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

ट्रैक मेंटेनर के लिए प्रवेश पाठ्यक्रम

INDUCTION COURSE FOR TRACK MAINTAINER



हस्त पुस्तिका भाग-V

Booklet Part-V

ट्रैक रखरखाव गतिविधियाँ

Track Maintenance Activities

कैमटेक/2025/सी/टीएमआईसी/भाग-V/1.0

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EXCELLENCE IN MAINTENANCE

INDIAN RAILWAYS

Centre for Advanced Maintenance Technology (CAMTECH)
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हस्त पुस्तिका भाग–5: ट्रैक रखरखाव गतिविधियाँ

Handbook on Induction course for Track Maintainer

Booklet Part-V: Track Maintenance Activities

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 Maintenance Activities 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 ***Adarsh Khare***

August - 2025 ***Principal Executive Director***

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/*M*ate/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 Induction course for Track Maintainer Part-V: Track Maintenance Activities..

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.

We welcome valuable suggestions from our readers for further improvements.

CAMTECH/Gwalior ***Deepak Mehra***

August - 2025 ***Director/Civil***

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1.0 Track Maintenance

Every structure which is subjected to wear and tear due to continuous use requires maintenance. Railway track is also subjected to heavy wear and tear due to constant uses which generates heavy vibrations and tends to loosen the packing and fastenings. On curves, due to continuous rubbing of wheel flanges against the rail, there is heavy side wear in the head of outer rail. At joints due to existence of gap, there is vertical jerk with the passage of each wheel, which loosens the packing and also causes battering of rail ends. It is therefore necessary to keep the general condition of track under constant watch and take adequate action from time to time to make good the deficiencies caused due to continuous use of track.

The track should be maintained with the objective of restoring it to best possible condition consistent with its maintainability by Mechanized system of maintenance. However, till complete mechanization, few activities like picking up of slacks may be done manually.

1.1 Necessity of Track Maintenance *(Ref: Track Maintenance, Diploma Course in Railway Engineering, Institution of Permanent Way Engineers (India))*

The railway track has to be maintained properly in order to enable trains to run safely at highest permissible speed and to provide passengers a reasonable level of riding comfort. The necessity of track maintenance arises due to following reason:

(i) Due to constant movement of heavy and fast moving trains, the packing under the sleepers gets loose and track geometry gets disturbed. The gauge, alignment, longitudinal and cross levels thus get affected adversely and safety of the track is likely to be jeopardized.

(ii) Due to vibrations and impact of fast moving trains, fittings of track get loose and there is heavy wear and tear of track and its components.

(iii) The track and its components get worn out due to weathering effect of rain, water, sun and sand.

1.2 Advantages of Proper Track Maintenance

(i) A well maintained track give safe and comfortable journey to passengers; if track is not maintained properly, there will be discomfort to passengers and in extreme cases unsafe conditions may be created leading to derailments of vehicles and consequential loss of life and property.

(ii) Due to good maintenance, the life of track as well as rolling stock gets increased as there is lesser wear and tear of their components.

(iii) Good track maintenance helps in reducing operating costs and the fuel consumption.

(iv) A small item of track maintenance done at proper time like tightening of bolt or key, hammering the dog spike etc. May avoid loss of that fitting and afford considerable economy.

(v) Track maintenance when neglected for a long time, may create condition that track is beyond repair and heavy track renewals costing huge sum have to be done.

1.3 Characteristics of Good Track Maintenance

A well maintained track provides base for safe and comfortable journey. It should have the following characteristics:

i. Sound condition of rails, sleepers and fittings
ii. All fittings be complete and properly tightened
iii. Adequate good quality and clean ballast under the sleepers and also around it with full shoulder width;
iv. Formation is stable with good drainage and slopes well protected by grass or stones pitching;
v. There is no difference in cross levels except on curves, where cross level vary to provide super-elevation;
vi. Longitudinal and cross levels should be in good condition and within allowable limits;
vii. Gauge is correct or within specified limits
viii. Alignment is straight and not kinky;
ix. sleepers are well packed;
x. No excessive wear and tear on track and its components.

2.0 Mechanized Track Maintenance System *(Ref: Para 604 & 604(A) of IRPWM)*

For mechanized system of track maintenance, the following system shall be adopted.-

A. The Three tier system of track maintenance

B. The Modified Three tier system of track maintenance

The brief discussion of both the systems has been given below.

2.1 The Three tier system of track maintenance *(Ref: Para 604 of IRPWM)*

The 3 tier system of track maintenance shall be adopted on sections nominated for Mechanized track maintenance. This shall consist of the following 3 tiers of track maintenance –

- On-track Machines Unit (OMU)
- Mobile Maintenance Gang (MMG)
- Sectional Gangs

2.1.1 On-track Machines Unit (OMU)

On track machines for track maintenance include Tie – tamping machines for plain track and points and crossings, shoulder ballast cleaning machines, ballast cleaning machines, ballast regulating machines, dynamic track stabilizers and UTV.

These machines shall be deployed to carry out the following jobs:

a) Systematic tamping of plain track as well as Points & Crossings;

b) Intermediate tamping of plain track as well as Points & crossings;

c) Shoulder ballast cleaning;

d) Ballast profiling/redistribution;

e) Track stabilization;

f) Periodical deep screening;

g) Picking up and transportation of material.

2.1.2 Mobile Maintenance Gang

a) There will be one Mobile Maintenance Gang (MMG) under each SSE/P.Way (In overall charge) with a jurisdiction of about 70-80 km in single line section and 30 to 50 km in double or multi line section. lt will be headed by a sectional JE/SSE P.Way/ (MMG) and shall be based on a Rail Borne Maintenance Vehicle (RBMV) for mobility. Till RBMV are arranged for all In-charge SSE/P.Way. The activities listed hereunder except (b) (viii) shall be done by sectional gangs.

b) The functions of MMG shall be as under:

(i) Repair to rail/weld fracture including in-situ AT welding.

(ii) Attention to SEJs.

(iii) Scattered replacement of switches and crossing components, glued joints, SEJs, etc.

(iv) Rail cutting/drilling and chamfering.

(v) Spot renewals of rails and sleepers.

(vi) Spot attention by Tamping of few sleepers with off-track tampers or any other approved equipment.

(vii) Loading and unloading of Material required for spot attention.

(viii) Driving of RBMV.

(ix) Any other functions assigned.

c) The MMG shall possess the equipment and other accessories as given below, which shall be used according to the working instructions and manufacturer's operating instructions. *(Ref: Annexure-6/1 of IRPWM)*

List of Equipment

(A) Communication Equipment			42	Axe	2 No.
1	Walkie Talkie	4 Sets	43	Motorized Wood Cutting Saw	2 No.
2	Portable field telephones	4 Sets	44	Hand Wood Cutting Saw	2 No.
3	CUG mobile Set	1 No.	(I) Manual & Codes		
(B) Rail cutting/Drilling Equipment			45	Working Time Table	1 No.
4	Abrasive Disc Cutter	2 No.	46	G & SR Book	1 No.
5	Rail Drilling Machine	1 No.	47	Accident Manual	1 No.
6	Chamfering kit	1 No.	48	IRPWM	1 No.
(C) Rail Welding Equipment			49	Track Machine Manual	1 No.
7	Rail Welding Equipment	2 Sets	50	USFD Manual	1 No.
8	Generator	2 No.	51	LWR Manual	1 No.
9	Weld Trimmer	1 No.	52	PN Book	1 No.
10	Rail profile Grinder for welded	1 No.	53	AT Welding Manual	1 No.
(D) Spot Tamping with lifting Lining			54	Small Track Machine Manual	1 No.
11	Off Track Hand Held Tamper	4 No.	(J) Safety & Protection Equipment		
12	Tamping Tools	4 No.	55	Detonators	20No.
13	Lifting Jack-hydraulic /mechanical	4 Sets	56	Banner Flag	4 No.
14	Lifting-cum Slewing Device	2 Sets	57	Red Flag	4 No.
(E) Material Handling Equipment			58	Green flag	2 No.
15	Rail Dolly	4 No.	59	Tricolour Torch	4 No.
16	Mono Rail Wheel Barrow	2 No.	60	First Aid Medical Box	1 No.
(F) Material Handling Equipment			(K) Measuring Equipment		
17	Joggled Fishplates	10No.	61	P.Way Kit	1 Set
18	C Clamps	20No.	62	Gauge-Cum-Level	2 No.
19	Fish plate 600 mm: 60kg/52kg each	10No.	63	Straight Edge 1 M	1 No.
20	Fish Plate 1 m:60kg/52kg each	10No.	64	Measurement Tape 15 m	1 No.
21	Fish Bolt	50No.	65	Rail Thermometer	1 No.
22	SEJ nut and bolts	20No.	66	Vernier Calipers	1 No.
23	Plate Screws	50No.	67	Micrometre	1 No.
24	Fire Extinguisher	1 Set	(L) Miscellaneous		
25	Wooden Blocks	10No	68	Welding Material Portion	20No.
26	Box Spanner	4 No.	69	Rail Closers of various lengths	10No.
27	Fish Plate Spanner (Small)	4 No.	70	Safety Belt	6 No.
(G) Gas Cutting Equipment with Accessories		1 Set	71	Aluminium Ladder	1 No.
(H) Tools:			72	Safety Goggles	6 No.
28	Crow Bars (low carbon with alloy steel)	20No.	73	Halogen Set	1 No.
29	Sledge Hammer	6 No.	74	Safety Helmet with miner light	10No.
30	Small Hammer	2 No.	75	Water Dispenser with cans	2 No.
31	Spanner (low Carbon steel, chromium and vanadium alloy) (in set)	2 No.	76	Tarpaulin	3 No.
32	Rail Tongue	6 No.	77	Rail Cutting Disc	10No.
33	Sleeper Tongue	6 No.	78	Grinding Wheel	10No.
34	Pick axe	2 No.	79	Mould Shoes(Pairs)	2 No.
35	Powrah	4 No.	80	Safety Apron for welding	10No.
36	Mortar Pan (Steel light weight)	10No.	81	Chain link	1 No.
37	Chisel	6 No.	82	Hand Gloves	10 Pairs
38	Sickle	3 No.	83	Wire Rope 15 M	1 No.
39	Wire Claw	10No.	84	2T oil	500 ml
40	Tool Box	1 No.	85	Transmission Oil	5 Ltr.
41	Shovel	2 No.	86	Nylon Rope-15 m	1 No.

2.1.3 Sectional Gangs

The sectional gangs shall perform the following functions:

a) Systematic through packing of track where tamping machines have not been deployed or small stretches of track needing spot attention for which machines cannot be deployed due to whatever reasons.

b) Overhauling of track.

c) In addition to above following works are /may also be assigned:

(i) Patrolling of track:

- Keyman's daily patrol
- Hot/cold weather patrolling
- Monsoon Patrolling

(ii) Watching vulnerable locations

(iii) Need-based attention to bridges, turnouts, SEJs and level crossings and their approaches.

(iv) Greasing of ERCs, lubrication of joints, casual changing of rubber pads and other fittings

(v) Minor cess repairs

(vi) Cleaning of drains

(vii) Attention to loops

(viii) Creep and gap adjustment not involving use of machines

(ix) Pre & post tamping attention

(x) Examination of rails, sleepers and fastenings including measurement of toe load of ERCs.

(xi) Inspection of and attention to insulated joints, switch expansion joints etc.

(xii) Weld collar painting, cess cleaning, cutting of tree branches/shrubs for improving visibility.

(xiii) Any other functions assigned.

2.2 Modified Three Tier System of Track Maintenance *(Ref: Para 604(A) of IRPWM)*

Principal Chief Engineer of the Railway may decide to implement Modified Three Tier System of Track Maintenance in certain sections. The Modified Three Tier System of Track Maintenance shall consist of following three tiers:

- On-track Machines Unit (OMU)
- Mobile Maintenance Gang (MMG)
- Sectional Gangs

The first two tiers will be almost same as that of Three Tier System of Track Maintenance with some additional infrastructure & responsibility. Since it has no bearing on responsibilities on track maintainers, it is not necessary to discuss it here. However Indian Railway Permanent Way Manual may be referred for details, if required. Relevant provisions of third tier are being discussed here.

2.2.1 Sectional Gangs

a. Sectional SSE/JE (P.Way) will have a jurisdiction of 35-40 Km in single line section and 17 to 20 Km in double/multiple line section and shall comprise of:

- Assistant SSE/JE (P.Way)
- Keyman
- Sectional Gang

b. The track shall be inspected daily by Keymen with a jurisdiction of about 6–8 Km each in single line and 3–4 Km in double/multiple line.

c. Sectional gang will maintain the entire jurisdiction of Sectional SSE/JE (P.Way). It will be supplemented with manpower through Zonal and/or Special P.Way Contracts.

d. The sectional gang will comprise of:

- Mobile Track Maintenance and Monitoring Gang (TMMG) with a multi-utility road vehicle that transports the track maintainers, equipment and materials and will have the same jurisdiction as that of sectional SSE/JE (P.Way). It will be headed by one SSE/JE (P.Way)/TMMG.
- Manpower for patrolling of track.

- Stationary watchmen
- Boulder gangs
- Gatemen for manning level crossing gates in the section including rest giver.

e. The TMMG will generally be responsible for:

- Looking after overall safety of track in their beat.
- Carrying out works of casual renewal.
- Spot maintenance.
- Attention to fittings.
- Assisting the working of on–track machines.
- Protection of work sites.

• Other miscellaneous repair/maintenance activities etc. assigned by Sectional JE/SSE (P.Way)

3.0 Through Packing by Conventional Manual Method *(Ref: Para 607 & Annexure- 6/9 of IRPWM-2024)*

Normally manual through packing is not to be done in concrete sleeper track. However, in locations of slacks where multipurpose tampers are not available, following steps in sequence shall be followed. The length of track opened out on any one day shall not be more than that can be efficiently tackled before the end of the day –

(1) Opening of the road.
(2) Examination of rails, sleepers and fastenings.
(3) Squaring of sleepers.
(4) Slewing of track to correct alignment.
(5) Gauging.
(6) Packing of sleepers.
(7) Repacking of joint sleepers.
(8) Boxing of ballast section and tidying.

The provisions of LWR should be followed, wherever through packing is being done in LWR/CWR track. Appropriate small track machines should be deployed instead of conventional tools for carrying out various operations, wherever feasible. Details of the 8 operations of Systematic through Packing are as detailed below:

3.1 Opening of the Road

Ballast should be opened out on either side of the rail seats to the extent from end of sleepers to 450 mm inside of the rail seat to a depth of 50 mm below the packing surface without disturbing the cores under the sleepers. The ballast should be drawn by phowrahs/ shovels or rake iron ballast outwards and inwards i.e. that portion of the ballast on the outside of the rail should be drawn outwards, the portions between the rails being drawn towards the centre, care however, should be taken to see that the ridge between the rails does not project more than 50 mm above rail level.

3.2 Examination of Rails, Sleepers and Fastenings

1) Rails should be examined, the underside for corrosion, the ends for cracks, the head for top and side wear, rail joints for wear on the fishing planes, fish bolts for tightness.

(i) If rails on curves wear at an unusually rapid rate, lubrication of the gauge face should be done.

(ii) Rust and dust must be removed from the corroded rails by using wire brushes.

(iii) Kinks in rails should be removed by Jim Crowing.

(iv) Sleepers should be inspected for their condition and soundness particularly at the rail seats.

(v) Fastenings and fittings should be examined to ensure that these are in good order, and appropriately tightened so that they firmly hold the rails. Broken ones should be replaced immediately.

3.3 Squaring of sleepers

Gauge variations and kinks inevitably result from sleepers getting out of square, therefore the spacing of sleepers on the sighting rail should first be checked and correctly chalk – marked. Corresponding marks should then be made on the other rail using the square at every point. The core of sleepers that are out-of-square should then be 'picked' with the pick ends of beaters, the fastenings loosened and the sleepers levered and squared to correct position. Squaring should be done by using mechanical/hydraulic spacer or by planting the crow bars firmly against the sleeper and pushing it. Under no circumstances should sleepers be hammered. Sleepers that are squared should be re-gauged immediately, the fastenings tightened and repacked.

3.4 Slewing of track to correct alignment

(i) Heavy slewing will only be required during realignment of curves when it will be necessary to loosen the rail, joints and the packing cores being broken with the pick-ends of beaters. Slewing for normal maintenance will be of a small order and should be done after opening out the road, loosening the cores at ends and drawing out sufficient ballast at the ends of the sleepers.

(ii) Slewing of track shall be directed by the Gang Mate, who should sight the rail from a distance of 30 to 60 meters on straight track. On curves, the Gang Mate should sight the outer rail.

(iii) Slewing is best done in the morning unless it is cloudy, as later on, sighting conditions become unfavourable.

(iv) Slewing should preferably be done using hydraulic/mechanical jacks or TRALIS. If crow bars are used, these should be planted well into the ballast at an angle not more than 30 degrees from the vertical; otherwise lifting of the track may occur.

3.5 Gauging

(i) Preservation of gauge is an important part of track maintenance especially through points and crossings. For good riding, the basic requirement is uniform gauge over a continuous stretch of track and such gauge should be allowed to continue so long as it is within the permissible limits of tightness or slackness.

(ii) Gauging should only be done after ensuring that sleepers are truly square.

(iii) The track gauge cum level should be held firm with one lug against the base rail, and the other end being swivelled over the opposite rails. The tightest position obtained determines the correct point to test the gauge. The gauge cum level should not be forced as that causes considerable wear on the gauge lug.

(iv) While it is desirable to maintain the correct gauge, it may not be possible to maintain the correct gauge due to wear in rail and sleeper inserts. It is good practice to work within the tolerances of the gauge. The limits of gauge as per measurement in floating condition, for the guidance of the engineering officials regarding condition of track from passenger comfort perspective shall be as given below, provided that generally a uniform gauge can be maintained over long lengths. *(Ref: Para 525(1) of IRPWM-2024)*

a	On straight Track	-6 mm to +6 mm
b	On curves with radius 440 m or more	-6 mm to +15 mm
c	On curves with radius less than 440 m	Up to + 20 mm

3.6 Packing of sleepers

(i) The aim of packing is to have each sleeper firmly and uniformly packed to ensure that the rails are at their correct relative levels i.e., level on the straight track and to the required cant on curves and that no sleeper has any void between it and its bed.

(ii) Before packing is commenced, it is necessary to ensure that all the fittings are intact. Wherever feasible packing is to be done by worksite tampers. However, if worksite tampers are not available, manual packing as detailed below may be done.

(iii) The Gang Mate shall sight the base rail with an eye along the lower edge of the head of the rail and any dip or low joint lifted correctly. The adjacent sleepers should then be packed and the top checked. After two rail lengths have been attended to, the rail on the other side should be brought to the correct level by checking the cross-level with the gauge-cum-level at every rail joint and at every fourth sleeper. The next two rail lengths should then be taken up and the process continued.

No joint or dip should be lifted higher than the proper level in the expectation that it will settle to the correct level. Instead, it will settle more under traffic as a result of being high and cause rough running.

(iv) Having aligned the track and the rail table adjusted, Track Maintainers should be distributed in batches of two for packing all sleepers in a systematic manner, commencing from one end. Four men should deal with every sleeper successively,

two at each rail seat. The ballast under the sleeper should be packed by the men standing back-to-back and working their off-track hand-held tampers diagonally under the rail seat at the same time to ensure firm packing. Where off-track hand-held tampers are not available the packing can be done by crowbars / straightening bars.

(v) While using crowbars, it is important that the cores are thoroughly broken before packing and re-packed.

(vi) After packing the rail seat, the packing should be continued outwards and inwards to the requisite extent on each side of the rail seat i.e., end of the sleeper to 450 mm inside, the strokes being kept as nearly horizontal as possible. Care must be taken to avoid forcing any large stone under the sleeper so as not to cause uneven bearing and to avoid striking the edges of the sleepers. All men should aim to work the crowbars from the same height so that the sleepers are uniformly packed. Higher or lower lifting of the crowbars results in uneven compactness.

(vii) Before final dressing is done, it should be ensured that no sleeper is centre-bound by working the pick-ends over the central range. Centre bound sleepers cause vehicles to roll from side to side.

(viii) Care must also be taken while packing to ensure that the work does not result in the sleepers adjoining those being packed, lifted off their bed, thus creating artificial voids under them.

(ix) The packing on the inside and outside at every rail seat should, before boxing the track, be checked by the Gang Mate by tapping with a rubberised Canne-a boule. An inadequate rebound would indicate defective packing, which should be attended to again.

(x) As soon as the packing is completed, slight distortions in alignment and top should be checked and corrected by the Gang Mate, the sleeper disturbed for this purpose being finally repacked.

3.7 Repacking of joint sleepers

The joint and 'shoulder' sleepers should be repacked, before boxing is done and the cross-levels at joints checked. The rail joint being the weakest portion, firmness of its support is essential.

3.8 Boxing of Ballast section and Tidying

(i) After completing the preceding operations in sequence, clean ballast should be worked in with ballast forks or rakes. The ballast section should be dressed to the specified dimensions, a template being used for the purpose. Hemp cords 6 mm dia. of sufficient length should be used for lining the top and bottom edges of the ballast section. Where the quantity of ballast is inadequate, full section of ballast should be

provided near the rail seat, the deficiency being reflected along the centre of the track and not under the rails or in the shoulders.

(ii) The cess should then be tidied up.

(iii) Where earth ridging exists at the edge of the bank, it should be removed.

(iv) Cess should be maintained to the correct depth below rail level according to the ballast-section and formation profile. Too high a cess affects drainage; too low a cess results in ballast-spread and wastage.

4.0 Systematic Overhauling of Track *(Ref: Para 609 of IRPWM)*

The length of the section to be overhauled shall be such that complete overhauling of track will be accomplished within a specific period (normally 3 to 5 years). The overhauling should be done using SBCM for cleaning of shoulder ballast. The crib ballast should also be shifted to shoulders for screening by the machine, which should again be put back in crib portion. In case it is not feasible to screen the crib ballast by machine, the same should be screened manually. Adequate care should be taken in removing the crib ballast in LWR/CWR track.

All the loop lines should be shallow screened/overhauled once in 7 years or more frequently as required, along with systematic tamping/packing.

4.1 Sequence of operations – Overhauling consists of the following operations in sequence:

(a) Shallow screening and making up of ballast.

(b) All items attended to, while doing through packing as detailed in Para 3.0.

(c) Making up the cess.

4.1.1 Shallow screening and making up of ballast

(a) For good drainage periodical screening of ballast is essential.

(b) In case of manual overhauling, the crib ballast in the shoulders should be opened out to a depth of 75 to 100 mm below the bottom of sleepers, sloping from the centre towards sleeper end. The ballast in the shoulders opposite to the crib as well as between the sleepers is removed to the full depth. A slope is given at the bottom sloping away from the sleeper end. The ballast is then screened and put back. Care should be taken to see that the packing under the sleepers is not disturbed and the muck removed is not allowed to raise the cess above the correct level.

(c) Two contiguous spaces between sleepers should not be worked at the same time.

(d) Screening should be progressed in alternate panels of one rail length. In no circumstances should several rail lengths of track be stripped of ballast simultaneously.

(e) Where drains across the track exist, they should be cleaned and filled with boulders or ballast to prevent packing from working out and forming slacks.

(f) After screening, full ballast section should be provided, extra ballast being run out in advance for the purpose. Work should be commenced after making sure that the ballast will not be

seriously deficient. Deficiency, if any, should be shown in the central portion of sleeper and this also should be made up soon.

4.1.2 Through packing of track

The detailed operations are described in Para 3.0. Through packing may be done preferably by using machines and in unavoidable situations by conventional beater packing.

4.1.3 Making up of Cess

Cess when high should be cut along with overhauling and when low should be made up. A template should be used for this purpose.

4.2 Overhauling should be completed before the end of March.

4.3 Overhauling of SWR track ***(****Ref: Para 324 of IRPWM)*

i. Overhauling of SWR track may be carried out without restriction when the rail temperature is below t_m + 25°C in the case of zone I & II and t_m + 20°C in the zone III and IV. However, on curves of less than 875 metre radius in Broad Gauge or yielding formation, the above temperature limit shall be restricted to t_m + 15°C in the case of Zone I and II and t_m +10°C in the case of Zone III and IV.

ii. If the maintenance operations have to be undertaken at temperature higher than that mentioned above in Sub-Para (i) above, not more than 30 sleeper spaces in one continuous stretch shall be opened, leaving at least 30 fully boxed sleeper spaces between adjacent lengths which are opened out. Before the end of the day's work, it shall be ensured that the ballast is boxed up.

iii. As an additional precaution, during summer months, to be specified by the Chief Engineer, for attention to run down track, even if temperature is less than the temperature specified in Sub-Para (i) above, not more than 30 sleeper spaces in one continuous stretch shall be opened, leaving at least 30 fully boxed sleeper spaces between adjacent lengths which are opened out. Further, if joint gaps are not available at the time of opening of the track even when rail temperature are less than those specified in clause Sub-Para (i) above not more than 30 sleepers in one continuous stretch should be opened leaving at least 30 boxed sleeper spaces between adjacent length which are opened up.

iv. Adequate number of joggled fishplates with special clamps shall be provided to the gangs for use in emergencies.

v. In the case of any fracture in the weld or in the rail, the portion of rail with fracture is cut, and removed for a length of not less than 5.5m to carry out the re-welding duly introducing a rail piece of equivalent length, also ensuring that no weld lies closer than 4 m from the fish-plated joint.

4.4 Overhauling of LWR/CWR track ***(****Ref: Para 345 of IRPWM)*

4.4.1 General

i. The regular track maintenance in LWR/CWR shall be confined to hours when the rail temperature is between t_d+10°C and t_d -30°C and shall be completed well before onset of summer. However, for LWR on wider base sleepers, regular track maintenance shall be confined to hours when the rail temperature is between t_d +15°C and t_d -30°C.

ii. If rail temperature after the maintenance operation exceeds t_d +20°C for conventional PSC sleeper and t_d +25°C for wider base sleepers during the period of consolidation, then the speed restriction of 50 Km/h shall be imposed.

iii. Ballast section shall be properly maintained, especially on pedestrian & cattle crossings, curves and approaches to level crossings and bridges. Cess level should be correctly maintained. Dwarf walls may be provided on pedestrian and cattle crossings to prevent loss of ballast.

iv. Replenishment of ballast shall be completed before onset of summer. Shortage of ballast in the shoulder at isolated places shall be made up by the Gang Mate by taking out minimum quantity of ballast from the centre of the track between the two rails over a width not exceeding 600 mm and a depth not exceeding 100 mm.

v. Sufficient quantity of ballast shall be collected to provide full ballast section before commencing any maintenance operation, specially lifting.

vi. When crowbars are used for slewing, care shall be taken to apply these in a manner so as to avoid lifting of track. In this connection, the instructions in Para 3.0 shall be followed.

vii. Special attention shall be paid to maintenance of track at following locations:

- SEJs/breathing lengths
- Approaches of level crossings, points & crossings and un-ballasted deck bridges
- Horizontal and vertical curves

viii. All fastenings shall be complete and well secured in position.

4.5 Mechanized Maintenance

Mechanized cleaning of shoulder ballast shall be undertaken when prevailing rail temperatures are within the limits prescribed together with the precautions mentioned therein.

4.6 Manual maintenance

i. At no time, not more than 30 sleepers spaces in a continuous stretch shall be opened for manual maintenance or shallow screening with at least 30 fully boxed sleeper spaces left in between adjacent openings. Maintenance of in between lengths shall not be undertaken till passage of traffic for at least 24 hours in case of BG carrying more than 10 GMT or 2 days in case of other BG routes.

ii. For correction of alignment, the shoulder ballast shall be opened out to the minimum extent necessary and that too, just opposite the sleeper end. The ballast in shoulders shall then be put back before opening out crib ballast for packing.

iii. In exceptional circumstances when more than 30 sleeper spaces have to be opened for any specific work, like through screening of ballast etc. during the period of the year when

minimum daily rail temperature is not below td-30°C or maximum does not go beyond td+10°C, upto 100 sleeper spaces may be opened under the direct supervision of JE/SSE/P.Way.
iv. It should however, be ensured that rail to sleeper fastenings on the entire length of LWR including SEJs are functioning satisfactorily.

5.0 Picking Up Slacks *(Ref: Para 606 of IRPWM)*

'Slacks' are generally those locations of track where the running is not good and the defects are to be attended to on priority. One or two days are kept in a week for picking up the slacks. During picking up slacks, the following items are attended to generally:
(i) Joint sleepers along with at least 3 sleepers on either side;
(ii) Approaches of level crossings and bridges.
(iii) Transition lengths of curves.
(iv) Approaches of points and crossings.
(v) Breathing lengths in LWR and
(vi) Stretches running bad.

(1) Slacks usually occur on stretches of yielding formation, on high banks and cuttings, on approaches of bridges, LC approaches, SEJs, P&C zones, Glued Joints, on badly aligned curves, axle counter locations and other electrical and S&T installations where ballast is poor in quality or quantity or where drainage is defective. Need for attention to slacks is determined by inspections and results of track recording car and OMS. The locations needing urgent maintenance as detected by TRC/OMS shall be targeted first for restoring normal condition quickly and thereafter the locations identified for Condition Based Maintenance as determined by Track recording Car or other inspections shall be attended. For spot attention/slack picking, multi- purpose Tampers and Off-track hand held tampers/ any other approved equipment shall be used as a regular measure.

(2) For Off-track tampers, the working instructions, issued by Railway Board/RDSO should be followed. As an interim measure, where Off-track tampers are not available, packing may be done with the help of Crowbar/Beater, duly taking care that concrete sleepers are not damaged.

(3) The quantum of work turned out by a gang during the day will depend on the extent of slacks. In all cases, sighting is done, the defects assessed and marks made with chalk on sleepers to be attended. The marked sleepers should then be dealt with as in through packing as given in Para 3.0, care being taken to see that the packing of adjacent sleepers does not get disturbed. In case a large percentage of sleepers need attention in a rail length, the entire rail length should be attended to. The marking of defects shall be as indicated below –

SN	Defects	Symbol	Place of indication
1	Cross levels	C-2	On the sleeper inside gauge face.
2	Loose packing	H or P	On the sleeper outside the gauge face

3	Gauge	G±	On the sleeper inside the gauge face
4	Unevenness	→ ←	On the rail web on gauge face side
5	Alignment	↓ →	On the foot of rail inside the gauge face

(4) In the case of a low joint, the fishplates should be slightly loosened and the joint tapped, so that the rail ends are, rendered free and are capable of being lifted. After the joint is thoroughly packed the fishplates should be tightened again. When joints are picked up, at least three sleepers on either side of the joints should be packed.

(5) If the length of track marked for need based maintenance is more in a Kilometer then this should be attended by on track Machine

6.0 Some Important Small Track Machines *(Ref: IRSTMM-2024)*

6.1 General

Due to growing traffic and introduction of heavier track structure, faster and more efficient methods of maintenance are needed to be evolved. Small track machines are light weight machines used for assisting permanent way staff in day to day maintenance and in laying of new track by performing such functions like cutting rails, drilling holes in rails, transportation of track fittings etc. Being light weight, it can easily be carried to site of work. Normally it does not occupy the track and even if occupying can be easily off tracked by men at site itself. In the changed socio-economic scenario, the role of small track machines has increased for quality maintenance of track. Different types of small machines have been developed for various activities of track.

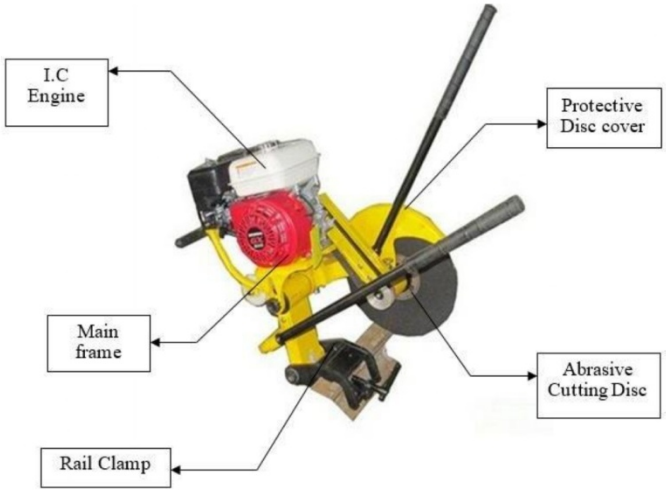
i. Abrasive Rail Cutter (ARC)
ii. Rail Drilling Machine (RDM)
iii. Compressed Air Petrol Preheating Machine (CAP)
iv. Weld Trimmer (Power Pack Version) for AT Welding
v. Rail Profile Weld Grinder (RPWG)
vi. Generator
vii. Hydraulic Track Jack (non-infringing type)
viii. Hydraulic Rail Tensor (Non-infringing Type)
ix. Toe Load Measuring Device
x. Light Weight Rail (Mono) cum Road Trolley
xi. Self-Propelled Light Weight Trolley
xii. Powered Material Trolley
xiii. Box Type Gauge cum Level (BG) with Spirit Level
xiv. Chamfering Kit
xv. Thermometer
xvi. Gang/worksite Remote Control Hooter

xvii. Hydraulic Track Lifting cum Slewing Device (TRALIS)
xviii. Track Based Lubricators
xix. Off Track Tamper

Although, regarding description, functional requirements, technical requirements, troubleshooting etc. for small track machines have been laid down in IRSTMM-2024 in detail. Guidelines for using , handling, transporting and storing of machines, precautions in operation etc. for important STMs are being reproduced below:

6.2 Abrasive Rail Cutter (ARC)

Abrasive Rail Cutter is used for quick cutting of all types of rail sections including wear resistant, head hardened rails. Photo of sample Abrasive Rail Cutter is given below:



Abrasive Rail Cutter

6.2.1 Guidelines for using, handling, transporting and storing of Machines *(Ref: Para 205 of IRSTMM-2024)*

(A) Proper utilization of machine

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of actual cutting:

a. Inspect wheel for cracks or other damages.
b. Test disc by striking lightly with a piece of wood. If the disc does not make a full ringing sound, it is damaged.
c. Check the contact surfaces of the cutter disc and ensure that flanges are flat and free of foreign material.
d. The disc shall be within its expiry date of use.

(B) Precautions in operation

a. The operator shall be fully conversant with use of the machine. The operator shall not be tired, under stress or under influence of any drug or alcoholic drink.

b. The operator shall read and understand the safety precautions mentioned in the operation's manual and shall strictly follow the instructions.

c. The operator shall wear safety clothing, shoes and goggles before starting the machine.

d. No inflammable article shall be in vicinity of the cutting location. During cutting of rails in track circuit area care should be taken to avoid signal cable from burning.

(C) Safety instructions

a. Ensure the proper tightening of all nut and bolts of the abrasive rail cutter before operation

b. Always make sure that the cutting disc is properly inserted & fixed in the machine.

c. Clamping device must be clamped and tightened in proper position

d. No extra force should be exerted on the machine handle during operation.

e. Always make sure that there should be sufficient Mobil oil in the engine.

f. Do not touch the muffler.

g. Control the surrounding area before operation- The safety distance around the abrasive rail cutter for personnel not operating the machine should be at least 15 meters.

h. There should be no one in the line of rotating cutting disc on both sides of the machine.

i. During transportation, always remove the cutting disc from the cutter.

j. When cutting the rail off line, the machine should put on the rail steadily to prevent the rail from overturn or hurting some body after cutting it off.

(D) Handling:

The Abrasive Rail Cutter shall be handled carefully to avoid any physical damages. It shall not rest on the cutting wheel during idle period, which can cause breakage of the cutting wheel.

(E) Transportation

The machine shall not be transported while the cutting disc is mounted on it. In an engine driven cutter, the fuel tank shall be empty while transporting from one place to another place. There shall not be rough handling during transporting. The machine may be transported on push trolley/material trolley.

(F) Storage:

The machine shall be stored in a box/carton at a dry place.

6.2.2 Rail Cutting Wheel (Abrasive Disc)

The Rail Cutting Wheel (Abrasive Disc) is a thin circular cutting disc made of abrasive sand and bonding material and is used with abrasive rail cutting machine for cutting rails.



Rail Cutting Wheel (Abrasive Disc)

6.2.2.1 Guidelines for using, handling, transportation and storing of abrasive disc *(Ref: Para 214 of IRSTMM-2024)*

(A)Proper utilisation of Abrasive Disc

Instructions contained in the manual supplied with the item shall be followed for operation including operational safety measures etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. The cutting wheel shall be fixed to the spindle of the machine after ensuring that diameter of the spindle perfectly matches the bore of the cutting wheel.
b. The operating speed as prescribed by the manufacturer of the cutting wheel shall be ensured.
c. Cutting operation shall be done as per the operating instructions furnished by the manufacturer of both the machine and wheel.
d. The cutting wheel shall only be used on an abrasive cutting machine originally equipped with 400 mm guards.
e. Supplier's manual shall be referred to for safe operation.

(2) Precautions in Operation

Instructions regarding safety precautions for operation, mentioned in the operation and maintenance manual issued by the manufacturer of the cutting wheel shall be followed.

(3) Handling

The abrasive cutting wheels shall be handled carefully to prevent breakage. The disc shall not be under any impact loading/hitting which can cause breakage.

(4) Transportation

For transportation, the cutting wheel shall be packed suitably in packets/carton. Being light in weight, the cutting wheels may be transported on bi-cycle/push trolley/material trolley.

(5) Storage

The rail cutting wheels shall be stored in polythene bags within carton/packing box with silica gel inside the bags to protect from moisture.

6.3 Rail Drilling Machine (RDM)

Rail Drilling Machines are used for drilling holes in rail webs of all types of rails. Purpose of the Rail drilling machine is to produce holes of different sizes wherever required to facilitate Fish plates, Bond wires etc. The machine should be easily movable and capable to make holes in all types of Rails. The machine should comprise of an integrated driving engine with drilling unit coupled together rigidly in a compact unit.



Rail Drilling Machine

6.3.1 Types of Rail Drilling Machine

There are following types of rail drilling machines depending on their drive.

(1) Electric Driven Rail Drilling Machine

(2) Engine driven Rail Drilling Machine

a. Light weight Rail Drilling Machine (LWRDM)

b. Regular Rail Drilling Machine (RRDM)

(3) Battery operated Rail Drilling Machine (BORDM)

The Electric Driven Rail Drilling Machine runs on electricity, hence these are ideal machines to use on railway workshops/major yards where power supply is easily available.

The Engine driven Rail Drilling Machine runs on petroleum fuels such as petrol, kerosene, etc., while the Battery Driven Rail Drilling Machine runs on electricity supplied from a Li-ion battery. The Engine driven Rail Drilling Machines and Battery Driven Rail Drilling Machine are ideal machines when drilling in a remote location where there is no availability of electricity. However, The Battery Driven Rail Drilling Machine machines can do limited holes as the power of the machine depends on the capacity of the battery.



Light weight Rail Drilling Machine



Battery Operated Rail Drilling Machine

Guide-lines for using, handling, transporting and storing of Engine driven Rail Drilling Machines and Battery Driven Rail Drilling Machines has been discussed below.

6.3.2 Guide-lines for using, handling, transporting and storing of Engine driven Rail Drilling Machine machines *(Ref: Para 306 of IRSTMM-2024)*

(A) Proper utilization of the machine

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/ maintenance, overhauling, trouble-shooting etc. However following instructions shall be observed in general:

a. Check engine oil level: To check oil level, take out level gauge, clean it with clean cloth, refit it and again take it out. On the level gauge see whether the oil mark matches with

the level mark on the scale .If not, add engine oil and again check with level gauge. Repeat the procedure till it shows the correct level.

b. Gearbox grease: always ensure that the gear box is adequate with grease. Recoup whenever necessary. Check any grease is leaking from the oil seals of the shafts.

c. Fill water in the water tank.

d. Check drill bit: On the shank of the drill bit, size of the drill bit is given. Select the size of drill bit to suit the requirement. Use taper shank drill bit only.

e. Fixing Drill Bit: For fixing and taking out the drill bit, the manufacturer's manual shall be strictly followed.

f. Fix template of proper size in the machine as per rail section.

g. Clamp the machine to the rail section by operating a handle provided with a clamping device.

h. Start engine on petrol and shift to kerosene for running in kerosene run engines.

i. Slowly give feed to the drill bit for drilling by rotation of the drive sprocket.

j. Open the knob of the water tank.

k. After drilling of hole, remove the drill bit from the drilled hole by rotation of the drive sprocket in anti-clockwise direction.

l. For kerosene run engines, before switching off, turn the fuel knob from kerosene to petrol so that at the time of switching off, the engine is running on petrol.

m. De-clamp the fixtures and fix it as above for next drilling.

n. After the drilling work is over, clean the machine with a clean dry cloth.

o. If the work is not to be continued, take out petrol, kerosene oil and water. The drill bit shall be taken out from the socket.

(B) Precautions in operation

Following precautions shall be taken during operation of the drilling machine:

a. The operator shall be fully conversant about the operation of the machine and shall know the safety precautions mentioned in the operating and maintenance manual issued by the manufacturer/supplier.

b. Excessive feed shall not be given at a time.

(C) Handling

The rail drilling machine shall be handled carefully to avoid any physical damage. The machine shall be kept vertical during shifting and shall not be moved on uneven surfaces to avoid falling. During drilling operation, it shall be evenly placed.

(D) Transportation

a. The machine is fitted with a mono-rail wheel arrangement and a handle of convenient height, to enable it to be pushed over one rail by one person to take it to the work site. Nylon wheels are also provided at the bottom to move it on cess/plain surfaces.

b. Powered material trolleys, dip lorry and inspection trolleys with detachable trailers can be used for transportation on track. The machine can also be carried by a road vehicle.

(E) Storage

The rail drilling machine shall be stored in a covered and dry place.

6.3.3 Guide-lines for using, handling, transporting and storing & Maintenance of Battery operated Rail Drilling Machine (BORDM) *(Ref: Para 315 & 316 of IRSTMM-2024)*

(A) Proper utilization of the machine

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/ maintenance, overhauling, trouble-shooting etc. However following instructions shall be observed in general:

a. Install the hollow drill bit on the spindle before turning on the power supply.

b. Select the locating block matched with the type of rail to be drilled then install it on the front plate and fasten.

c. Put the water tank at the same side of the machine and insert the water pipe into the water inlet.

d. Lift the clamping arm to loosen the clamp and put the fixture on the rail. Press the adjusting lever until the fixture chuck the rail firmly (clip the two tips of clamp lower part to the rail web), while the fixture is open, the machine can be moved away from the track freely, make sure that the center of the rail hole to be drilled is in alignment with the drill center, (drill holes with locating ruler). Make sure that the front plate is perpendicular to the rail bottom, the positioning block is in close contact with the rail palate and the upper arc surface of the rail bottom, and then press the clamping arm, the drilling operation can be carried out after the clamping unit is installed firmly.

e. Press down the water valve and push it forward to open. Then switch on the motor. If there is nothing wrong, drive the feeding handle to do the rail drilling operation. The cooling liquid will flow out automatically to cool the bit once the bit touches the rail.

f. While drilling, operate properly with feeding evenly to avoid feeding too much, and slowdown the feeding rate at the end of completing the hole drilling.

g. After drilling operation, drive the feeding handle to allow the drill bit return and switch off the motor. Then push back the water valve to stop filling coolant and remove the water tank. Lift the clamping handle to loosen the fixture, and move the machine to the next drilling spot.

(B) Precautions in operation

Following precautions shall be taken during operation of the drilling machine:

a. The operators have to be trained technically, qualified with work permit.

b. The operators have to read the manual and know the structure, features and applying method of the machine as well as the safety operation notice.

c. Before working, check and make sure that the machine is in good working condition. Check if the insulating condition is good enough. If anything wrong, deal with the problem at once.

d. Operate and maintain the machine according to the requirement mentioned in the manual, and follow the safety operation notice strictly.

e. While drilling, make feeding evenly. Towards the end of completing the hole drilling slowdown the feeding rate.

f. If the drill is blocked, return it and feed again slowly.

g. If the machine is out of order while working, move it away from the track clearance and do trouble shooting. While adjusting, maintaining the machine or replacing any part, stop the motor. Maintain the machine according to the requirement to keep it in good working condition. Never employ the out of Order-machine in the rail drilling operation.

h. While operation, prohibit cleaning up the scrap iron with hand.

i. Don’t use the machine if raining.

j. Prohibit employing the power cable to haul the equipment.

(C) Handling

The Battery Operated Rail Drilling Machine shall be handled carefully to avoid any physical damage. The machine shall not be moved on uneven surfaces to avoid falling. During drilling operation, it shall be evenly placed.

(D) Transportation

The equipment is portable and can be carried by one man. It can be transported by a monorail trolley and by any road vehicle.

(E) Storage

The Battery Operated Rail Drilling Machine shall be stored in a covered and dry place.

(F) Maintenance

(1) Recondition the worn out drill bit in time to keep the bit sharp.

(2) Keep the machine from drenching. Don’t use it in wet situation or place with any flammable objects nearby.

(3) Shut off power supply before replacing part or maintaining the machine.

(4) The battery should be charged with the charger in time to avoid battery failure.

(5) After operating, clean up the machine (keep the air duct of the drill clean and unclogged without any scrap iron or other foreign matter). Oil the guiding rod regularly and lubricate the feed screw periodically to keep the equipment always in good working condition.

(6) If the equipment is not used for a long time, store it in dry-ventilated room without corrosive air or fume.

6.4 Compressed Air Petrol Preheating Machine (CAP)

Conventional preheating system that used a petrol tank and drum vaporizer need longer preheating time i.e. 12 minutes for 60 kg and 10minutes for 52 Kg rails which requires longer block periods and width of the heat affected zones is wider and the preheating process is also not uniform due to manual operation. To eliminate all these deficiencies fully mechanized compressed air petrol preheating machines which allow the preheating of the rails ends uniformly and reduces the preheating time.

The fully mechanized Compressed air petrol machine is able to preheat the rail ends uniformly and reduce the preheating time to 4.5 minutes for 60 Kg and 4 minutes for 52 kg rails and the width of the heat affected zone is also narrowed.



Compressed Air Petrol Preheating Machine

6.4.1 Guide-lines for using, handling, transporting and storing of machines *(Ref: Para 405 of IRSTMM-2024)*

(A) Proper utilization of machine

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/ maintenance, overhauling, trouble-shooting etc. However following instructions shall be observed in general:

a. Check engine oil level: To check oil level, take out level gauge, clean it with clean cloth, refit it and again take it out. On the level gauge see whether the oil mark matches with the level mark on the scale .If not, add engine oil and again check with level gauge. Repeat the procedure till it shows the correct level.

b. Gearbox oil: always ensure that the gear box is adequate with gear oil. Recoup whenever necessary. Check any oil is leaking from the oil seals of the shafts.

c. Fill petrol in the air compressor petrol tank.

d. Place the blow torch gently in the 3 piece mould and clamp it to the rail.

e. Make sure that any of the hosepipes are not in twisted condition.

f. Start engine on petrol and shift to kerosene for running in kerosene run engines.

g. Open the valve of the petrol tank gently.

h. Light the torch and adjust the pressure of the machine as per the required standards.

i. After completion of preheating, close the petrol tank valve and de-clamp the blowtorch from the rail.

j. For kerosene run engines, before switching off, turn the fuel knob from kerosene to petrol so that at the time of switching off, the engine is running on petrol.

k. After the preheating work is over, clean the machine with a clean dry cloth.

l. If the work is not to be continued, take out petrol, kerosene oil.

(B) Precautions in operation

Following precautions shall be taken during operation of the drilling machine:

a. The operator shall be fully conversant about the operation of the machine and shall know the safety precautions mentioned in the operating and maintenance manual issued by the manufacturer/supplier.

b. Correct pressure shall be maintained every time while operating the STM.

(C) Handling

The Compressed Air Petrol preheating machine shall be handled carefully to avoid any physical damage. The machine shall be kept vertical during shifting and shall not be moved on uneven surfaces to avoid falling. During preheating operation, it shall be evenly placed and at sufficient distance from the weld area.

(D) Transportation

a. The machine is fitted with a mono-rail wheel arrangement and a handle of convenient height, to enable it to be pushed over one rail by one person to take it to the work site. Nylon wheels are also provided at the bottom to move it on cess/plain surfaces.

b. Powered material trolleys, dip lorry and inspection trolleys with detachable trailers can be used for transportation on track. The machine can also be carried by a road vehicle.

(E) Storage

The Compressed Air petrol preheating machine shall be stored in a covered and dry place.

6.5 Weld Trimmer (Power Pack Version) for AT Welding

After welding the rail joint by Alumino-Thermit the extra weld metal over rail head (top & sides) used to be chipped off manually with the use of a chisel and hammer which was still in red hot condition. This manual operation had many disadvantages like hot metal flying, deformity in trimming and it requires long blocks. To eliminate these shortcomings and faster operation Double action Weld trimmer is used to trim the Welded joint within less time.

This machine is used for trimming extra weld metal from rail (top and sides) of AT welded rail joint after the welding operation. The machine works with petrol/kerosene engine coupled with a hydraulic oil tank.



Weld Trimmer (Power Pack Version) for AT Welding

6.5.1 Guidelines for using, handling, transportation and storage of Weld Trimmer machine *(Ref: Para 505 of IRSTMM-2024)*

(A) Proper Utilization of Machines : Following steps shall be observed:

a. Pre-start check

i) Check engine oil and hydraulic oil level. Top up if necessary.

ii) Check for loose bolts, nuts, screws etc. Tighten if necessary.

iii) Visually check all pipes/hoses for damage. Replace if damaged.

iv) Ensure correct hydraulic oil grade as recommended by the supplier.

v) Check fuel and fill up if necessary.

vi) Connect the hose pipe to the power pack.

vii) Start the engine. Run at rated speed. Check for leakage at joints.

viii) Check and clean the cutting head of the shear blade after each cut.

b. Operation

i) Operate Direction Control valve in forward direction till the rams of the trimming unit are fully extended.

ii) Ensure that the gap between cutting heads is 0.5 to 1.0 mm in fully extended position.

iii) Retract the cutting heads by changing the oil flow.

iv) Place the machine on the rail, with the welding mould in between the two cutting heads. Waiting period is generally 3 to 4 minutes for 25 mm gap and 8 to 12 minutes for 75 mm gap after pouring hot metal. Operate the direction control valve to move cutting heads to inward direction for trimming excess metal. With reversal of direction control valve, cutting heads move outward. Trimming time is approximately half a minute to one minute for different rail sections.

(B) Precautions in operation: Following instructions shall be followed:

a. DO's

i) Clean the cutting tool edge of shear blades after every cut.

ii) Always ensure that the gap between two cutting heads is 0.5 to 1.0 mm when fully extended.

iii) While changing the cutting heads, remove the cutting heads when the ram is fully contracted.

iv) Leave all rams retracted when the weld trimmer is not in use.

b. DON'Ts

i) Never open any hydraulic parts except during troubleshooting.

ii) Never use the machine on cold welds.

iii) Never operate a power pack unless the hose connection with the machine is fixed properly.

iv) Never run the engine beyond rated speed.

v) Do not operate the control valve during withdrawal from the weld joint until the cutting heads are closed.

(C) Handling

The weld trimmer shall be handled carefully to avoid any physical damage. While not in use, the cylinder's pistons shall be kept in retracted position.

(D) Transportation

The machine has been provided with a mono-rail double flange wheel arrangement at the bottom with a handle to enable it to be pushed over the single rail to take it to the work site. Nylon wheels are also attached at either end of double flanged wheels to enable the machine

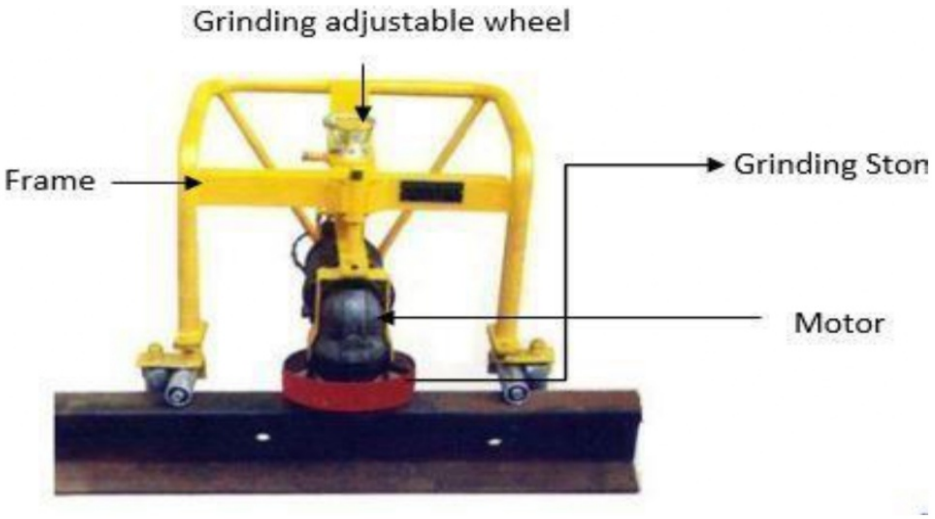
to be moved on cess/plain surface. The machine can also be handled/transported with help of a lightweight monorail trolley by keeping the two units i.e., trimmer and power pack separately.

(E) Storage

The machine shall be kept at a dry and covered place.

6.6 Rail Profile Weld Grinder (RPWG)

The Rail Profile Weld Grinder consists of a grinding unit coupled with an engine/electric motor and fitted to a lightweight frame. This machine is used for grinding off the leftover metal from rail joints after A.T. welding to provide the correct profile on the top and both sides of the rail head.



Rail Profile Weld Grinder

6.6.

1 Guidelines for using, handling, transportation and storage of machines *(Ref: Para 605 of IRSTMM-2024)*

(A) Proper utilization of machine

Following procedure shall be observed:

a. Check the level of the engine oil and refill if required. For AC power, check and ensure correct electrical connections.

b. Check fuel level in the fuel tank. Top up if necessary.

c. Check the grinding wheel. It should be tightly fixed on the shaft.

d. The condition of the insulated covering shall be checked by the user before every use.

e. Ensure firm footing of trolley on level ground.

f. Start the engine/motor. The grinding wheel automatically starts rotating. The machine can be moved to and fro over the welded joint by means of two rollers attached to the machine.

g. For grinding, the feed screw shall be slowly rotated clockwise.

h. After the grinding is complete, turn the handle of the feed screw anticlockwise till the grinding wheel has moved up from the rail.

i. Stop the engine/motor and remove the machine from the top of the rail.

(B) Precautions in operation

a. Do not apply extra pressure on the grinding wheel.

b. Use safety goggles while grinding.

c. Stop the engine fuel supply/switch off the electric motor immediately after the grinding is completed.

d. Any part of the motor shall not be touched while the grinder is in operation.

(C) Handling

The rail profile weld grinding machine shall be handled carefully to avoid any physical damage. The electric motor shall be kept off rains/water splashes.

(D) Transporting

The rail profile weld grinder can be transported on material trolley/road vehicles.

(E) Storage

The machine shall be stored at a covered and dry place.

6.7 Generator

Generator is a machine by which mechanical energy is converted into electrical energy for use in external electrical power.

6.7.1 Types of Generators

(1) Portable A. C. Generator

(2) Portable D.C. welding Generator

Portable A.C. Generator

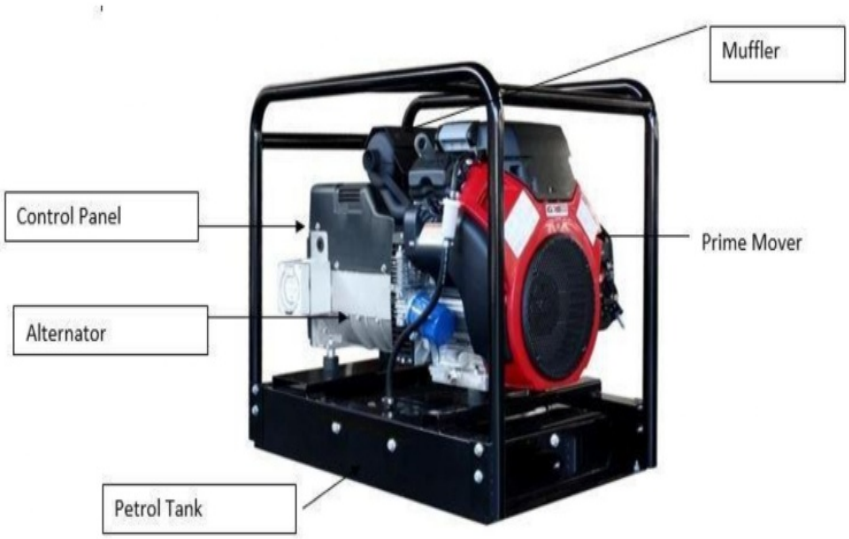
Portable A.C. generators are used as power pack for rail profile grinding machine and for lighting purposes during night for working of track machines and accident restoration sites.

Portable D.C welding Generator

Portable D.C. Welding Generator is used for reconditioning of CMS crossings & Tongue rails and any fillet welding using direct current (DC). In extreme exigencies, it is also suitable for running of Rail Profile Grinder & Lighting arrangements using auxiliary A.C. output.



Portable A.C. Generator



Portable D.C. welding Generator

6.8 Hydraulic Track Jack (non-infringing type)

The Hydraulic Track Jack (non–infringing type) is a portable lifting device used for lifting of track in track maintenance/construction work.



Hydraulic Track Jack

6.8.1 Guidelines for using, handling, transporting and storing *(Ref: Para 805 of IRSTMM-2024)*

(A) Proper utilization of Machine

a. Check the hydraulic oil level in the pump reservoir.

b. Loosen the oil filler plug cum air vent to act as an air-vent, for the entrapped air in the oil pump.

c. At the location where the rail is to be lifted, remove some ballast and place the jack centrally underneath the rail foot.

d. Loosen the release key of the pump and pump a few times to flush out the trapped air (if any) from the pump unit.

e. Close the release key firmly.

f. Pump till the required lift is achieved.

g. When the jack is required to be lowered or removed from the track, unscrew the release key of the pump. The saddle of the jack below the rail foot gets slightly lowered. The jack can be pulled out by hand and thereafter its ram can be manually pushed down.

(B) Precautions in operation

SN	Do`s	Don’ts

1.	Air venting is an important precaution for the successful performance of any hydraulically operated device, equipment or system.	Under no circumstances, the equipment shall be used beyond rated capacity or rated maximum lift.
2.	All fasteners shall be properly tightened.	Do not forcibly hammer fit any component in the jack.
3.	The equipment shall be kept free from dust through regular cleaning.	After use, do not leave the equipment exposed to excessive heat in summers, dust and fumes.
4.	Check oil level each time before use.	Do not refill without a strainer.
5.	In the pump unit, the release valve shall be properly tightened during operation.	Do not use the jack if any leakage of oil is observed.
6.	The jack must be centrally loaded.	Do not apply extra force other than hand pressure to close the release valve.
7.	Use hydraulic oil of recommended grade.	Do not use fluffy clothes or cotton waste for cleaning cylinder ram, valve and oil tank.
8.	Use wooden/steel support under the jack where ground is soft or yielding.	Do not disturb the preset overload safety valve integrated with the pump.

(C) Handling

The jack shall be handled with care to avoid damage. When not in use the ram shall be kept in a retracted position. The jack shall not be turned upside in down position, during transportation.

(D) Transportation

As the machine is light in weight, one man can carry the machine on a bicycle or by monorail trolley over short distances. This can also be transported by material trolley/road vehicle.

(E) Storage

The following shall be ensured for storing hydraulic track jacks:-

a. The ram shall be in the fully retracted position.

b. The pump plunger shall be in the retracted position.

c. The oil filler plug cum air vent shall be in a closed position.

d. The jack shall always be stored in an upright position.

e. The jack shall be free from dirt.

f. The jack shall be stored in a covered and dry place.

6.9 Hydraulic Rail Tensor (Non-infringing Type)

Rail tensor is used to create either pulling or pushing action of rails. It is a device used for rail distressing operation in Continuous welded rail (CWR), repair of rail breakages etc.



- 2 hydraulic cylinders (**1**)
- 2 clamping assemblers (**2**)
- 2 tie rods (**3**)

6.9.1 Guidelines for using, handling, transportation and storage *(Ref: Para 905 of IRSTMM-2024)*

(A) Proper utilization of the machine

Following procedure shall be followed during use of the tensor in the field.

a. The rail extension required for distressing of LWR track at the prevailing temperature is determined first. Accordingly, the gripping heads of the machine shall be placed at rail webs on either side of the rail joint to be welded.

b. The gripping heads are connected with the hydraulic rams through lever arms and connecting rods.

c. The hydraulic rams are connected with the pumping unit through hydraulic hoses. Before operating the pump, the lever arms are pulled manually for engaging the gripping blocks on the rail web firmly.

d. While operating the hydraulic pump manually it is ensured that the rams' move equally. In case an unequal extension of the two rams is observed, the same shall be rectified after referring to the supplier's instruction manual.

e. The hand pump is operated unless the required gap is achieved at the rail joint.

f. After completion of the AT welding and allowing for its cooling, the rail tensor is dismantled carefully from the track and its components kept safely.

g. Traffic block is required for installation and operation of the rail tensor on a track open to traffic.

(B) Precautions in operation

Following precautions shall be taken during operation of the tensor:

a. The operator shall be fully conversant about the operation of the tensor.

b. The pump shall not be run if oil is deficient.

c. The pumping operation shall be started only after ensuring proper fitting of the yoke, lever, connecting rods and cylinders.

d. The system shall not be used beyond its rated capacity and the ram shall not be extended beyond its specified stroke.

(C) Handling

The rail tensor shall be handled carefully to avoid any physical damage. During dismantling, cylinders shall not be lifted without detaching the connecting rods first.

(D) Transportation

For transportation, the equipment shall be dismantled. The hydraulic rams shall be handled carefully to avoid any damage to the piston surface, oil seals and oil inlet and outlet adapters. The equipment in dismantled condition can be transported to worksite by powered material trolley, road vehicle or RCRV.

(E) Storage

The following precautions are to be taken while storing the hydraulic rail tensor when not in use:

a. The rams of the cylinders shall be in fully retracted position.

b. Pump plungers shall be in a fully closed position.

c. Oil filter plug cum air vents shall be accurately closed.

d. Cylinders shall be placed in horizontal position.

e. The entire unit shall be free from dirt.

f. The unit shall be stored in a box in a covered place.

6.10 Toe Load Measuring Device

6.10.1 Mechanical Toe Load Measuring Device (MTLMD)

Mechanical Toe load measuring device consists of a pre-calibrated helical spring having a steel pointer attached to a lever arrangement through a link hanger for gripping elastic rail clip. The device is supported on three legs, two resting on the sleeper and one on the rail head. It is used to determine the toe load of elastic rail clips during service in the field.

When the spring is compressed by turning a rotating handle at the top of the device, the toe of the clip gets pulled up and compression of the spring causes a pointer to indicate displacement on a graduated scale. The Toe load (in Kg) exerted by the spring on the toe of the clip is measured by multiplying the displacement of the pointer and the spring constant.



Mechanical Toe load Measuring Device

6.10.1.1 Guidelines for using, handling, transporting and storing of the Device *(Ref: Para 1005 of IRSTMM-2024)*

(A) Proper utilization of Device

a. Place the device with one leg resting on the rail top and the other two legs resting on the sleeper surface.

b. Adjust horizontally the base plate by means of the nut of the leveling leg.

c. Turn the handle continuously till air gap is created between rail flange/top of liner and toe of clip. Introduce a filler gauge of 0.1 mm thickness in the air gap created between the toe of the clip and the rail flange / top surface of liner.

d. The handle is then turned anticlockwise so that the filler gauge comes under a normal pressure. Turn the handle again clockwise and simultaneously pull out the filler gauge. The filler gauge when moved, indicates the lifting of the toe of the clip.

e. At this stage note down the reading on the graduated scale multiplied by the spring constant gives the toe load exerted by clip on the rail foot.

(B) Precautions in operation

Following precautions shall be observed during operation:

a. Operating staff should be skilled and knowledgeable about the machine.

b. There shall be no oily substance on the surface of tongs so as to prevent slippage during operation.

c. Steel grip shall be engaged firmly to the clip to avoid the slippage on the application of load.

d. Longer portion of the steel grip shall be away from the rail web.

e. Base plate shall be horizontal.

f. Link hanger shall be vertical to the toe of the clip.

g. Operator shall not lean over the device.

(C) Handling

The toe load-measuring device shall be handled with care to avoid physical damage.

(D) Transportation

The equipment is portable and can be carried by one man. It can be transported by a monorail trolley and by any road vehicle.

(E) Storage

The device shall be stored in a packing box and kept in a covered and dry place.

6.10.2 Electronic Toe Load Measuring Device (ETLMD)

It is used to directly measure the toe load of elastic rail clips during service in the field.

Electronic Toe Load Measuring Device has a load cell of 2000 kg capacity and an LCD panel integrated with suitable electronic circuitry. This device has got a lever arrangement attached to it in order to grip the toe of the elastic rail clip. When the load cell is compressed by turning a rotating handle, the elastic rail clip gets pulled up. The force applied on the load cell is converted into load (in kg.) and displayed directly on LCD screen.



Electronic Toe Load Measuring Device

6.10.2.1 Guidelines for using, handling, transporting and storing of the Device *(Ref: Para 1014 of IRSTMM-2024)*

(A) Proper utilization of Device

a. Put the measuring unit of the electronic toe load device to 'ON' position for a few minutes before measuring the toe load of an elastic rail clip.

b. Place the device on its three supporting legs with one resting on the top of the rail head and the other two resting on the sleeper.

c. Bring the base plate in horizontal position by means of the levelling leg provided for adjustment of the three legs.

d. Engage the tong to the elastic rail clip keeping a longer portion of the tong away from the rail web.

e. Turn the handle clockwise to compress the load cell and pull the hanger. The toe of the elastic rail clip will get pulled up.

f. Continue to turn the handle until the toe leaves contact with the liner/ rail foot. A Feeler gauge of gap sensing device having thickness of 0.05-0.1 mm is inserted below the toe of the clip. The handle is then turned anti clockwise so that the feeler gauge comes under normal pressure. Turn the handle clockwise again and simultaneously the gap-sensing device is pulled out gently. When the feeler gauge moves out, it indicates the incipient point of lifting of toe of the elastic rail clip and at the same time the sensing device automatically freezes the toe load reading on LCD. At this stage, the reading displayed on the LCD panel is the measured toe load of the elastic rail clip.

(B) Precautions in operation

Following precautions shall be observed during working:

a. The operator shall be fully aware of the using, maintenance and troubleshooting of the device.

b. The device shall be properly placed on its three legs and the base plate shall be kept horizontal before measuring the toe load.

c. No extra effort shall be utilized on the gap sensing instrument during pulling out of the feeler gauge.

d. Feeler gauge shall be correctly inserted below the toe of the clip to avoid slippage.

e. The operator shall not lean over the device.

f. It shall be ensured that the longer portion of the steel grip shall be away from the rail web.

g. Link hanger shall be vertical to the toe of the clip.

(C) Handling

The electronic toe load measuring device shall be handled carefully to avoid any/physical damage. The device when not in use shall be kept in the box provided with the machine.

(D) Transportation

The equipment can be carried by one man.

(E) Storage

The device shall be kept in a packing box and stored in a covered dry place.

6.11 Light Weight Rail (Mono) cum Road Trolley

It is a manually driven trolley to carry small track machines and can be moved on a single rail or on ground.



6.11.1 Guidelines for using, handling, transportation and storing of trolley *(Ref: Para 1105 of IRSTMM-2024)*

(A) Proper Utilization of machine

Instructions contained in the manual supplied with the trolley shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. For running on road- Bring the nylon wheels downward and lock in position by bolts and nuts. The trolley is ready for use and can be moved by pulling/ pushing its handle.

b. For running on rail– The nylon wheels are lifted and locked in position. The trolley is moved on a single rail on its double flange wheels. For movement of the mono – rail trolley on rails, the safety rules for a push trolley should be followed as given in the GR/SR for that particular zonal railway.

c. 1 to 3 persons are required for loading/unloading and movement of the trolley as necessary depending upon the load. On sighting any approaching rail vehicle like a train etc., the mono - rail trolley shall be quickly off-tracked for safety, in case of its movement on rails without traffic block.

(B) Precautions in operation

Following precautions shall be observed during operation:

a. The trolley shall not be overloaded.

b. The operator shall remain cautious about any approaching train.

c. The trolley shall not be run on the nose of crossing.

d. The trolley shall be put on line only after assuring proper functioning of the double flanged wheels and nylon wheels.

(C) Handling

During use, the trolley shall be handled carefully so that its nylon wheels/double flanged wheels don’t infringe with rails.

(D) Transportation

The trolley can be dismantled and put in a box and transported by rail or road. Over short distances it can be moved on its nylon wheels on the ground or on its double flanged wheels on rails.

(E) Storage

The trolley shall be kept in a covered and dry place.

6.12 Self-Propelled Light Weight Trolley

The Self-Propelled Lightweight Trolley is used by Railway officials for track inspection and to reach accident/work sites quickly.

6.12.1 Type of self-propelled Light weight trolley

Two types of Self-Propelled Lightweight Trolley are there:

(1) Engine operated (2) Battery operated

Battery operated light weight trolley should be preferred over engine operated.



Self-Propelled Lightweight Trolley

6.12.2 Guide-lines for using, handling, transportation and storing of trolley *(Ref: Para 1206 of IRSTMM-2024)*

(A) Proper Utilization of the trolley

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. Fill the fuel tank if required.

b. Check the brakes.

c. Start the engine by rope / self-starter and run the engine for five minutes for circulation of oil.

d. Engage the gear and drive the trolley.

e. For braking, bring the gear to neutral position and apply the brake.

f. For movement of the trolley on a running track, the GR / SR rules for that particular Zonal Railway shall be followed as applicable for a push trolley.

(B) Precautions in operation

Following precautions shall be observed during operation:

a. The trolley shall not be over speeded.

b. Operating instructions for the trolley and engine, supplied with the trolley shall be strictly followed.

c. The trolley shall run under trolley protection rule as mentioned in GR/SR.

d. The operator shall be fully conversant about working, maintenance and troubleshooting of the trolley.

e. The trolley shall not be put on the track during foggy or bad weather when visibility is hampered.

(C) Handling

The trolley shall be handled carefully to avoid any damage. During off-tracking the trolley shall be bodily lifted and not dragged.

(D) Transportation

The trolley shall be dismantled and loaded in the brake-van / SLR of a train or in a road vehicle for transportation.

(E) Storage

The trolley shall be kept in a covered garage under lock and key.

6.13 Powered Material Trolley

Powered Material Trolley is used by P.Way staff for carrying small track machines and tools for day to day track maintenance works.



Powered Material Trolley

6.13.1 Guidelines for using, handling, transportation and storing of Trolley *(Ref: Para 1305 of IRSTMM-2024)*

(A) Proper utilization of the trolley

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc.

In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. Fill the tank with petrol / diesel.

b. Put the trolley on track

c. Check the brake.

d. Start the engine and run the engine for 5 minutes for proper oil circulation.

e. Then put the gear in first and give acceleration when the trolley is in movement. Engage the gear, give acceleration for required speed.

f. Always use the clutch in shifting of gear.

g. For stop, bring the gear in neutral position and pull the brake lever.

h. When the trolley is stopped, switch off the key.

(B) Handling

The trolley shall be handled carefully to avoid any physical damage. During off track of the trolley, it shall be lifted bodily and shall not be dragged.

(C) Transportation

The trolley should be dismantled in pieces as recommended by the manufacturer and may be transported on loading it to the brake van / SLR of a train or by road- vehicle.

(D)Storage

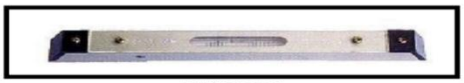
When not in use, the trolley shall be kept in covered shade.

6.14 Box Type Gauge cum Level (BG) with Spirit Level

The Box Type Gauge- Cum - Level is an instrument used to measure the track gauge in mm with an accuracy of 1 mm. This instrument simultaneously measures the cross level of the rails in mm with an accuracy of 1 mm. Each gauge-cum-level comprises two main items i.e. the 'gauge' and a spirit level.



Box Type Gauge cum Level (BG)



Spirit Level

6.14.1 Guidelines for using, handling, transporting and storing of equipment *(Ref: Para 1405 of IRSTMM-2024)*

(A) Proper utilization of the equipment

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc.

In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. Inspect the device for damages.

b. Inspect the device for any measurement reading errors.

(B) Precautions in operation

a. The operator shall be fully conversant with use of the machine. The operator shall not be tired, under stress or under influence of any drug or alcoholic drink.

b. The operator shall read and understand the safety precaution mentioned in the operation's manual and shall strictly follow the instructions.

c. No load or pressure shall be applied on the gauge cum level.

(C) Handling

The Box Type Gauge Cum Level shall be handled carefully to avoid any physical damages. The instrument shall be provided with a suitable handle for carrying purpose.

(D) Transportation

There shall not be rough handling during transporting. The machine may be transported on push trolley/material trolley.

(E) Storage

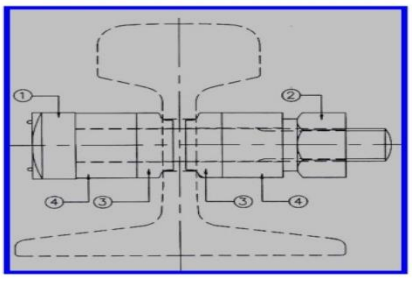
The machine shall be stored in a box/carton at a dry place under lock and key.

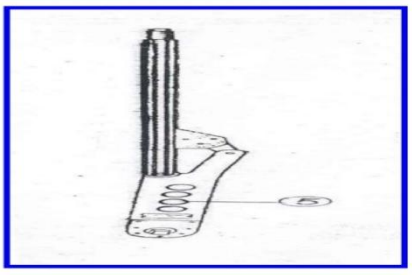
6.15 Chamfering Kit

Chamfering Kit is used to chamfer rail holes to eliminate chances of developing crack at the sharp edge of drilled holes in rail.

i. Chamfering Kit- Manual

ii. Chamfering Machine (Battery Operated)







Chamfering Machine (Battery Operated)

6.15.1 Guidelines for using, handling, transportation and storing of Manual Chamfering Kit equipment *(Ref: Para 1505 of IRSTMM-2024)*

(A) Proper utilization of equipment

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. The hole, to be chamfered, is to be cleaned to remove iron-chips/burrs.

b. The bolt is to be fixed in the rail hole keeping one packing piece and one chamfering bit on one side of the hole and similar set on the other side of the hole. The nut is to be hand tightened first.

c. The torque-wrench is to be set at 52 kg-m torque (for 90 UTS rail) and to be fixed to the square drive socket, torque may be different for higher UTS rail.

d. The nut is to be tightened by the torque wrench, engaging the square drive socket to the nut.

e. Tightening is to be continued unless the torque wrench sounds a ‘click’, which indicates that the pre-set torque is achieved.

f. The nut is then loosened by the torque wrench by reversing its square drive and turning the nut in reverse direction.

g. The bolt, packing pieces and chamfering bits are removed from the hole.

(B) Precautions in operation

Following precautions shall be observed during operation:

a. The operator shall be conversant with the use of this kit properly.

b. During tightening of the bolt, the operator shall not lean over the wrench.

c. Drive sockets shall be properly fitted to the nut before operating the torque wrench.

d. The tip of the chamfering bits shall properly match the hole.

e. Ensure correct dia. of hole before chamfering to avoid breakage of chamfering bit.

(C) Handling

The chamfering bits are very hard and shall not be subjected to impact or shock during handling to avoid breakage.

(D) Transportation

Being light in weight, the chamfering kit can be transported by hand on bi- cycle/push trolley/material trolley.

(E) Storage

The packing pieces and chamfering bits are to be kept assembled with the bolt. These shall be coated with a thin film of grease during storage. The chamfering kit shall be stored in a wooden carton and kept in a dry place.

6.15.2 Guidelines for using, handling, transportation and storing of Battery Operated Chamfering Machine (*Ref: Para 1514 & 1515 of IRSTMM-2024)*

(A) Proper utilization of the machine

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. The hole, to be chamfered, is to be cleaned to remove iron-chips/burrs.

b. Before using the machine, the battery should check the charge level. The battery should be fully charged.

c. The bolt is to be fixed in the rail hole keeping one packing piece and one chamfering bit on one side of the hole and similar set on the other side of the hole. The nut is to be hand tightened first.

d. The torque-wrench is to be set at 52 kg-m torque and to be fixed to the square drive socket.

e. The nut is to be tightened by the machine, engaging the square drive socket to the nut.

f. Tightening is to be continued 2-3 seconds only, which indicates that the pre-set torque is achieved.

g. The nut is then loosened by the machine by reversing its square drive and turning the nut in reverse direction.

h. The bolt, packing pieces and chamfering bits are removed from the hole.

(B) Precautions in operation

Following precautions shall be observed during operation:

a. The operator shall be conversant with the use of this kit properly.

b. During tightening of the bolt, the operator shall not lean over the wrench.

c. Drive sockets shall be properly fitted to the nut before operating the machine.

d. The tip of the chamfering bits shall properly match the hole.

e. Ensure correct dia. of hole before chamfering to avoid breakage of chamfering bit.

(C) Handling

The chamfering bits are very hard and shall not be subjected to impact or shock during handling to avoid breakage.

(D) Transportation

Being light in weight, the chamfering kit can be transported by hand on bi- cycle/push trolley/material trolley.

(E) Storage

The packing pieces and chamfering bits are to be kept assembled with the bolt. These shall be coated with a thin film of grease during storage. The chamfering machine shall be stored in a suitable carrying caseand kept in a dry place.

(F) Maintenance

(1) The bolt shall be lubricated before every use.

(2) The packing pieces and chamfering bits are to be kept free of dust.

(3) A thin film of grease shall be applied on the packing pieces, chamfering bits and bolt when the kit is not in use.

(4) The machine, when not in use, shall be kept set at its minimum range of setting.

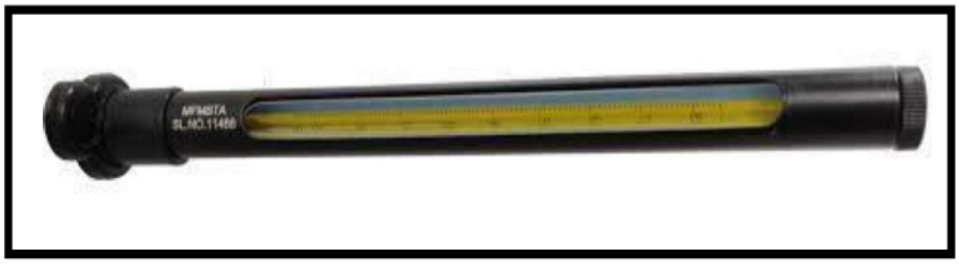
(5) Charge Battery regularly for long lasting battery life.

(6) The machine shall be periodically calibrated as per instructions of the manufacturer.

6.16 Thermometer

6.16.1 Magnetic Base type Rail Thermometer

It enables the user to take instantaneous readings of rail temperature using strong Magnetic sensor complete in case.



Magnetic Base type Rail Thermometer

6.16.1.1 Guidelines for using and storing of equipment *(Ref: Para 1605 of IRSTMM-2024)*

(A) Proper utilization of the equipment:

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

(B) Precautions in operation:

Following precautions shall be observed during operation:

a. The operator shall be conversant with the use of this device properly.

b. The device should be used only after seeing the movement of the train on the track.

c. The thermometer must have been compared with the standard thermometer before using it for the first time.

d. Thermometers shall be placed on rail top. The thermometer shall be kept on rail for six minutes and temperature shall be recorded.

(C) Storage:

The machine shall be stored in a box/carton at a dry place under lock and key.

6.16.2 Continuous Rail Thermometer

Continuous Rail Thermometer (CRT) is used for continuously displaying rail temperature, storing the data at pre-set interval and transferring this data to PC through USB port of PC, using Data Transfer Module.



Continuous Rail Thermometer

6.16.2.1 Guidelines for using, handling, transporting and storing of machines *(Ref: Para 1614 of IRSTMM-2024)*

(A) Proper utilization of the equipment:

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, trouble-shooting etc. in addition to the operational instructions contained in the manual given by the supplier.

(B) Precautions in operation:

a. Ensure that all the connections are proper.

b. Check all the fuses before operation.

c. Kindly press Alarm Acknowledgement Key when the user sense the alarm indication as long duration usage of buzzer may damage it.

(C) Handling:

This device is of sophisticated nature, so it should be handling with utmost care.

(D) Transportation:

The machine can be transported manually by one person, if required.

(E) Storage:

The machine shall be stored in a box/carton at a dry place.

6.17 Gang/worksite Remote Control Hooter

Gang/Worksite Remote Control Hooter is used to warn the trackmen about a train approaching towards the worksite by transmitting hooting sound at site of work.



Gang/Worksite Remote Control Hooter

6.17.1 Guidelines for using, handling, transporting, and storing of equipment *(Ref: Para 1705 of IRSTMM-2024)*

(1) Proper utilization of the equipment

Instructions contained in the manual supplied with the machine shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. Before starting the operation, power switches of both hooting unit and remotecontrol unit should be on.

b. The hooting unit is to be kept at worksite and the remote-control unit shall be with the lookout man away from the worksite.

c. Switch on both units Hooter Unit and Remote-Control Unit and confirm 'LOW' battery LED not glowing.

d. Wait for a minute and check communication 'LED' in the both units is blinking or not? e. Press the SET button in the Hooter Unit or ON button in the Remote-Control Unit and check both Hooters are working or not.

(2) Precautions in operation

a. Proper fixing of Antenna.

b. Indications will be observed regularly in order to check the status of battery before operating the system it may get failure of communication between the remote-control unit and the hooter unit in case Low battery occurs.

c. The system should be kept in charging mode after field operation is completed.

d. There should be an indication for detection of failure of link between the system and remote-control unit.

e. Before going away from the worksite, the lookout man carrying the remote switch should assure that both the hooting unit and the remote unit are functioning properly.

f. For operation of the equipment, after watching the incoming train, the authorized staff at far end shall press hooter 'ON' button on the remote-control unit and gets acknowledgement of hooter activation on his remote-control unit. The hooter placed at worksite will start and continues till the person at work site press the 'RESET' button or remote-control unit person press the hooter stop button in the unit.

(3) Handling

The equipment shall be handled carefully to avoid any physical damage. Both the hooting unit and remote unit shall be switched off while not in use.

(4) Transportation

As the equipment is light in weight, one man can carry the equipment himself (on shoulders) on a bicycle or by mono rail trolley over short distances. This can also be transported carefully by material trolley/road vehicle.

6.18 Hydraulic Track Lifting cum Slewing Device (TRALIS)

Hydraulic Track Lifting cum Slewing Device (hereinafter called TRALIS) is a hydraulic device used for lifting and slewing of Railway track and turnouts for maintenance/ laying purpose.

6.18.1 Guidelines for using, handling, transportation and storing of Device *(Ref: Para 1805 of IRSTMM-2024)*

(A) Proper Utilization of the device

Instructions contained in the manual supplied with the Device shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc. In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. Loosen/open the ballast at the ends of sleepers towards the direction of slew for 7 to 8 sleepers on both sides of the slewing point prior to the insertion of TRALIS.

b. Connect the Jack unit to the Pump Unit as per supplier's instruction manual if it is in dismantled condition.

c. Open the Oil Filler Plug cum-Air-Breather partially and close the Release Valve for vertical as well as horizontal operation.

d. Unlock the Directional Control Valve and set the Directional Control Lever for desired slewing (either to slew right or left).

(B) Precautions in operation

Following precautions shall be observed during operation:

a. The operator shall be well conversant with operation, maintenance and troubleshooting of the equipment.

b. Both the horizontal and vertical jack shall never be loaded beyond rated capacity and the pistons shall not be extended beyond rated limit.

c. Eccentric loading shall not be allowed.

d. Factory pre-set overload safety valve shall not be disturbed.

e. Operate the Pump for lifting the Vertical Jack and stop pumping when the desired lift is achieved.

f. It is advisable to bring the Vertical Jacks at the centre of the reaction trough before they are placed below the rails for slewing. If the required slew is excessive the vertical Jack may be shifted to the extreme end before placing under the track.

g. If slewing for the other side is required, unlock the Directional Control Valve and shift the Valve Lever to the other position. Follow the operation procedure as directed above.

h. Pack the sleeper ends as required.

i. For lifting one rail of the track for correcting unevenness or super elevation, place both the loading units under the same rail at adjacent sleeper position and operate the vertical pump for lifting up to the desired level.

(C) Handling

The equipment shall be handled carefully so that the surface of the trough plate and piston do not get damaged.

(D) Transportation

The equipment can be transported by one man walking or on a bicycle or on a mono-rail trolley over short distances or carried by a road or a rail vehicle.

(E) Storage

The equipment shall be stored in dry and covered place to protect it from rain and dust.

6.19 Track Based Lubricators (Electronic Type)

Track Based Lubricators are used on railway tracks to lubricate the rails in curves or so as to reduce the friction coefficient between the gauge face of the rail and flange of the wheel. The lubricator is dispensed on to the rail which is then carried forward and spread by the wheel of the moving train.

6.19.1 Track Based Lubricators (Hydraulic Type)

Track Based Lubricators are used on railway tracks to lubricate the rails so as to reduce the coefficient of friction between the rail surface and the wheel of the train. The lubricator is dispensed on to the rail which is then carried forward and spread by the wheel of the moving train.

6.20 Off Track Tamper

The Off Track Tampers (OTT) are intended to be used as a regular means of packing for spot attention/picking up slacks in between two successive tamping with heavy on track tamping machine on concrete sleeper track on Indian Railways. It is useful to eliminate the triangular pits under the sleepers and improve the track safety. OTTs are either percussion type or vibrating type based on method of tamping. Based on mode of operation, they are of power pack version or engine mounted version or battery operated.



Off Track Tamper

6.21.1 Guidelines for using, and precautions in operation of Machine *(Ref: Para 1912 of IRSTMM-2024)*

(A) Proper utilization of the machine:

Instructions contained in the manual supplied with the tamper shall be followed for operation including operational safety measures, repair/maintenance, overhauling, trouble-shooting etc.

In addition to the operational instructions contained in the manual given by the supplier, following instructions shall be observed before commencement of operation:

a. Inspect the entire tool before each use. Re-place damaged parts.

b. Check for fuel leaks and make sure all fasteners are in place and securely fastened.

c. Replace parts that are cracked, chipped or damaged in any way before using the tool.

d. Do not smoke or allow smoking near fuel or the tool or while using the tool.

e. When filling up fuel, stop engine and make sure engine is cool and choose the places where no flammables present and well ventilated.

f. Wipe up all fuel spills before starting engine.

(B) Precautions in operation:

a. Always wear heavy, long pants, boots and gloves. Do not wear loose clothing, jewellery, short pants and sandals or go barefoot. Secure hair so it is above shoulder length.

b. Do not operate the tool when you are tired, ill or under influence of alcohol, drugs or medication.

c. Never let a child or inexperienced person operate the machine.

d. Never start or run engine inside a closed room or building. Breathing exhaust fumes can kill.

e. Always wear a safety face shield or goggles.

f. Keep handles free of oil and fuel.

g. Hold the handles firmly with both hands and make sure to stand on the firm base or ground.

h. Do not touch spark plug, high voltage cord during operation as it may cause electric shock.

i. To avoid burn do not touch those places like engine, muffler, exhaust where get every hot during in use or even after stop engine until it gets cool for the time being.

j. When operation is prolonged, take a break from time to time so that you may avoid possible white finger disease which is caused by vibration.

k. For ear-protection against the sound emitted during operation of machine, suitable ear protector shall be supplied along with safety apron and leather gloves (four sets) by the manufacturer with each set.

(C) Handling:

The equipment shall be handled carefully to avoid any physical damage.

(D) Transportation:

A set of OTT can be transported in 2 Nos. of two wheelers fitted with hook by 2 persons (only drivers).

(E) Storage:

a. In case of engine mounted version: Empty the fuel tank before storing the tool. It is recommended that the fuel be emptied after each use at the end of the day. If fuel is left in the tank, ensure that fuel shall not leak.

b. Suitable precautions to be taken to ensure battery not get discharged in case of battery operated version.

7.0 Consumables used in some of the important STMs

i. Consumables used in some of the important STMs

Sl.No	STMs	Consumables
1.	Abrasive Rail cutter	Abrasive cutting disc
		Petrol
2.	Rail Drilling Machine	Drilling bit
		Petrol/Kerosene
3.	Rail Profile Grinder	Grinding stone
4.	Compressed Air Petrol Pre heating Machine	Petrol/Kerosene
		Blow torch
5.	Double Action Weld Trimmer (Power pack version)	Petrol/Kerosene
		Shear Blades
6.	AC/DC generator	Petrol/Kerosene
7.	Hydraulic Jack	Nil
8.	Hydraulic Rail Tensor	Nil
9.	Toe LoadMeasuring Device	Nil

8.0 Works Involved in the Maintenance of Curves

8.1 Inspection of Curved Track: *(Ref: Para 2.1 of the Book ''Railway Curves'' issued by the IRICEN/Pune)*

On Indian Railway routes, gauge, versines and superelevation on each curve must be checked at prescribed intervals . Such checks should also be carried out whenever the running over curves is found to be unsatisfactory.The gauge and cross levels are to be measured using the gauge-cum-level at each station in the same manner as for a straight track. The versine is the parameter used to measure the curvature of the curve.
Following chord lengths are normally used on IR:

- For curves in normal track, 20m chord length is used on stations 10m apart.
- For lead portion of turnouts and turn-in-curves, 6m chord length is used on stations 3m apart.

B. Wear on Outer Rail of Curves (*Ref: Para 424 of IRPWM-2024)*

(1) The wear on the outer rail on the curve can be reduced effectively by-

(a) Lubricating the gauge face of outer rails on the curves.

(b) Maintaining correct curve geometry and Super-elevation.

(c) Provision of suitable checkrail.

(d) Adopting slack gauge PSC sleeper as per RDSO drawings depending on curvature of track.

9.0 Works involved in the Maintenance of Bridges

9.1 Maintenance of Steel sleeper for Bridges *(Ref: Para 629 of IRPWM-2024)*

(a) After laying steel sleepers, tightening of all fittings including hook bolts should be done once in 15 days for initial one month. Thereafter it should be done once a month for next six months and subsequently it should be on need basis as observed by inspecting officials.

(b) Guard rail fittings should be tightened once in three months for first six months and thereafter on need basis.

(c) The above will be in addition to daily attention by Keyman.

(d) Replacement of grooved rubber pads & elastomeric pads shall be done on condition basis.

9.2 Maintenance of Track on Approaches of Bridges *(Ref: Para 630 of IRPWM-2024)*

(a) On the bridge approaches, sleepers with arrangement for fixing guard rails should be provided for provision of guard rails.

(b) Full complement of track fittings at bridge approaches up to 100 metres should be provided to maintain required track geometry and effort should be made to immediately recoup deficiency noticed, if any.

(c) Rail level of track at approaches of bridges should be maintained as per designed L-section and dips in rail level immediately after the abutments should be avoided.

(d) Rail joints should be avoided within three metres of a bridge abutment.

(e) Joggled fish plate with clamps or two far end bolts on good AT welds shall be provided on bridges having length of water way as 100 m or more and on approaches upto 100 m length.

9.3 Maintenance of Track on Bridge proper (*Ref: Para 631 of IRPWM-2024)*

(a) *Sleepers* – The condition of sleepers and fastenings should be checked. The spacing of sleepers should not exceed the limits laid down. Squareness of sleepers shall be ensured. Sleepers requiring renewals should be marked with paint and renewals carried out.

(b) *Hook Bolts* – Hook bolts should be checked for their firm grip. Position of arrows on top of the bolts should be at right angles to the rails pointing towards the rail. Hook bolts, if not galvanised, should be oiled periodically to prevent rusting.

(c) Creep and joint gaps should be checked and rails pulled back wherever necessary. Rail fastenings should be tight. Defective rails should be replaced. Where switch expansion joints are provided on the girder bridge, it should be ensured that free movement of the switch is not hindered.

(d) *Guard rails* – Adequacy of guard rail arrangements should be checked. Correct distance between the running rail and guard rail should be maintained as per the prescribed dimensions.

(e) On girder bridges adequacy of pathways for inspection should be checked.

10.0 Maintenance of Points and Crossings: - *Ref: Para 429 of IRPWM-2024*

Maintenance of point and crossing involves correction of track geometry as well as reconditioning of tongue rail, stock rail and crossing. Many fittings in turnout that become loose because of vibration, are to be tightened regularly. Apart from these regular maintenance lugs of slide chairs also break specially near ATS, which are to be welded from time to time. Important issues involved with maintenance of points and crossings are:-

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

(b) Cess level should be such as to permit efficient drainage and adequate depth of ballast cushion should be provided.

(c) Correct spacing of sleepers should be ensured according to the standard layout drawings.

(d) Use of spherical washers at appropriate places in a Points and Crossings assembly is very important. A spherical washer is used to obtain flush fit of the head of the nut of the bolt with the web of the rail, in the switch and crossing assembly. The use of spherical washer is necessary where the shank of the bolt is not at right angles to the axis of the rail.

Spherical Washers are used on skew side In I.R.S. turnouts with straight switches, these should be provided on the left hand side invariably in the switch assembly.

(e) Packing under the sleepers must not be loose/ defective especially under the crossing and the switch.

(f) The chairs and fastenings and all other fittings must be properly secured.

(g) Wear on switches can be reduced by lubrication of the gauge face of tongue rail.

11.0 Works involved in the Maintenance of Level Crossing *(Ref: Para 913 of IRPWM-2024)*

(i) Level crossings laid with PSC sleepers should be overhauled with each cycle of machine packing or more frequently as warranted by condition and in no case shall opening be delayed by more than two years. In all cases, rails and fastenings in contact with the road shall be provided with galvanized fittings. Alternatively, non-galvanized fittings should be thoroughly cleaned with wire brush and a coat of coal tar/anti-corrosive paint applied. Flange way clearances, cross level, gauge and alignment should be checked and corrected as necessary, and the track packed thoroughly before reopening the level crossing for road traffic.

(ii) The painting of gates and discs should be done at regular intervals.

(iv) 'Whistle Boards' and 'STOP' Boards provided on the approaches to level crossings should be properly maintained.

(v) Check rails of level crossing are required to be removed for tamping operations,

***12.*0 Creep of Rail** *(Ref: Para 321 of IRPWM-2024)*

It is a longitudinal movement of rails in the track. Rails have a tendency to move gradually in the direction of the dominant traffic. It is believed to be caused by the 'ironing out' of yielding track by the moving load, augmented by braking loads, and by the impact of the wheels on the running-on ends of the rails, particularly at times when they are in a state of expansion or contraction. Creep takes place on every track but it is more in some localities and negligible in other places.

12.1 Effects of Creep

Among the troubles caused by 'creep' are –

(a) Sleepers getting out of square.

(b) Distortion of gauge.

(c) Loosening of joints.

(d) Shearing and breaking of bolts and fishplates.

(e) Buckling in extreme cases.

12.2 Causes for creep in track

The following are some of the avoidable causes to which creep is attributed:

(a) Inadequate toe loads of the fastening and rails not secured properly to sleeper.

(b) Inadequate ballast resistance to the movement of sleepers due to poor or insufficient ballast or other causes.

(c) Inefficient or badly maintained rail joints.

(d) Improper expansion gaps.

(e) Damaged sleepers, uneven spacing of sleepers.

(f) Lack of proper drainage.

(g) Yielding formation.

(h) Loose/uneven packing.

12.3 Precautions to reduce creep

The PSC sleepers with effective elastic fastenings are considered as creep resistant and therefore no other creep anchors are required. In case, excessive creep is observed on PSC sleeper road, the condition of elastic fastenings, sleepers and adequacy of ballast resistance

should be examined. Action for replacement/ renewal of fittings, sleepers and providing adequate ballast resistance etc. should be taken as necessary

12.4 Creep indicator posts

Creep indicator posts, square to the track should be erected on either side of the track on the cess at suitable intervals of not more than one km apart. These may be unserviceable rail posts with chisel mark square to the joints. The top of the post should be about 25 mm above the rail level and the amount of creep one way or the other measured with a fishing cord stretched over the chisel marks.

12.5 Pulling back of Creep

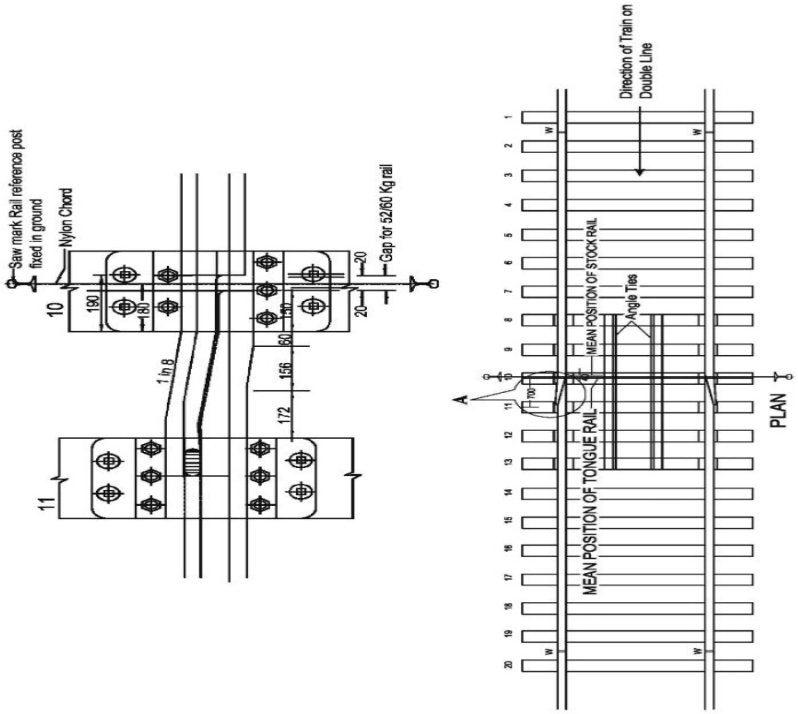
It is a good practice to adjust creep before the commencement of summer. It is desirable to pull back the rails during the cool hours of the day.

When creep has set in, the rails are pulled back to their original positions by means of crow bars and hooks provided through the fish bolt holes of the rail.

13.0 Attention to Switch Expansion Joint (SEJ), Insulated Joints

13.1 Switch Expansion Joint (SEJ)

Switch Expansion Joint (SEJ) is an expansion joint installed at each end of LWR/CWR to permit expansion/contraction of the adjoining breathing lengths due to temperature variations.



13.1.1 Maintenance of SEJs *(Ref: Para 345 of IRPWM-2024)*

(a) Once in a fortnight SEJs shall be checked, packed and aligned if necessary. Oiling and greasing of tongue and stock rails of SEJ and tightening of fastenings shall be done simultaneously.

(b) During his daily patrolling, Keyman shall keep special watch on the SEJs falling in his beat.

13.2 Insulated Joints *(Ref: Para 223 & 622 of IRPWM-2024)*

Track circuited sections are 'insulated' electrically from the track on either side by insulated joints. There are two types of insulated rail joints provided for track circuiting:

(a) Fish plated insulated joints – Insulating components of this type are provided and maintained by S&T department. Rail ends shall be provided as square and smooth, battered ends should be rectified and gap between rails, if large, should be adjusted. The fish plated joint shall be kept tight and ballast well packed in the vicinity of joints to prevent undue movement of rail ends.

(b) Glued Insulated Joint - 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. There are two kinds of glued joints viz. G3L (with six bolts) and G3S (with four bolts) for usage in LWR/CWR and SWR/FR track respectively. The G3L type glued joint should be provided on all run through lines.

13.2.1 Maintenance of Fish plated insulated joints

(a) The metal burrs at the end, if any should be removed well in time to avoid shortcircuiting.

(b) Fish bolts at the insulated joints must be kept tight and the sleepers well packed in the vicinity of the joints.

(c) Rail ends shall be kept free from brake dust, dirt, sand, rust, other foreign materials etc.

13.2.2 Maintenance of glued insulated joints

(a) The ballast used in track in the vicinity of glued insulated joints shall be clean to

ensure efficient packing and drainage.

(b) Care should be taken to see that the ballast is clear of rails and rail fastenings.

(c) The track at glued joint and its vicinity shall be kept clean with efficient drainage.

14.0 Observance of Sleepers under Passage of Traffic *(Ref: Para 608 of IRPWM-2024)*

During the passage of the trains within working hours, the Mate and Track Maintainers at the work site should stand on the cess each about one rail-length apart on either side of the portion of track they are attending to, and observe the movement of sleepers under load.

Immediately after the passing of train, loose sleepers should be marked, packed uniformly and the packing tested. In respect of other trains, the mate and the trackmen should observe the sleepers near where they are working and take similar action. Firm and uniform packing is the primary need for good track maintenance.

15.0 Observance of Train or Seized Bearings/Hot axles, hanging parts of rolling stock-

Gateman shall watch all passing trains and keep a sharp lookout for any unusual like hot axle, hanging chains, hanging batteries, any vehicle/ wagons/ train/ battery box on fire, shifted load, falling material like brake blocks, brake beams, safety bracket, vacuum cylinder, flat tyre or any other situation endangering safe running of trains and be prepared to take such action as may be necessary to ensure safety of trains. *(Ref: RB letter No. 2000/Safety(A&R)/19/39 dt 08.052002)*

16.0 Welding of Rails

(Ref: Para 3, 4 & 5 of Manual for Fusion Welding of Rails by the Alumino-Thermic Process-2022)

On Indian Railways Alumino-Thermic welding (A.T. welding) is required to be done to convert flash butt welded rail panels into long panels and for repair of fracture. A.T. welding with short pre-heating process by using high silica sand mould is being followed at present for welding rails of different chemistry and sections. Short pre-heating is mostly being done by Oxy-LPG and compressed air petrol fuel mixture. Welding of rails is done only by trained and certified welders. Track-Maintainers may provide supporting assistance. The relevant provisions have been reiterated here-

i. The rail ends shall be cut by sawing or using abrasive disc cuter and not by flame cutting.

ii. In case of in-situ welding the rail fastenings for at least five sleepers on either side of the proposed weld shall be loosened. The sleepers adjacent to the joint to be welded shall be shifted to obtain a clear working space of 250 mm on either side to accommodate the moulds, clamps, preheating equipment, etc. The rails shall then be properly aligned, both horizontally and vertically.

iii. When the welding work is carried out on cess, full rail length shall be leveled by supporting on at least ten wooden blocks on either side. The rails shall be properly aligned in horizontal and vertical direction and held in position.

iv. The rail ends to be welded shall be properly aligned in horizontal and vertical planes within the dimensional limits.

v. Before mounting on the rail ends to be welded, each pair of moulds shall be examined for defects, dampness, cracks, blocked vents, etc. and defective moulds discarded. The prefabricated moulds shall be handled with care as they are fragile and liable to breakage.

vi. Post welding, before the passage of traffic, the wedges used for aligning should be removed and joint sleepers which were shifted to obtain the clear gap of 250mm on either side as per para 16.0 (ii) above shall be re-shifted to the original location and repacked. Packing of these re-shifted sleepers should be carried out gently and carefully.

vii. The first train should be allowed to pass on the newly welded joint only after 30 minutes have elapsed since pouring of weld metal. Necessary speed restriction shall be observed until the grinding operation is over.

viii. After the excess metal is trimmed off, the grinding of the remaining metal on the rail table and the sides of the rail head shall be carried out only with rail profile guided grinding trolley of approved design.

17.0 Maintenance of Track in Electrified Areas

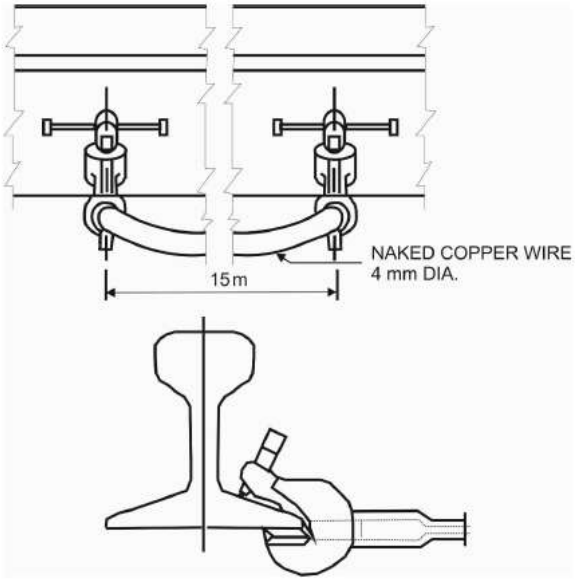
17.1 General Instructions to Staff *(Ref: Para 663 & 664 of IRPWM-2024)*

(a) Every engineering official working in electrical traction area will ensure that rules pertaining to carrying out engineering works in electrical traction area are strictly observed.
(b) All electrical equipment, every power line or cable shall be regarded as being 'live' at all times. No work shall be commenced adjacent to any electrical equipment except on authority issued in writing by a competent official of the Electrical Department to the effect that the equipment has been made dead and earthed.
(c) Defects or break-downs in the overhead equipment including track and structure bonds noticed by the Engineering staff shall be reported immediately to the Traction Power Controller. When defects in the overhead equipment that are likely to cause damage to pantographs or trains, are noticed and it is not possible to convey information to Station Masters or signalmen to enable them to issue caution orders, the line shall be protected by the staff.
(d) Any hole drilled in the rail for providing OHE bonds should be at the neutral axis of the rail and chamfered.
(e) While carrying out the track maintenance, various OHE installations should be got removed, wherever they interfere with the maintenance activities so as not to cause any damage to such fixtures.
(f) No work shall be done within a distance of two metres from the live parts of the O.H.E. without a 'permit-to-work'.
(g) No part of the tree shall be nearer than 4 m from the nearest live conductor. Any tree or branches likely to fall on the live conductor should be cut or trimmed periodically to maintain the safety clearances
(h) No fallen wire or wires shall be touched unless power is switched off and the wire or wires suitably earthed. In case the wires drop at a level crossing, the Gatekeeper shall immediately make arrangements to stop all road traffic
(i) All bonds removed by the staff of the Engineering Department shall be replaced by the staff of the Engineering Department.
(j) Steel tapes or metallic tapes with woven metal reinforcement or metallic staff should not be used in electrified tracks. Linen tapes are safer and, therefore, should be used even though they are not accurate.

17.2 Maintaining Continuity of Track *(Ref: Para 665 of IRPWM-2024)*

(a) During maintenance or renewal of track, continuity of the rails serving electrified tracks shall invariably be maintained. For bridging gaps which may be caused during removal of fish-plates or rails, temporary metallic jumpers of approved design shall be provided as under. The necessary jumper will be provided by the electrical department on requisition.

(b) In case of rail fracture, the two ends of the fractured rail shall be first temporarily connected by a temporary metallic jumper of approved design (as shown in the sketch below). In all cases of discontinuity of rails, the two parts of the rail shall not be touched with bare hands; Gloves of approved quality shall be used.



17.3 Additional Precautions in A.C. Traction Area *(Ref: Para 665 of IRPWM-2024)*

The following additional precautions are required to be taken in A.C. traction areas:

(a) Build-up of potential due to induction in metallic bodies situated close to O.H.E. – It is important to note that dangerous voltages may be induced in metallic masses such as fencing posts in the vicinity of traction conductors. To avoid possibility of shock due to such voltages, the metallic structures are bonded together and earthed.

(b) Unloading of rails – When unloading rails along tracks, care shall be taken to ensure that rails do not touch each other to form a continuous metallic mass of length greater than 300 metres.

(c) Permanent way staffs are advised to keep clear of the tracks and avoid contact with the rails when an electrically hauled train is within 250 m.

17.4 Fire in Electrified Areas *(Ref: Para 667 of IRPWM-2024)*

The permanent way officials noticing a fire likely to result in loss of life or cause damage to property shall take all possible steps to prevent it from spreading and to extinguish it. In case the fire is on adjacent to any electrified equipment, the permanent way official shall make no

attempt to extinguish the fire but shall report the occurrence of fire to the nearest Station Master by most expeditious means.

18.0 Precautions to be taken while Working in Track Circuited Areas *(Ref: Para 662 of IRPWM-2024)*

(a) No tool or metal object should be placed across or touching two rails in the track which may cause short circuiting.
(b) All gauges, levels and trolleys used in the track-circuited length should be insulated.
(c) Steel or C.I. pipes used for carrying water/gas under the track should be run sufficiently below the rails to prevent any short-circuiting.
(d) While carrying out the track maintenance, various S&T/Electrical installations should be got removed, wherever they interfere with the maintenance activities so as not to cause any damage of track circuit fittings like rail bonding wires, lead wires to rails, boot leg, jumper wires etc. .
(e) Use of steel tapes should be avoided in track-circuited section.
(f) Pulling back of running rails in track should be done in track-circuited areas in the presence of S&T staff, where signalling connections are involved.
(g) Proper drainage should be ensured so as to avoid flooding of track, during rains, particularly in yards, where watering of coaches is done.
(h) Ballast must be kept clean throughout the track circuited section.
(i) On PSC sleepers track, availability of insulated liners upto a minimum level of 97% shall be ensured.
(j) Any hole drilled in the rail for providing S&T fixtures should be chamfered.

(k) No cable laying work should be allowed to start without approved plan and thereafter permit from Engg. supervisors. *(Ref: Para 1504 of Handbook for Track Maintenance issued by IRICEN Pune)*

REFERENCES

S. No.	Description
1.	Indian Railways Permanent Way Manual (IRPWM)-2024 (Corrected up to ACS - 5)
2.	Indian Railway Small Track Machine Manual-2024
3.	Manual for Fusion Welding of Rails by the Alumino-Thermic Process-*2022*
4.	Handbook *for* Track Maintenance, IRICEN, May, 2016.
5.	Track Maintenance, Diploma Course in Railway Engineering, Institution of Permanent Way Engineers (India)
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CAMTECH is continuing its efforts in the documentation and up-gradation of information on maintenance practices of civil engineering assets. Over the years a large number of publications on civil engineering have been prepared in the form of handbooks, pockets books, pamphlets and video films, etc. These publications have been uploaded on the internet as well as on rail net.

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
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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:

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