Budget), AM(CE), AM(C&IS), AM(Comml.), AM(Traction), AM(Fin), AM(Mech.), AM(Plg.), AM(Project), AM(PU), AM(Sig.), AM(Staff), AM(RS), AM(T&C), AM(Tele), AM(TT), AM(Works), PED(Vig.), PED(Safety), PED(Coaching) LA,

iv) ED(Plg.), ED(Accts.), EDCE(B&S), EDCE(G), EDCE(Plg.), ED(CHG), ED(CC), ED(C&IS), ED(E&R), EDEE(Dev), EDEE(G), EDE, ED(RRB), EDE(N), EDE(Res), EDF, EDF(B), EDF(X)I, EDF(X)II, ED(H), JS(C), EDME(Chg.), EDME(Fr.), ED(PC)I, ED(PC)II, EDRE, ED(Safety), ED(Safety)-II, IG./RPF(Hqs), ED(Sig.), ED(SP), EDRS(G), EDRS(S), ED(TD), EDTC(R), EDCE(P), ED(PM), ED(FM), EDPG, EDTT(F), EDTT(S), EDV(E), EDV(Elect), EDV(T), EDVE(S), ED(W).

v) Chief Commissioner of Railway Safety, Lucknow.
vi) E(Trg.), E(NG)I, E(NG)II, E(G), F(E)I, F(E)II, F(E)III, E(SCT)I, E(SCT)II branches of Railway Board.

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Room No. 27A, Ground Floor, Rail Bhawan, New Delhi-110001

TRAINING MODULE FOR INDUCTION COURSE (T-9) (Revised)

CATEGORY: TRACK MAINTAINER **DURATION: 30 DAYS (240 PERIODS)**

TOPIC	TOPIC DETAILS	Periods	
		Existing	Revised
	PART – I INTRODUCTION	**6**	**6**
1.1	Railway's Organizational Structure, Role of Track-maintainer in Railways.	2	2
1.2	Classification of Routes.	1	1
1.3	Duties & Responsibilities of Track-maintainer (IRPWM Para 149). Duties of Trackman as per para 2.11 of GR.	3	3
	PART – II PERSONAL SAFETY	**21**	**29**
1.1	Precaution during work on running lines, **including Double / Multiple lines, vicinity of LCs, important major yards, shunting / marshalling lines etc.**	1	**2**
1.2	Precaution during routine maintenance activity, handling/ transporting materials **including while working in Block, Speed Restriction etc**	1	**2**
1.3	Precaution during Track machine working **including pre, post and during tamping, BCM working, sharp look out on adjoining lines etc**	2	**4**
1.4	Precaution during working on sharp Curves/Curves with poor visibility. Precaution during working at accident spots, congested locations like bridge, tunnel. in High speed locations, **Use of Rakshak and other such warning systems**	1	3
1.5	Precautions in track circuited areas, electrified areas, **including working with Cranes, JCBs, earth moving equipment etc.**	2	**3**
1.6	Precaution while working during heavy rain, Safety against Snake/Insect Bite Precautions during night working **at Monsoon Patrolling / Hot / Cold weather Patrolling etc**	1	**2**
1.7	Safety during working in Ghat sections. Personal safety- Dos & Don'ts	1	1
1.8	**Hands on**: Repairs to Trolley Refuges/ Man refuges	4	4
1.9	**Hands on**: Exchange of hand signals. Fixing detonators	4	4
1.1	**Field visit** for demonstration of various safety drills.	4	4
	PART – III RAILS, SLEEPERS, FASTENINGS & BALLAST	**23**	**23**
1.1	Types of rails, Fish plates, Fish bolts.	1	1
1.2	PSC sleepers for main line and other locations viz. level crossing, SEJ, bridge and its approach, turnout, sharp curves, etc.	2	2
1.3	Elastic Fastenings: Types of ERC – ERC mark III, ERC mark V, zero toe load, GJ clip. Rubber pads: Different types. Liners : Different types, GFN liners, metal liners, combination liners Modern elastic fastenings viz. Vossloh, Nabla etc.	2	2
1.4	Glued joints, Block Joint, SEJs, Points & Crossing.	2	2
1.5	**Model room** showing different types of rails, sleepers, elastic fastenings, SEJ, Glued joint, block joint, points and crossing.	2	2
1.6	**Field visit** for showing items mentioned at 1.5 above.	8	8
1.7	Ballast profile at different location, Steps to prevent Pedestrian/ Cattle Crossing	2	2
1.8	**Hands on** Ballast Handling, adjustment of ballast in profile, measurement of ballast cushion	4	4
	PART – IV LUBRICATION OF RAIL JOINTS	**14**	**14**
1.1	Lubrication of Rail Joints (IRPWM Para 241)	1	1
1.2	**Hands on**: Lubrication of Rail Joints	4	4
1.3	Greasing of ERCs, sealing of liners.	1	1
1.4	Painting of Rails and Welds.	1	1
1.5	Lubrication of gauge face of outer rail on curves, turnouts, SEJ etc.	1	1
1.6	**Hands on**: Lubrication of ERC, Curves, Turnouts, SEJ.	6	6
	PART – V TRACK MAINTENANCE ACTIVITIES	**57**	**57**
1.1	Through Packing (IRPWM Para 224), Slack Picking (IRPWM Para 229),	2	2
1.2	**Hands on**: Manual through packing.	8	8
1.3	Systematic Overhauling of Track(IRPWM Para227)	1	1
1.4	**Hands on**: Systematic Overhauling	4	4
1.5	Mobile Maintenance Units (IRPWM Para228)	1	1
1.6	Introduction to Small Track Machines. Safe operation of Small Track Machines available on Indian Railways on running track.	2	2
1.7	Basic knowledge regarding consumables being used in Small Track Machines.	1	1
1.8	**Hands on:** Repair & maintenance of Small Track machines, troubleshooting of Small Track machines.	4	4

TRAINING MODULE FOR INDUCTION COURSE (T-9) (Revised)

CATEGORY: TRACK MAINTAINER **DURATION: 30 DAYS (240 PERIODS)**

TOPIC	TOPIC DETAILS	Periods	
		Existing	Revised
1.9	**Hands on** training for operation of small Track Machines including weld trimmer, grinder, rail cutting, hole drilling, chamfering, etc.	4	4
1.1	Works involved in the maintenance of Points &Crossings, Curves, Level crossings and Bridges.	2	2
1.11	**CREEP**: Creep and its effect, pulling back of creep, fixing of anchors, recoupment of missing fittings, renewal of ineffective fittings.	1	1
1.12	Attention to SEJ, Glued Joints, insulated block joints.	1	1
1.13	Observance of Sleepers under passage of Traffic(IRPWM Para 230)	1	1
1.14	Observance of train for seized bearings/hot axles, hanging parts of rolling stock.		
1.15	**Technical films/ video clips/ photographs** showing various Track Maintenance activities.	1	1
1.16	**Hands on**: Casual rail renewal	4	4
1.17	**Hands on**: Casual sleeper renewal	4	4
1.18	**Hands on**: Measurement of Gauge, Cross level, Check-Rail Clearance, Versine, Cant.	2	2
1.19	**Hands on**: Change of Crossing and Switches in yards.	4	4
1.2	Welding of Rails.	2	2
1.21	**Hands on**: Assisting in welding of rail joint.	4	4
1.22	**Technical films/ video clips/ photographs** on use of weld trimmers &Grinders, Rail cutting machine, Rail drilling Machine, Chamfering machine, Impact Winch for bolt tightening, Toe load measurements.	2	2
1.23	**Hands on**: Maintenance in Electrified territories: precautions involved during maintenance of Track-Circuited sections, Felling/ Cutting/ Pruning of trees close to OHE	2	2
	PART – VI LONG AND SHORT WELDED RAILS (LWR/SWR)	**24**	**24**
1.1	Introduction to LWR/SWR track.	1	1
1.2	Rail temperature-types of Rail Thermometers, measurement of temperature and working range.	1	1
1.3	**Hands on**: Measurement of Rail temperature	1	1
1.4	Competency to carry out various Maintenance and Repair works in LWR.	1	1
1.5	Do's and Don'ts for LWR and SWR track.	2	2
1.6	Hot and Cold Weather Patrolling	1	1
1.7	Action to be taken in case of rail/weld failures.	1	1
1.8	**Hands on** : for attending emergency repair of rail/weld fracture	4	4
1.9	Action to be taken in case of buckling	1	1
1.1	De-stressing of LWR.	2	2
1.11	Different types of SEJ – Inspection and Maintenance	1	1
1.12	**Hands on**: Cold / Hot Weather Patrolling, Monsoon Patrolling.	8	8
	PART – VII RAIL FRACTURES AND WELD FAILURES	**7**	**7**
1.1	Introduction to Rail/ weld failures.	1	1
1.2	Marking of USFD Flaws, Action for protection / removal of defective welds/rails	2	2
1.3	**Hands on**: Attention to various types of USFD Flaws	4	4
	PART – VIII TRACK RENEWALS	**21**	**21**
1.1	Scope, activities involved & method for execution of Through Rail Renewal, Through Sleeper Renewal, Through Bridge Timber Renewal, Through Fittings Renewal, Through Turnout renewal	3	3
1.2	Deep Screening (IRPWM Para 238), Lifting/Lowering of track, **Working of Track machine such as BCM, SBCM, DTS, Unimat, T-28**	3	3
1.3	Working of Ballast Train / DMT working	2	2
1.4	**Hands on**: Ballast train/ EUR unloading.	8	8
1.5	**Technical films/ video clips/ photographs** of various types of Track machine on Railway	1	1
1.6	**Hands on**: Pre & Post tamping activities, Attention during Track-Machine tamping	4	4
	PART – IX LEVEL CROSSINGS	**10**	**10**
1.1	Classification of Level Crossing, Equipment at LC.	2	2
1.2	Visibility at LC, Speed breakers, Road sign boards and W/L boards at level crossings, Location of various LC Boards	1	1
1.3	Introduction to working of gateman, competency, Refresher & medical Examination.	1	1
1.4	Action during Gate failures, Height Gauge damage, Breakdown of vehicle at LC	1	1

TRAINING MODULE FOR INDUCTION COURSE (T-9) (Revised)

CATEGORY: TRACK MAINTAINER **DURATION: 30 DAYS (240 PERIODS)**

TOPIC	TOPIC DETAILS	Periods	
		Existing	Revised
1.5	**Technical films/ video clips/ photographs** showing operation of Level Crossing and its components.	1	1
1.6	**Hands on**: Visit to nearest level crossing	4	4
	PART – X PATROLLING OF TRACK (Ch-X of IRPWM)	**16**	**12**
1.1	Types of Patrolling	2	2
1.2	Duties of Patrolman, Equipment of patrolman. Reporting of unusual. Understanding of patrol chart and diary.	2	2
1.3	Action to be taken during emergency by Patrolman.	1	1
1.4	Duties of Stationary watchman at vulnerable location	1	1
1.5	**Hands on**: rainfall reading with rain gauge	2	2
1.6	**Hands on:** Patrolling Duty	8	**4**
	PART – XI Rail Dolly/Trolley/Dip Lorry Working	**15**	**11**
1.1	Working of Trolley, Lorry and Rail dolly.	2	2
1.2	**Technical films/ video clips/ photographs** on working of Rail Dolly/Dip Lorry.	1	1
1.3	**Hands on**: working of Trolley, Lorry, Rail dolly and Protection	4	4
1.4	**Tutorial on** preparation on various memo viz. track unsafe memo, caution order, track safe memo with caution order, etc.	8	4
	PART – XII BASICS OF SIGNALLING & PROTECTION OF TRACK	**13**	**13**
1.1	Various types of Signals& Their Aspects	2	2
1.2	Station limit, block sections, different types of territory (absolute/automatic).	1	1
1.3	Various method of protections: HS Flags, banner flags, HS lamp, detonator, tri-color torches, hooters etc.	1	1
1.4	Protection during short duration/long duration works.	2	2
1.5	Engineering Indicator boards for various speed restriction/ stop dead, Location of boards at work site.	2	2
1.6	**Hands on** for Fixing of Indicator Boards at Work site	4	4
1.7	Training on disaster management including fire safety.	1	1
	PART – XIII ESTABLISHMENT MATTER	**5**	**5**
1.1	Leave & Pass Rules	1	1
1.2	DAR	1	1
1.3	HOER	1	1
1.4	Avenues of career progression in Railways	1	1
1.5	Introduction to Civil defense organization in Railways	1	1
	PART – XIV FIRSTAID	**4**	**4**
1.1	Knowledge on medicines provided in first aid box. Training and demonstration on first aid to be given to injured having bone fractured/ dislocation, precaution while carrying injured staff in absence of stretcher.	4	4
	PART – XV MISCELLANEOUS	**4**	**4**
1	Exam, Viva-Voce, Reporting/Relieving etc.	4	4
2	**Self-development (physical & emotional)**		
2.1	Jogging/ yoga exercise one hour daily in morning session (7am to 8am).		
2.2	Breathing exercise, meditation, relaxation daily one hour in evening session (5.30pm to 6.30pm).		
	Grand Total	**240**	**240**
	NOTE: 30 days= 30 x 8 pds = 240 pds of 45mins each		

SUMMARY

A	**CLASSROOM LECTURES**	**95**	**103**
B	**TECHNICAL FILMS/ VIDEO CLIPS/ PHOTOGRAPHS**	**6**	**6**
C	**FIELD VISITS**	**12**	**12**
D	**HANDS ON**	**113**	**109**
E	**MODEL ROOM**	**2**	**2**
F	**TUTORIAL**	**8**	**4**
G	**MISCELLANEOUS**	**4**	**4**
GRAND TOTAL		**240**	**240**

Note: *The aspect of personal safety is covered in Part-II- of both (Induction and Refresher) course modules, however to cover more safety aspects some additional topics are also added in the existing module like, working in Double / Multiple lines. safety during machine working, use of Rakshak and other such warning systems. safety during patrolling, safety while transporting materials and working with Cranes, JCBs, earth moving equipment etc For which the time period for personal safety in Induction Course has been increased from 21 periods to 29 periods (each duration 45 minutes) by suitably modifying the time allotted to other topics keeping total training duration unchanged as 30 days.*

It is also recommended that after completion of 30 days institutional training, newly recruited track maintainers, should also be given a 3 days practical safety training by the concerned JE/SSE P.Way supervisor before allowing them for field work. The same should be advised by divisions to SSE (P.Way) incharge.

REFERENCES

S.N.	Description
1.	*Railway Board letter vide RBE 3/2024 letter No. E(MPP)2019/3/46 dated 09.01.2024*
2.	*IRPWM*
3.	*E-Learning material, Diploma Course in Railway Engineering, Institution of Permanent Way Engineers (India)*
4.	*IRS specification T-12*
5.	*ZRTI track module ppt no. 2.1 of IRICEN*
6.	*Document No.TD-M-4.2.4-1, Master List of Drawings issued by Track Design Directorate, RDSO*
7.	*RDSO drawing no. T-6902 for improved SEJ*
8.	*RDSO drawing no. T-4220*
9.	*RDSO drawing no. T-4219*
10.	*RDSO drawing no. T-4218*
11.	*RDSO drawing no. T-4967*

NOTES

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Disclaimer

The contents of this handbook are for guidance only & are not statutory. It also does not supersede any instructions from Railway Board, RDSO, and Zonal Railways & the provisions of IRWM, BIS Codes/Reports on the subject.

If at any point contradiction is observed, then Indian Standards, regulations issued by Government bodies, Railway Board/RDSO guidelines shall be referred.

हमारा उद्देश्य

अनुरक्षण प्रौद्योगिकी और कार्यप्रणाली को उन्नयन करना तथा उत्पादकता और रेल्वे की परिसंपत्ति एवं जनशक्ति के निष्पादन में सुधार करना जिससे अन्तर्विषयों में विश्वसनीयता, उपयोगिता और दक्षता प्राप्त की जा सके।

यदि आप इस संदर्भ में कोई विचार और सुझाव देना चाहते हों तो कृपया हमें इस पते पर लिखें।

संपर्क सूत्र	:निदेशक / सिविल
पत्राचार का पता	: भारतीय रेल उच्च अनुरक्षण प्रौद्योगिकी केन्द्र महाराजपुर, ग्वालियर (म.प्र.) पिनकोड - 474005
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Our Objective

To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, and Utilisation.

If you have any suggestion & comments, please write to us:

Contact person	**:**	**Director (Civil)**
Postal Address	**:**	**Indian Railway Centre for Advanced Maintenance Technology, Maharajpur, Gwalior (M.P.) Pin code – 474 005**