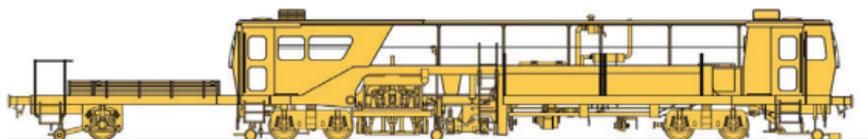




INDIAN RAILWAYS

HANDBOOK ON TRACK MACHINES
for
Permanent Way- Officers and Supervisors



February-2020

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FORWARD

Indian Railways Track Machine Manual published in March, 2000 has been revised in September, 2019. In the revised manual, working instructions and technical details of all new track machines inducted into Indian Railways in between has been included. Also, the working principle and working instructions of all track machines has been incorporated in detail for proper understanding of their working and for proper execution of work by them. However, need was felt for a handbook for P.Way engineers, containing only relevant instructions and guidelines from manual, normally required to be followed by them for executing the work properly at site.

I am happy that Track Machine Directorate, IRICEN and RDSO is bringing out pocket size handbook on Track machines for Permanent Way officers and Supervisors containing relevant working instructions from manual for proper execution of work. It is handy and can be easily carried to worksites by all P.Way Engineers instead of voluminous manual. The Track Machine manual available on machine can be referred.

It is hoped that this handbook will be quite useful to all the field officers and staff associated with mechanized maintenance of track machine working.

New Delhi
February 2020

Vishwesh Chaube
Member Engineering
Railway Board
New Delhi

PREFACE

Indian Railway has already shifted to fully mechanized system of laying and maintenance of track. Many new machines have been inducted and Indian Railways Track Machine Manual has been revised in 2019, incorporating working and technical detail of all type of track machines deployed over Indian Railways. However, a pocket size concise handbook containing only working instructions of different machines and which can be easily carried to worksite was found necessary. Shri Anil Choudhary, Sr Professor/Track Machines, IRICEN & Shri Om Prakash, Director/Track Machine-III, RDSO has prepared this handbook.

The handbook prepared is very concise and contains such working instructions of IRTMM-2019, normally required to be followed for correctly executing the work with track machines at site. The handbook has been prepared keeping in view the requirement of P.Way supervisor and officers, however it will be equally useful for track machine staff and officers. It is handy & can easily be carried to the work site. For detail instructions, Indian Railway Track Machine manual may be referred.

Pune
February 2020

Ajay Goyal
Director/IRICEN

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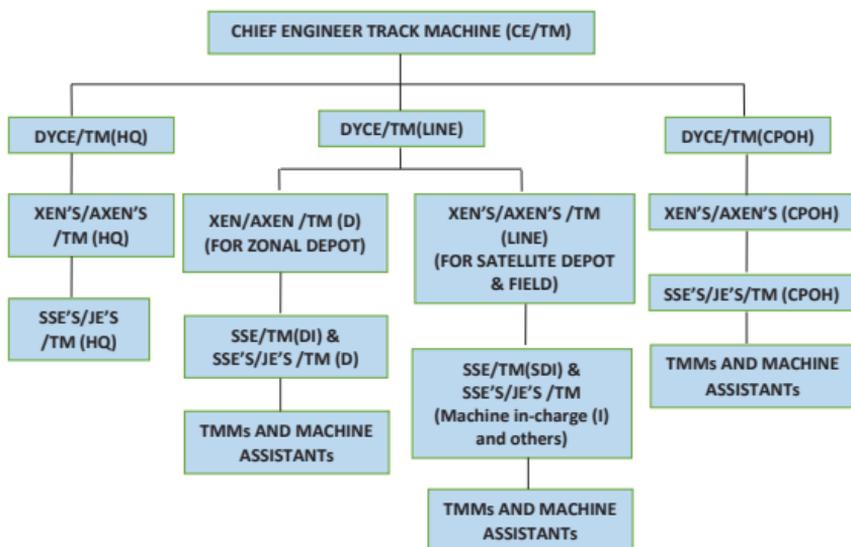
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CHAPTER-I

Track Machine Organisation, Duties of Officials and Inspection Schedule

1.0 Track machine organisation structure:



CPOH may be headed by CWM in place of CE/TMC. The organisation responsibility is:

- Manpower planning including their training and development.
- Planning and deployment of track machines.
- Operation and monitoring of track machines.
- Repair and maintenance of track machines.

1.1 Types of Machines - Following major on-track machines are at present working on Indian Railways:

1.1.1 Tamping Machines

a) Tampers without Satellite Unit

- 08-16 Unomatic.**
- 08-32 Duomatic-**
 - 08-32 Duomatic (Plasser India)
 - 08-32C Duomatic (Plasser & Theurer)
 - 08-32 WST with flat car (Metex – JSC Moscow, Russia)
 - VPR -02M without flat car (Kalugaputmash, Russia)
- UNIMAT (Points and Crossing Tamper):**
 - 08-275-2S UNIMAT (Plasser India).

- 08-275-3S UNIMAT (Plasser India- with third rail lifting arrangement).
- 08-475-4S UNIMAT (Plasser India- with arrangement for lifting and packing of third rail).
- Multi Purpose Tamper (Plasser India -Plain and Points and Crossing Tamper).

b) Tampers with Satellite Unit

- i. 09-32 CSM.
- ii. 09-3x Tamping Express.
- iii. 09-3x Dynamic Tamping Express.

1.1.2 Dynamic Track Stabilizer (DTS)

- i. DTS by Plasser.
- ii. DTS by BHEL.
- iii. DTS by Metex.

1.1.3 Ballast Handling Machines

a) Ballast Cleaning Machines (BCM)

- i. RM-80 92I (Plasser India-for plain track).
- ii. RM-76 (Plasser India- for turnout).
- iii. RM-80 92U (Plasser India- for plain track and turnout).

b) Shoulder Ballast Cleaning Machines (SBCM)

- i. FRM-80 (Plasser India).
- ii. FRM-85F (Plasser India).

c) Ballast Regulating Machine (BRM)

i. Without Hopper

- BRM Model 66-2/56-3 and (Kershaw).
- PBR 400R (Plasser India).
- BRM Model SPZ-210 K (Gemac Engg).

ii. With Hopper

- USP 2000 SWS (Plasser India).
- RPB-01 (Metex, Russia).

1.1.4 Track Laying Machines

- a) Track laying Equipment (Plasser India and Simplex).
- b) Track Relaying Train (TRT) .
- c) Points and Crossing relaying Machine T-28 (AMECA-Make).

1.1.5 Rail/Switch Grinding and Milling machine

- a) Rail Grinding Machine
- b) Switch Grinding Machine
- c) Rail Milling Machine

- d) Rail Inspection Vehicle

1.1.6 Special Purpose Machines

- a) Utility Track Vehicle (UTV).
- b) Rail Borne Maintenance vehicle (RBMV).
- c) Muck Disposal Unit (Plasser India)

1.2 Duties of Track Machine Officials.

Responsibility in brief are:

- (a) Dy CE/TM(HQ) and his team shall be responsible for planning and deployment of machines.
- (b) Dy CE/TM (Line) and his team shall be responsible for actual operation and maintenance of machines. Each machine shall be headed by SSE/JE/TM (In-charge) and he shall be assisted by other SSE/JE/Track machine, Track Machine Maintainer (TMM) and Khalasis who for track machine shall be called Machine Assistants. Duties of each of them is specified in IRTMM.
- (c) Dy CE/CPOH shall be responsible for POH of machine received from Zonal railways.

1.3 Duties of Open Line Officials

1.3.1 Assistant Divisional Engineer (open Line)

He shall perform following duties regarding track machines working in his section

- a) He shall ensure that the pre-requisites for introduction of various track machines as specified in this manual are complied with, well in advance of deployment of the machine(s).
- b) In the stretches where the requirement of tamping is more than the normal tamping cycle, the cause should be analysed and suitable remedial action taken to restore the normal cycle.
- c) He shall make arrangements for pre-block, during block and post block activities.
- d) He shall ensure that machines are utilised in continuous stretches as per planned programme avoiding frequent shifting of the machines.
- e) He shall ensure suitable accommodation for machine staff as required with the facility of water supply, power supply and resting arrangements.
- f) He shall periodically inspect track machines working in his jurisdiction as per specified schedule.
- g) He shall arrange HSD for machines including transportation of consumables, spares etc. required by the machines from the depot to site of work.
- h) He shall ensure adequate lighting arrangements when night working of machines is involved.

- i) He shall monitor the output and quality of work done by the machines.
- j) He shall co-ordinate with other departments like Traffic, OHE and S&T in the field to facilitate machine working.
- k) In the eventuality of breakdown of machine, he shall take all possible actions to clear the block section expeditiously, once it is known that machine cannot be repaired in the block.

1.3.2 Duties of SSE/JE/P.Way Deployed with the Machine

He shall be the in-charge of the supervision of the work of track machine. He shall perform following duties:

- 1) He shall ensure that the pre-requisites for introduction of various track machines as specified in IRTMM are complied with, well in advance of deployment of the machine like collection of site details and computation of values to be fed for design mode of working.
- 2) He shall be responsible for pre-block operations, block operations (other than machine operation) and post block operations as detailed for various machines.
- 3) During working of track machines, he shall check the track parameters and condition of track, attending to any shortcomings, ensuring that the track parameters are well within the tolerances. He shall also ensure that track is free of obstructions and infringements for safe passage of traffic before clearing the line block. As required or stipulated he shall allow traffic at suitable speed restriction based on the condition of track after machine working. He shall be responsible for issue of all necessary caution orders for machine working.
- 4) Transportation of tamping tools to be reconditioned and bringing back reconditioned tamping tools will be his responsibility. Similarly, he will be responsible for temporary storage and timely arrangement and transportation of diesel oil, lub oil, hydraulic oil and other consumables from the depots to various machines working in his jurisdiction.
- 5) In case the quality of work done by the machine is not satisfactory, he shall investigate and take suitable remedial measures in coordination with SSE/JE/TM
- 6) He is responsible for protection of the site of work and adjoining track wherever necessary. He will be responsible for arranging adequate precautionary measures for the safety of staff working with machine in the block section against danger of trains on the adjoining line(s). He shall arrange for track protection and provide look out men for safety at site.
- 7) He is responsible to ensure that the machine(s) are stabled in suitable sidings and at such stations as to minimise idle run of the machines as well as wastage of block hours in entering and clearing of the block section.
- 8) He shall provide all assistance to SSE/JE/TM for repairing of machine

and winding up for expeditious clearing of the block section in case of failure of the track machines in mid-section, duly calling for necessary assistance of light engine, breakdown special etc. as necessary.

9) He shall arrange for protecting and watching of stabled machines and he shall also ensure that no sick vehicles etc. are pushed into the same siding affecting the taking out of the machines to avail blocks.

10) He shall co-ordinate with other departments like Traffic, OHE and S&T in the field to facilitate working.

1.4 Inspection of Track Machines

1.4.1 Schedule for Track Machine officials

Track machine*	Inspection frequency of Track Machine Officials		
	Dy.CE/TM/ Line	AXEN /XEN/ TM/Line	SSE/TM/SDI or SD
RGM	3 months (Owning Railway)	Monthly (Owning Railway)	Fortnightly (Owning Railway)
	Monthly (Working Railway)	Fortnightly (Working Railway)	Weekly (Working Railway)
TRT	6 Months	Monthly	Fortnightly
TLE/ PCCM	1 Year	2 Months	Fortnightly
TEX/CSM/ UNIMAT WST	1 Year	3 Months	Monthly
BCM/ SBCM	1 Year	2 Months	Monthly
MPT/DTS/ BRM/ UTV/RBMV	Need Basis	4 Months	2 Months

**The inspection schedule is for individual machine. E.g. if there are 3 BCMs under one division, then AEN/TM/Line shall inspect each BCM, once in 2 months*

The inspecting officials shall issue inspection reports to their concerned immediate subordinates with a copy marked to immediate concerned superior.

1.4.2 Schedule for Open Line Officials:

Track Machine	Inspection frequency of open line officials			
	Sr.DEN	ADEN	SSE (P.Way) in-charge	JE (P.Way) sectional
TEX, CSM, DTS, WST, UNIMAT and SBCM	3 Months	Fortnightly	During supervision of pre-block, during block and post-block works but not less than once a week	During supervision of pre-block, during block and post-block works but not less than once a week
RGM, TRT, TLE, PCCM, and BCM	2 Months	Fortnightly		
MPT, BRM, UTV, RBMV etc.	As per need	Once during the deployment		

Copy of inspection report of ADEN shall be sent to AEN/TM/Line and that of Sr. DEN/DEN shall also be sent to Chief Engineer/TM and Deputy Chief Engineer/TM/Line and Dy.CE/TM/HQ in addition to concerned subordinate officials.

1.5 Items to be Inspected by Open Line Officials:

While track machine official shall inspect machine as per detail checklist issued by RDSO, open line official shall inspect the functional aspect of machine. The broad list of items to be checked and inspected by open line officials are given below.

- (a) **Pre-Block Inspection** They shall reach the stabling siding or station at least one hour before the block time. They shall check the following
- (i) Staff accommodation/facilities.
 - (ii) Infrastructural facilities like sidings, rest house, water supply and electrical connection etc.
 - (iii) Knowledge of safety rules of SSE/TM, MCM, TMM & machine assistants.
 - (iv) Working of emergency backup system for clearing block in case of machine failure.
 - (v) Adequate safety of staff working in block section against danger of incoming trains on adjacent lines.

- (vi) Staff attendance.
- (vii) Checking of competency certificates, route learning and medical fitness of staff, issues of field staff.
- (viii) Records of the machine failures and general health of machine.
- (ix) Availability of Codes and manuals with latest correction slips.
- (x) Availability of safety items/equipment as per prescribed norms.
- (xi) Availability and expiry date of detonators, fire extinguisher and first aid box.
- (xii) Availability of machine deployment plan and the actual deployment vis-a-vis the plan.
- (xiii) Working of braking system.

SSE/JE/P.Way shall inspect item (i) to (v). They will check the knowledge of safety rules for MCM, TMM and machine assistant.

(b) During Block Working

- (i) Shall inspect working of the machine(s)
- (ii) Safety precautions and practices observed, during traffic block in addition to attention to pre-requisites, works to be done during and post machine-working activities.
- (iii) They shall record the results of their inspection and ensure compliance within a reasonable time.
- (iv) Immediate action shall be initiated in respect of areas where the condition of machine or track aspects needs quick attention.
- (v) A report shall be submitted to the next higher authority at the end of every month indicating inspections carried out, deficiencies noticed and remedial actions taken.

(c) Machine Specific Items

Items to be checked for different machines by TMO as well as open line officials are listed below:

(i) TAMPERS

- Adequacy of track data required for the selected mode of working
- Mode of working and its appropriateness
- Condition of tamping tools
- Tamping parameters like; tamping depth, squeezing time, squeezing pressure, vibration pressure
- General lift, ramp in and ramp out, slew, lift, versine values, SE etc
- Tamping quality

(ii) BCM

- Condition of cutting chain and its fingers
- Condition of Screens
- Pre-survey and removal of obstructions
- Quality of screening and ballast distribution
- Waste conveyor safety switch operation
- Width and depth of cutting of ballast profile
- Safety precaution at closing of work

(iii) TRT

- Condition of BFR, gantry rail and bridge rail
- Sleeper picking and laying system (NT and OT conveyor)
- Sleeper spacing system (Index wheel)

(iv) BRM

- Functioning of all systems for dressing and distribution of ballast
- Condition of broom and conveyor belt
- Condition of different ploughs
- Working of hopper system where provided
- Quality of profiling done

(v) SBCM

- Condition of cutting chain and its cap
- Condition of Screens
- Screening width
- Operations of waste conveyor safety switch
- Quality of screening

(vi) TLE

- Proper laying of auxiliary track and its support system
- Working mode and working speed of machine
- Condition of BRNs

(vii) PCCM

- Function of motorized trolleys
- Arrangement of wooden block support for crawler

- Proper hooking of turnout
- Condition of hooks and pins
- Quality of laying (alignment) by machine

(viii) UTV/RBMV

- Condition of crane and its attachments for lifting materials
- Availability of all specified tools and plant and their condition.
- Condition of BRNs

(ix) RGM

- Condition of Grinding stone and spark arrestors
- Check track data in GDMS format uploaded in Machine, particularly direction of curve
- Grinding inputs (pattern) and input system
- Measurements at identified test locations wherever existing
- Sufficient water in water wagon and its discharge system
- Grinding quality and improvement in GQI
- Cleaning of machine of iron dust and its proper disposal
- Precautions at location of obstructions like points and crossing curve with checkrail etc.

(x) DTS

- Frequency of Vibration and static load
- Working mode and working speed
- Track parameter after work
- Precautions taken on bridges, tunnels etc.

(d) General Items

- (a) Output of the machine vis-a-vis traffic block
- (b) In Tampers, they should check Tamping charts and check reasons and suggest for remedies to increase tamping cycle
- (c) In BCM's they shall ensure that depth of cutting is a judicious mix of Lifting and Excavation based on advance survey and proposed L-section.
- (d) Check benchmarks & reference marks and obligatory points.

Inspection to be done as per check list enclosed as Annexure-I for different machines.

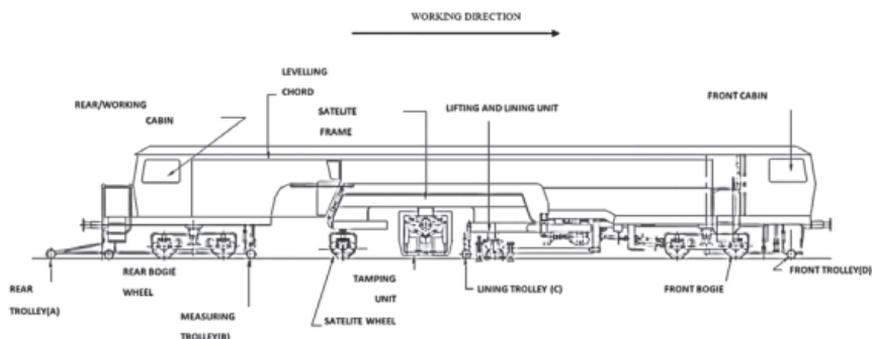
CHAPTER-II

Tamping Machines and Dynamic Track Stabiliser

2.0 Functions of Tamping machines

- (a) Packing of ballast under the sleepers.
- (b) Correction of alignment,
- (c) Correction of longitudinal and cross levels.

2.1 Layout of Tamping Machines (CSM)



The trolley distances of different machines are given in **Annexure-II**

2.2 Tamping Parameters

2.2.1 Squeezing Pressure

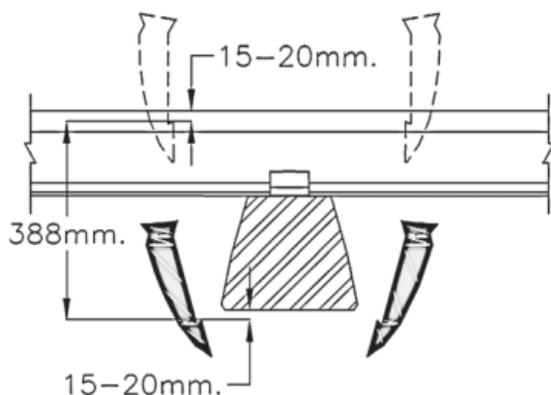
Type of Track and Sleeper	Squeezing Pressure
Plain Track (CST9)	90-100 Kg/cm ²
Plain track (ST& wooden)	100-110 Kg/cm ²
Plain track (PSC)	110-120 Kg/cm ²
P & C (ST/Wooden)	110-115 Kg/cm ²
P & C (PSC)	125-135 Kg/cm ²

2.2.2 Tamping Depth

Type of Sleeper	Desirable gap between top edge of the tamping tool blade and bottom edge of sleeper (Initial setting)
Flat Bottom Sleeper	15-20 mm
Metal Sleeper	22-25 mm

Tamping depth = Rail Height + Rubber pad thickness + Sleeper thickness at rail seat

Track structure	Rail Height	Rubber Pad Thickness	Sleeper Height at Rail Seat	Tamping Depth
60Kg Rail on 60 Kg Sleeper	172 mm	6 mm	210 mm	388 mm
52 Kg Rail on 60 kg Sleeper	156 mm	6 mm	210 mm	372 mm



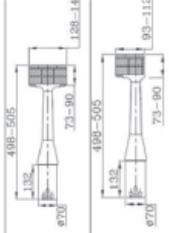
2.2.3 Squeezing time:

Between 0.8 to 1.2 seconds. For loose ballast it should be on lower side i.e close to 0.8 sec. and for caked ballast it should be on higher side i.e 1 to 1.2 seconds.

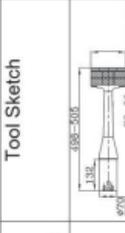
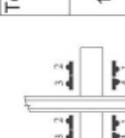
2.2.4 Tamping Tool

Wear up to 20% of original area is permitted. Position of tamping tool in different machines are shown at Page No. 12, 13 & 14.

a. Position of tamping tool for T-Express

TOOL DESCRIPTION FOR TAMPING EXPRESS (09-3X)			
Tool	RDSO Drg. No	Total No Required (out of 48)	Tool Sketch
1	RDSO/TM/15A/16	32	
5	RDSO/TM/15E/16	16	

b. Position of tamping tool for new CSM (MODEL CSM-955 onward) and new DUOMATIC

TOOL DESCRIPTION FOR NEW CSM AND DUO			
Tool	RDSO Drg. No	Total No Required (Out of 32)	Tool Sketch
1	RDSO/TM/15A/16	08	
2	RDSO/TM/15B/16	08	
3	RDSO/TM/15C/16	08	
4	RDSO/TM/15D/16	08	

c. Position of Tamping Tools for CSM (UPTO CSM 954)& DUO Tamping Machine (Old Model)

TOOL DESCRIPTION FOR CSM & DUO (OLD MODEL)			Tool Sketch
Tool No	RDSO Drg. No	Total No Required (Out of 32)	
6	RDSO/TM/14A/16	16	
7	RDSO/TM/14B/16	04	
8	RDSO/TM/14C/16	04	
9	RDSO/TM/14D/16	08	

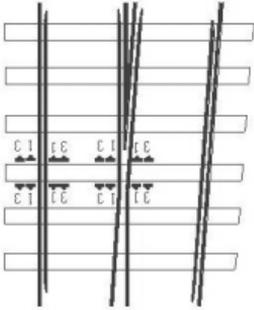
Note:
 1. NO. 2 & 4 CAN BE REPLACED BY EACH OTHER
 2. DIMENSIONS ARE IN MM.

d. Position of Tamping Tools for UNIMAT-45 Tamping Machine

TOOL DESCRIPTION FOR UNIMAT-45 TAMPING MACHINE			Tool Sketch
Tool No	RDSO Drg. No	Total No Required (Out of 16)	
1	RDSO/TM/01A/16	08	
2	RDSO/TM/01B/16	08	

e. Position of Tamping Tools for UNIMAT-2S & 3S Tamping Machine

TOOL DESCRIPTION FOR UNIMAT-2S&3S TAMPING MACHINE			
Tool	RDSO Drg. No	Total No Required (Out of 16)	Tool Sketch
1	RDSO/TM/01A/16	08	
3	RDSO/TM/01C/16	08	



2.3 Correction of Alignment.

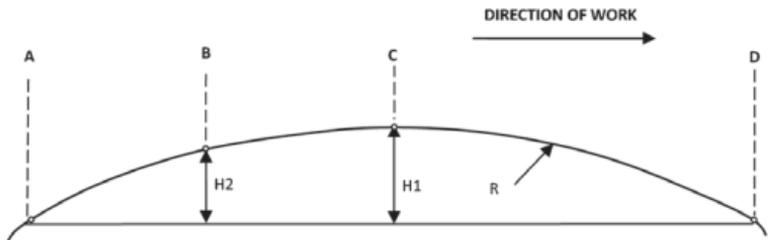
2.3.1 Reference Rail

- On curved track – outer rail (however if outer rail is highly worn out, inner rail should be taken as reference rail)
- On straight track on single, double and middle line in multiple line section – Any of the two rails of the track being tamped, which is less disturbed

2.3.2 4- Point Lining Method

4-Point method to be applied only for curves

The geometrical property of circle used is



$$\text{Theoretical Versine } H1 = \frac{AC \times CD}{2R}, \quad H2 = \frac{AB \times BD}{2R}$$

$$\text{Versine Ratio } i = \frac{H1}{H2} = \frac{AC \times CD}{AB \times BD} \text{ (is independent of radius of the curve}$$

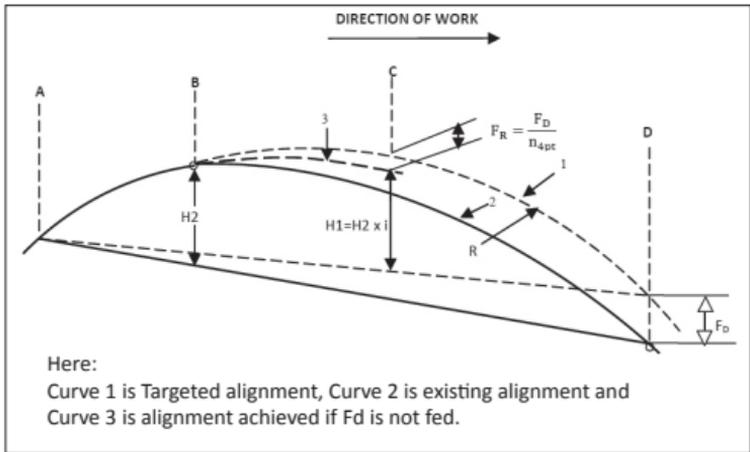
and depends only on trolley position therefore is machine property)

$$H1 = i \times H2$$

Trolley A & B are at corrected track. Machine measures H2, which is taken as correct and corresponds to some radius. It achieves H1=iH2 achieving the same radius at C as at trolley B.

Corrections to be fed:

a) **Front offset (Fd)- The error due to front trolley being on disturbed track:**



This Fd value can be calculated from

- **Fixed reference available-** Track disturbed at front trolley location w.r.t target alignment as measured from known fixed references.
- **Fixed references not available-** Slew values from slew chart (ROC) at front trolley location.

Fd is written on sleepers with direction and are fed at front trolley location in slew potentiometer provided in front cabin.

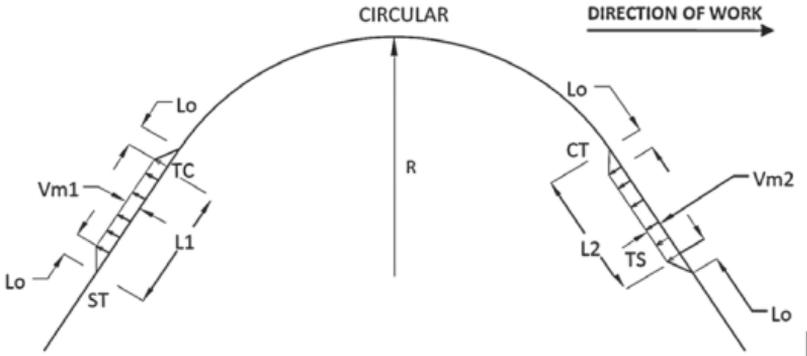
b) **Versine correction Vm - Error due to all four trolleys not in circular curve**

To be applied in at all locations of changing radius

- Transition of curve
- Compound curve
- Reverse curve etc

This versine correction is written at front trolley location on sleeper, however is applied at Lining trolley (C) location.

CORRECTION FOR TRANSITION CURVES WITH LINEAR CURVATURE



Direction of Versine correction:

- I. At entry will be towards outside of curve
- II. At entry will be towards inside of curve

The value of versine correction can be obtained from RT-4 manufacturers manual supplied with machines.

Here $L1$ and $L2$ are transition length and $L0$ is machine chord length
AD

Direction of Versine correction in this case is :

- i. At entry will be towards outside of curve
- ii. At entry will be towards inside of curve

The value of versine correction can be obtained from **RT-4 manufacturers manual** supplied with machines. A sample for M/s Plasser make MPT machine for Vm and its distribution is given in **Annexure-III**.

For Curve without transition, compound and reverse curve, the versine correction to be calculated as explained in IRTMM.

Types of 4-Point Lining:

1. **Smoothering mode:** No target alignment is decided to be achieved.
 - Only Vm correction is fed

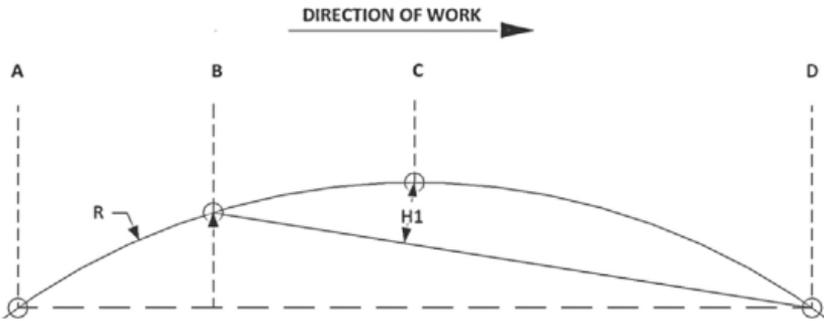
Thus, desired alignment is not achieved and only smothering of track is done.
2. **Design mode:** Targeted alignment proposed is decided
 - Both Vm and Fd are calculated and fed.

Thus, desired alignment is achieved.

2.3.3 3- Point Lining Method

3-Point method to be applied for both straight and curved track.

- i. **For Curve** the geometrical property of circle used is



The measuring chord is fixed between Points B and D. Geometrically

$$H1 = \frac{BC \times CD}{2R}$$

$$\text{Theoretical value } H1 = \frac{BC \times CD}{2R} = (\text{System constant})/R$$

- a. **Versine values of complete curve as to be fed in front tower of m/c:**

For curve with parabolic transition, the versine values to be written on sleepers will be as shown at page no. 19.

$$H = \frac{(\text{System constant value})}{R}$$

Where R is radius of targeted curve, L1 and L2 are length of two transitions.

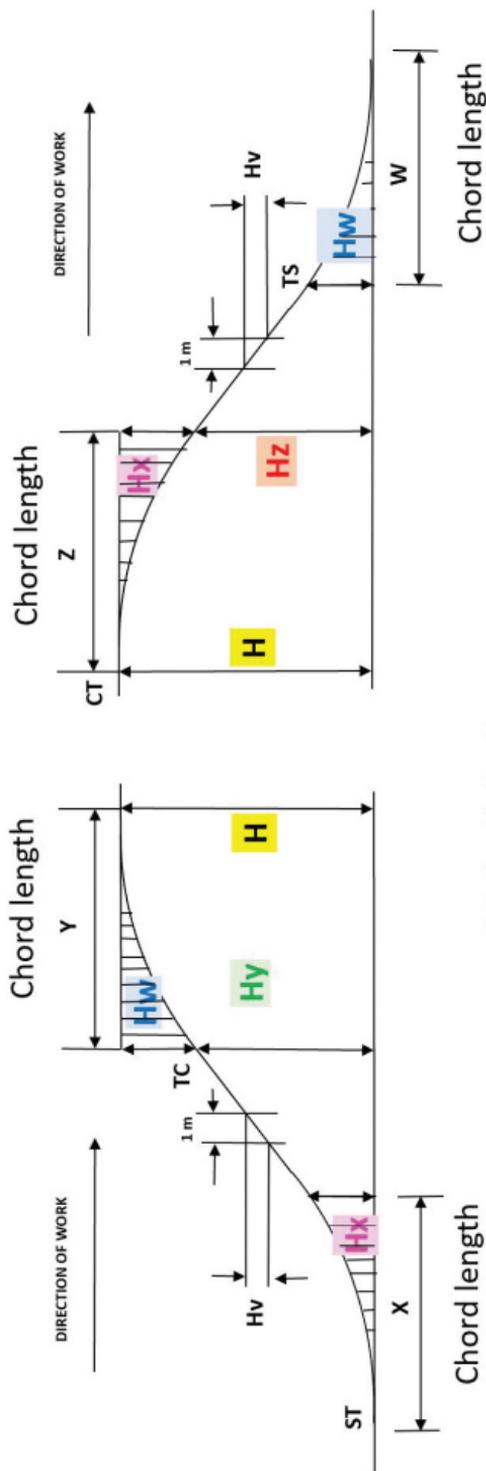
SECTION X:

$$Hx = \frac{Cxz}{RxL1}$$

BETWEEN SECTION X and Y:

After section X till TC (end of the transition) the versines are increased by adding of one "Hv" per meter

$$Hv = H/L1$$



3 Point Lining System

$$H = (BC \cdot CD) / 2R$$

$$H_x = Cx_z / RL$$

$$H_w = C_y w / RL$$

$$H_z = H - H_x$$

$$H_y = H - H_w$$

X, Y, Z, W are region of Chord length

Section X, Y, Z and W equal to machine chord length (BD) for 3point lining.
The versine of circular curve is

SECTION Y:

Hy for the section 'Y' are calculated as

$$H_y = H - H_w \quad \text{where } H_w = \frac{C_{yw}}{R \times L1}$$

Where H_w is further defined below

SECTION Z:

H_z for the section 'Z' is

$$H_z = H - H_x \quad \text{where } H_x = \frac{C_{xz}}{R \times L2} \quad \text{and } L2 \text{ is transition length at exit}$$

BETWEEN SECTION Z and W:

After section "Z" till "TS" the versine are decreased by subtracting of the " H_v " per meter where $H_v = H/L2$

SECTION W:

The Versine " H_w " is obtained from formula

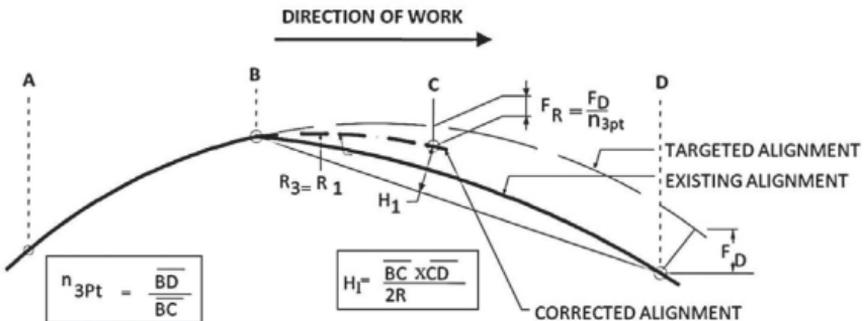
$$H_w = \frac{C_{yw}}{R \times L2}$$

The operational constant C_{xz} and C_{yw} are given in **manufacturers manual RT-3** of each machine. A sample calculation for M/s Plasser India make MPT machine is enclosed as **Annexure-IV**. In RT3 X, Y, Z, W are represented as A, B, C and D respectively.

b. Corrections to be fed

Front offset (Fd)-The error due to front trolley being on disturbed track

i. For Curve

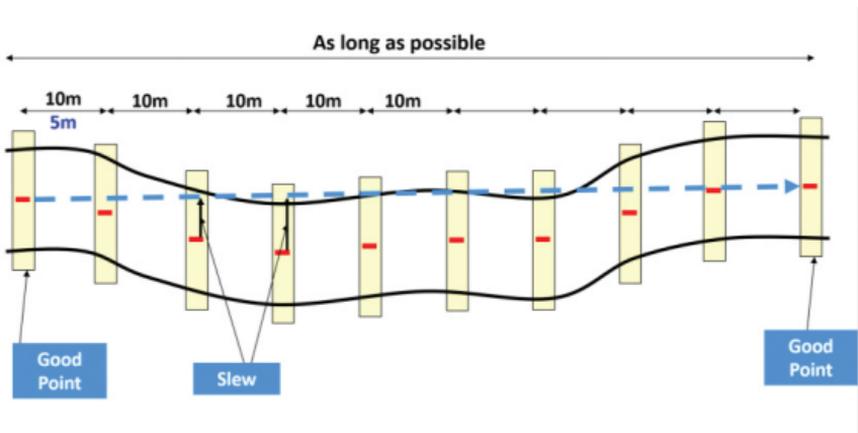


This F_d value can be calculated from

- **Fixed reference available-** Track disturbed at front trolley location w.r.t target alignment as measured from known fixed references.
- **Fixed references not available-** Slew values from slew chart (ROC) at front trolley location.

F_d values are to be written on sleeper to be fed in slew potentiometer in front cabin when front trolley is above that location.

- ii. **For Straight**, versine value (H) to be fed is zero and slew (F_d) is to be calculated from field survey as shown below



Types of 3-Point Lining:

1. Elementary mode:

- Only versine values for known R and L for curve are calculated and fed. For straight, versine is zero.

Proper alignment is not achieved and only smoothing to some extent of track is done.

2. Design mode: Targeted alignment proposed is decided

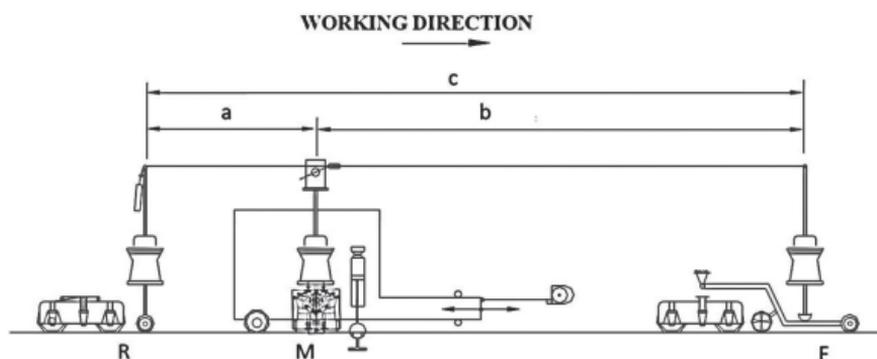
- Versine values (H, H_x, H_y, H_z, H_w) for targeted R and L for curve are calculated and fed. For straight versine value is zero.

- F_d for achieving targeted alignment calculated and fed.

Targeted alignment is achieved.

2.4 Correction of Longitudinal Level

2.4.1 The levelling system



R=REAR MEASURING POINT

M=MEASURING AND CORRECTION POINT

F= FRONT MEASURING TOWER

2.4.2 Datum Rail

- On curves- inner-rail.
- On straight track in double line-Less disturbed rail, which is generally non-cess rail.
- On straight track in single line and straight middle track in multiple lines section- higher/less disturbed rail.

2.4.3 Modes of levelling:

a) Levelling in Automatic Mode (Smoothering Mode) –

- General lift (GL) is provided on datum rail.
- The amount of general lift will be the algebraic difference of higher and lower point of Datum rail as found in stretch to be attended + 10 mm.

General Lift on Curves –

General lift	Value of General Lift
Existing SE < Equil SE	Track irregularities over the Datum Rail (Inner Rail + 10 mm)
Existing SE > Equil SE	Track irregularities in the Datum Rail plus max difference between existing and equilibrium SE

b) Design or Precision Levelling Mode

Datum rail level to be plotted, and final level is decided and lift value calculated. Instead of general lift, Lift value (Y) be fed in front tower for datum rail.

In curves if Existing SE > Equil SE, final level to be so decided that
 $Y >$ Existing SE-Equilibrium SE

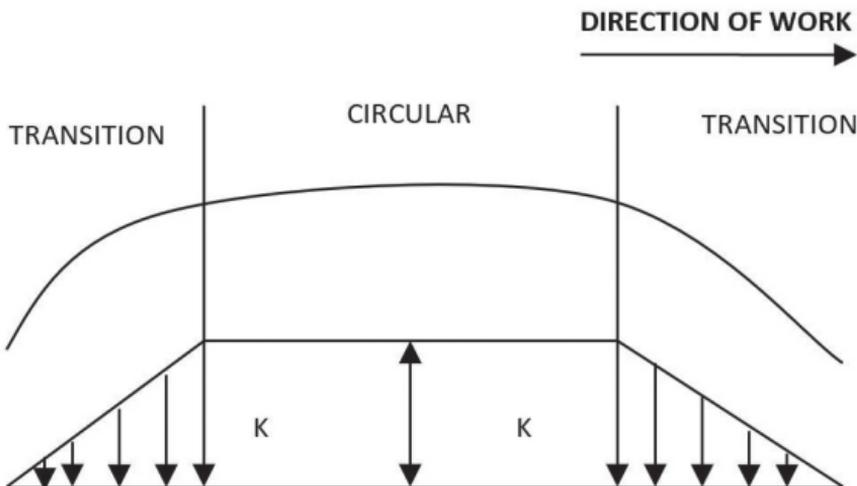
Minimum 20 mm general lift/lift should be provided.

2.4.4 Correction in general lift/lift value

These corrections are given in **manufacturers manual NT**

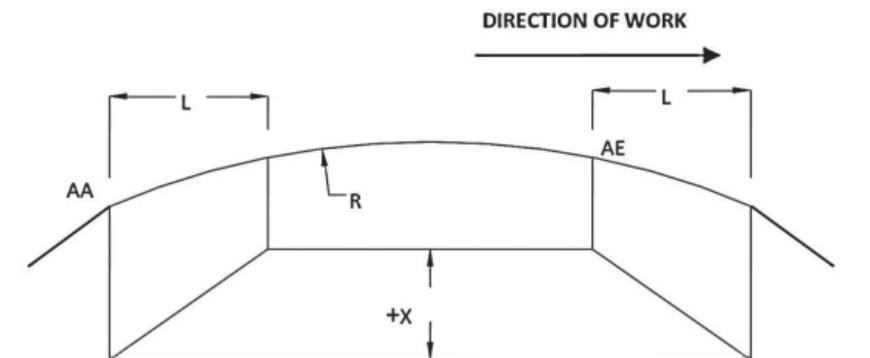
Due to Horizontal Curve (K correction)-

To be **subtracted** from General lift or Lift Value

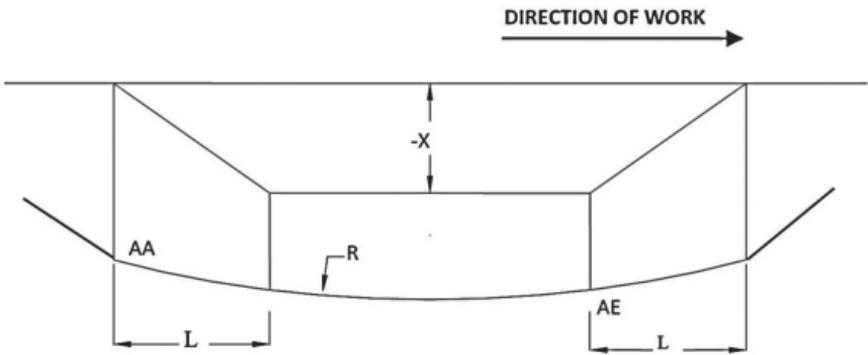


Due to Vertical Curve (X correction)-

To be **added** to General lift or Lift value of datum rail for top vertical curve



To be **subtracted** to General lift or Lift value of datum rail for bottom vertical curve

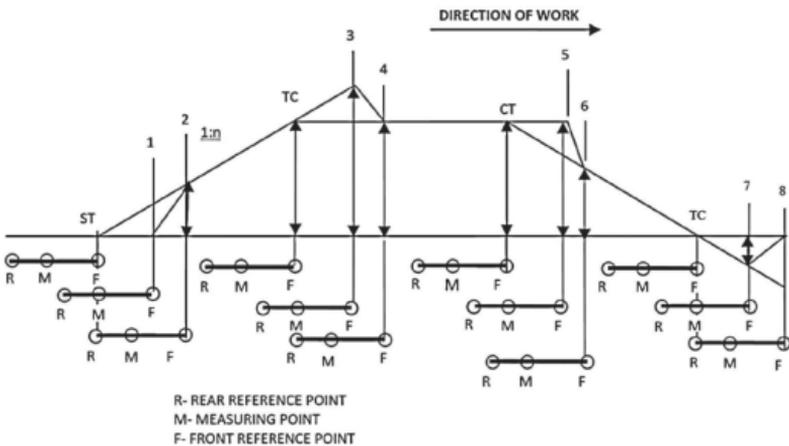


A sample copy of K and X correction for MPT machine is enclosed as **Annexure-V**.

2.4.5 Feeding of Cant

If feeding in working cabin it will be same as written at sleeper at the location of correction i.e M

If feeding in front cabin i.e at location F, the feeded values shall be as given below:



2.4.5 Packing based on Quantum of General Lift /Lift-

General lift/lift	No. of insertions
<30mm	Single
30-50mm	Double
>50mm	Two passes of tamping machine

2.5 In Brief the input required in different modes of working ;

2.5.1 On Curves

Mode of working	Values to be fed				Remark
	Versine/ versine compensation	Lift	Front Offset	cant	
4 pt. smoothening /compensation mode	Yes (Versine compensation)	General Lift (GL)	-	Yes	<ol style="list-style-type: none"> Existing curve radius and Transition length required for calculating versine compensation (Vm). Desired cant should be known. K value should be calculated and adjusted in general lift. X value if required should also be adjusted in general lift.
4 point design / Precision mode	Yes (Versine compensation)	Design Lift (Y)	Yes (FD Values)	Yes	<ol style="list-style-type: none"> Designed curve radius and Transition length required for calculating versine compensation (Vm). Designed cant should be known. K value should be calculated and adjusted in lift value (Y). X value if required should also be adjusted in lift value (Y). In addition to above, FD and Y should be ascertained by field survey for designed curve.

Mode of working	Values to be fed				Remark
	Versine/ versine compensation	Lift	Front Offset	cant	
3 point Elementary mode	Yes (Versine values H, HX, Hy, Hz, Hw, Hv, HFx, HFw)	General Lift (GL)		yes	<ol style="list-style-type: none"> Existing curve radius and Transition length required for calculating Versine values. Designed cant should be known. K value should be calculated and adjusted in general lift. X value if required should also be adjusted in general lift.
3 point design or precision mode	Yes (Versine values H, HX, Hy, Hz, Hw, Hv, HFx, HFw))	Design Lift (Y)	Yes (FD Value)	Yes	<ol style="list-style-type: none"> Designed curve radius and Transition length required for calculating Versine values. Designed cant should be known. K value should be calculated and adjusted in lift value (Y) X value if required should also be adjusted in lift value (Y). In addition to above, FD and Y should be ascertained by field survey survey for designed curve.

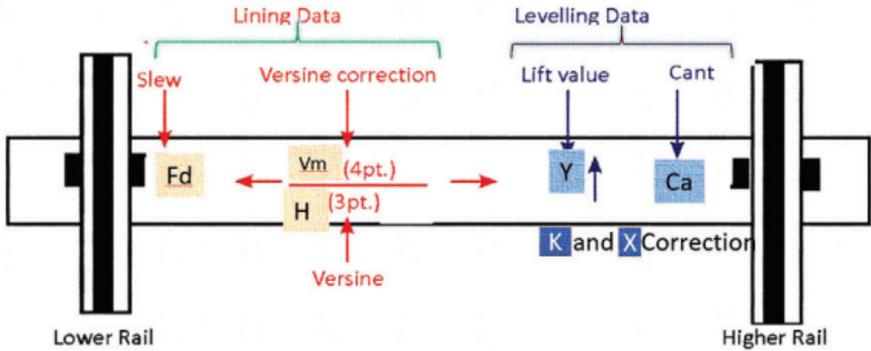
Note:

- If F_d is obtained from realignment of curve, the radius of final curve obtained after tamping will be curve as given by ROC. Same R should be used for calculating different constants (versines H, H_x, H_y, H_z, H_w or V_m or K etc) from manufacturers table and not the designed R as recorded in curve register.
- Maximum F_d to be 50 mm in one round.

2.5.2 On Straight

Only 3-Point lining to be used. F_d to be calculated from field survey and versine (H) to be taken Zero.

2.5.3 The values to be written on sleepers thus are:



2.6 Use of ALC for correcting track parameters:

It can work in two modes:

- Unknown track geometry mode (Measuring run mode).
- Known track geometry mode.

2.6.1 Unknown track geometry mode (Measuring run mode).

- Track parameters are measured at a speed of 10 Km/h. All measurements are on short chord. Measurement and correction done in 3-point mode only.
- During measurement, all obligatory points like curve starting, end, transition details etc are marked. Additional obligatory points or rectification to marked position can be done subsequently.
- Of the measured length, computation area is selected where correction is to be done. Following computations are then done
 - Target Super elevation is first fed.
 - Versine compensation is done by ALC based on speed potential of the track which is basically smoothening of the existing curve or track. Further improvement of curve can be done by selecting **constant areas of radius, transition and straight.**
 - Level compensation is done by ALC based on speed potential of the track which is basically smoothening of the existing curve or track. Further improvement of level can be done by selecting **constant areas of Level, gradient or change in gradient.**
- After computation by the "ALC" the tamper is set to work with the "ALC" automatically entering the computed lift, slew & versine values into the machine systems.
- Track geometry as per computed data provided by ALC is achieved.

2.6.2 Known track geometry mode.

- (i) Correction can be done in 4-point as well as 3-point lining method.
- (ii) Final track geometry and level is decided in advance and accordingly following data's are fed.

A. Desired track geometry

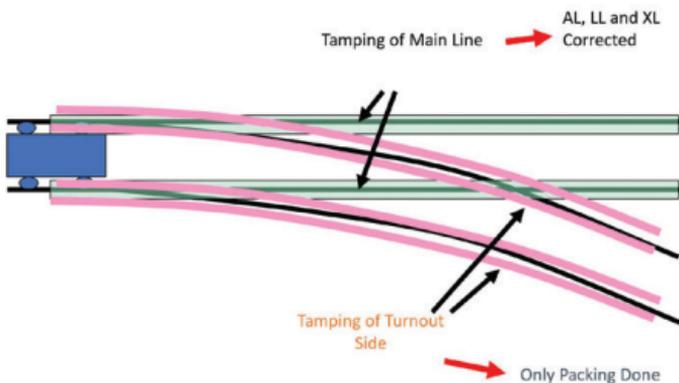
- Alignment detail i.e. starting and end of straight, starting and end of curve, radius of curve, length and shape of transition etc.
- Level detail i.e. start of gradient, location of change of gradient, value of gradient and connecting radius etc.
- Cant detail

B. Slew (Fd) and Lift (Y) required for achieving the geometry. This is obtained by prior survey of existing track.

- (iii) Desired track geometry after tamping is achieved.

2.7 Tamping of Points and Crossing:

All UNIMATS to first tamp M/L with system for correcting AI, Level and XL switched on and then tamp T/o after disconnecting Levelling and Lining system i.e only tamping to be done.



2.8 Works required Before, During and after Tamping:

For detail works, kindly refer to IRTMM. In brief, the works to be done are produced below:

2.8.1 Preparatory and Pre-Tamping Works:

- a. Minimum Clean cushion 150 mm should be available for running lines. For construction line it should be 250 mm for main line and 150 mm for loop line.
- b. Fixed references should preferably be provided all along the track and alignment and level of designed curve should be permanently marked so that every time track is corrected w.r.t the same reference.

- c. Track should be surveyed in advance after deciding the datum and cant rail for calculating slew (Fd) and lift (Y) either w.r.t design curve as marked on references or w.r.t curve decided to be achieved after survey.
- d. All values of versine's (H, Hx, Hy, Hz, Hw for 3-point) and Versine correction Vm for 4-point) and other values like X and Y to be calculated and to be written on sleepers as discussed above.
- e. Sleeper spacing should be corrected.
- f. Gauge to be corrected in advance.

2.8.2 Works during tamping:

- a. Tamping should be done preferably in design mode.
- b. Reference and datum rails shall be decided by P.Way supervisor.
- c. Tamping parameters i.e. Tamping depth, Squeezing pressure and Squeezing time should be correct.
- d. All obstructions to tamping like joggle fish plates, guard rails, check rails, Road at Level Xing, OHE or signal bonds likely to infringe during tamping to be removed in advance.
- e. Proper co-ordination with other department to be ensured.
- f. Sufficient length (about 50 m) on both side of T/O, also to be tamped with the UNIMAT machine.

2.8.3 Post Tamping works:

- a. Check track parameters after tamping. Preferably record with recorders if provided in tampers or using measuring trolley.
- b. Re-fix all fixtures removed or disconnected during tamping.

2.9 Dynamic Track Stabiliser (DTS):

To be used behind both Plain Track and Points and crossing tamper. It works in two modes

- a. Maximum settlement/Constant preload mode: To be used when priority is maximum consolidation of ballast and not retaining track parameters as achieved by tamping machines like initial or first tamping at Deep Screening or track renewal site. **Levelling system is switched OFF**
- b. Controlled settlement/Variable Pre Load Mode: To be used when priority is Consolidation of ballast and also retaining track parameters as achieved by tamping machines like at maintenance tamping site. **Levelling system is switched ON.**

The different settings in DTS for different work locations shall be:

Condition	Leveling system	Settlement settings (vertical load)	Oscillation frequency	Working speed
A. Stabilization of Plain Track during maintenance tamping				
	ON	70 bar	30-35 HZ	600-1300 m/h
B. Stabilization after tamping of Plain Track at newly laid/deep screened track				
After first tamping operation	OFF	80 bar (Constant Loads)	30-35 HZ	600-1000 m/h
After second tamping operation	OFF	100 bar (Constant Loads)	30-35 HZ	600-1000 m/h
After final tamping operation	ON	70 bar	30-35 HZ	600-1300 m/h
C. Stabilization of Points and crossing during maintenance tamping				
	ON	50 bar	30-38 HZ	600-1300 m/h

Following precautions to be taken while working DTS:

- Higher frequency normally between 40-45 Hz to be kept while working on bridges.
- Not to be used in tunnels.
- While working on points and crossing, not to be stopped at crossing portion.

CHAPTER-III

Machines other than Tamping Machines

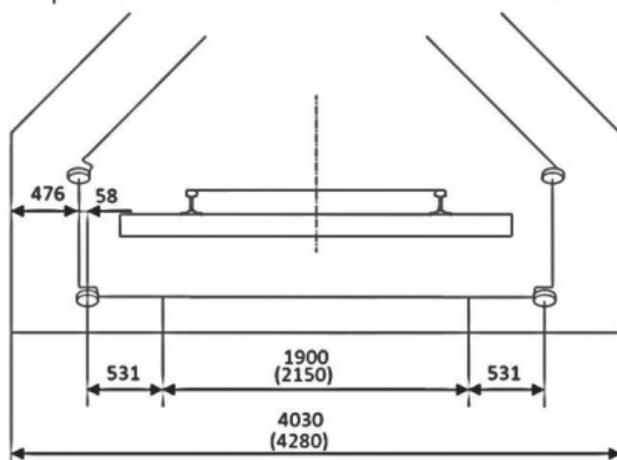
3.0 Ballast Cleaning Machines

The features of RM80 and RM80-92U is only discussed here. Features of RM 900 shall be different.

Various important dimensions are:

S.No	Item	Dimensions
1	Screening width	4030 mm (For cutter bar of 1900 mm)
		4280 mm (For cutter bar of 2150 mm)
2	Excavation depth	280 mm (cutter bar ht)- Screening depth of 300 mm and above can be achieved with some lift.
3	Sieving capacity	550 cum ballast/Hr
4	Sieve size	80x50x28 mm
5	Slewing capacity	300 mm
6	Lifting capacity	100 mm
7	Disposal of Muck (Waste disposal conveyor belt)	<ul style="list-style-type: none"> • Swing-Maximum 70° in both directions • Extension: maximum 5 m from centre of track • Muck disposal along the cess : 7.5 meters away from the centre of track.

The cutter bar position and excavation width is shown below:



Other capabilities of BCM

- a. Total excavation of ballast is possible by opening a ballast guide plate in ascending trough.
- b. The distribution of ballast can be controlled by guide plate provided over screen.
- c. The slope of formation can be achieved by controlling the depth of excavation on two sides.

Deep Screening of Points and crossing

Extension pieces each of 500 mm can be attached only on descending trough i.e. right side when seen in working direction. Total **7 pieces** can be attached.

Deep Screening over Ballasted deck bridge: Ballasted deck bridge of clear spacing between ballast retainer of 4500 mm or above can be screened with BCM using cutter bar preferably of 1900 mm following procedure laid down in RDSO letter no TM/GL/70/2 vol.3 dated 06.03.17.

Works before during and after BCM work:

- a. Existing level and alignment to be recorded in advance and marked on reference pillars.
- b. Formation depth available to be measured and requirement of lifting if any to be decided. According final level to be marked.
- c. All obstructions to movement of cutter bar within total 4.5m width (equally from C/L of track) to be removed in advance.
- d. Location of cess repair or locations of obstruction to throwing of muck be identified.
- e. If required additional ballast to be unloaded in advance for quick relaxation of speed restriction.
- f. All ballast beyond reach of cutter bar to be pulled inside and brought within cutter bar reach.
- g. Any damaged sleeper likely to fall during work to be removed.
- h. All fittings to be ensured beforehand.
- i. Cutter bar shall be inserted by removing 2 sleepers or shifting sleepers in advance of machine reaching the site for block working.
- j. All precautions laid down in LWR manual (specially those in para no. 6.3.2) shall be strictly followed while working on LWR track.
- k. Screening to be stopped before expiry of block period for having enough time for packing and stabilisation of ballast.
- l. Tamping machine and DTS to be used behind BCM. Final level as marked to be achieved.
- m. Vertical and horizontal infringement to OHE and mast/signal post to be checked before cancellation of traffic block.

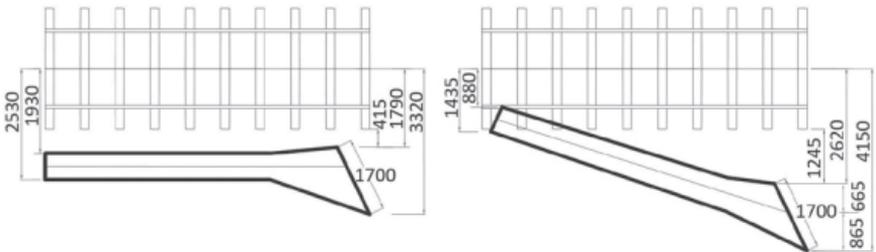
Speed Relaxation behind BCM.

- Work shall be executed at a caution of 20 Km/h.
- With tamping and DTS-As per para 238(2)(g)(iii) of IRPWM. However, for this the cutter bar to be removed from under the track after block working and the space to be filled with ballast so that complete deep screened track is tamped and stabilized.
- In case of failure/non availability of tamping machine on block working day or even subsequently, the speed relaxation shall be as per provision in IRPWM para 238(2)(g)(i) or (ii) as applicable.

3.1 Shoulder Ballast Cleaning Machines:

Used for deep screening of shoulder ballast

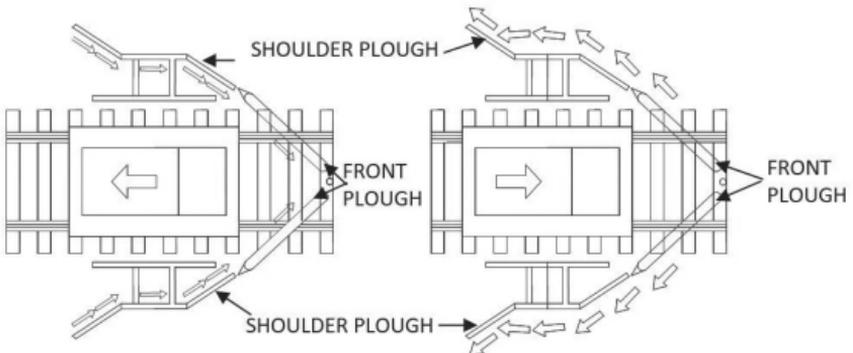
The cutting width in closed condition is 3320 mm while maximum it can cover 4150 mm from C/L of track as shown below:



Screen size, ballast handling capacity and muck disposal distance etc are almost same as in BCM. All infringements in this width to be removed in advance.

3.2 Ballast Regulating machine:

It can handle ballast up to 3.5 m from centre line of track. Some machines have hopper with capacity of 5-12 cum for carrying ballast.



3.3 Track Laying Equipment:

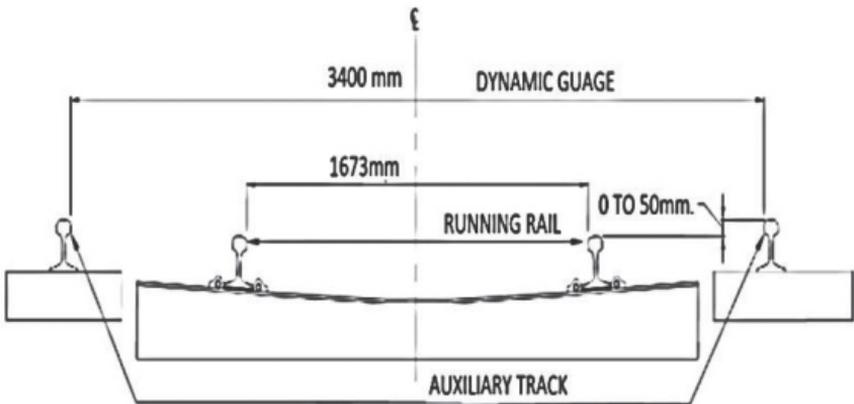
Following types of TLE are existing on Indian railways

Lifting Capacity	Manufacturers
9 tonnes	Plasser India (PQRS), BEML and Simplex
12 tonnes	Simplex

It is semi mechanised system of laying as panels are fabricated at base manually and also rail renewal at site has to be done separately.

3.3.1 Auxiliary track at site:

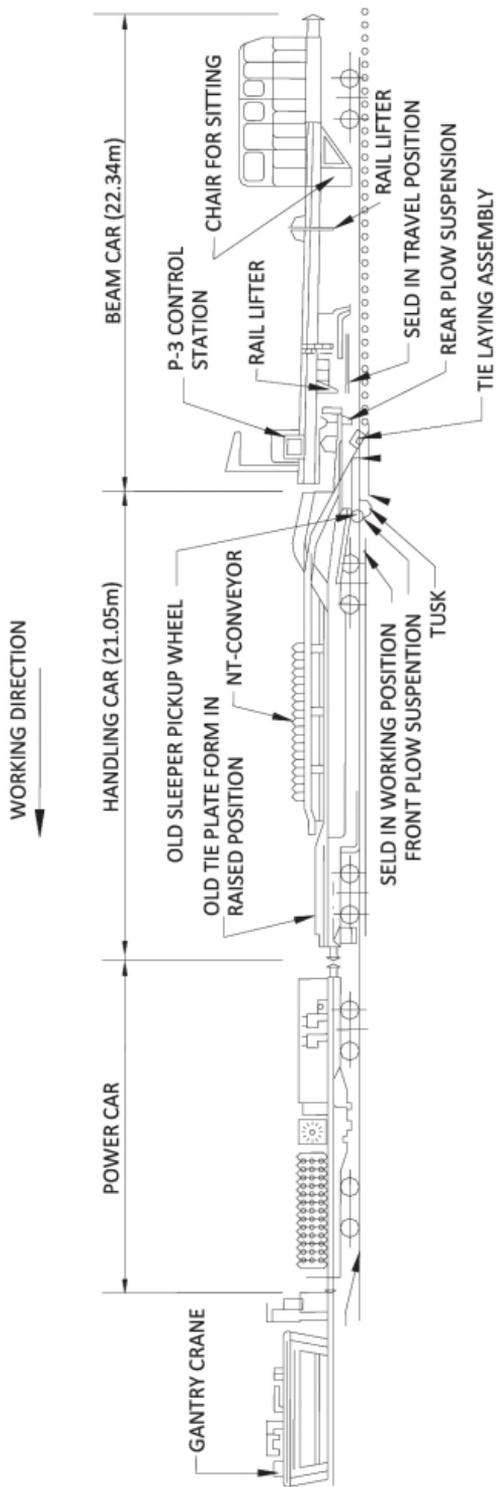
The gauge of auxiliary track shall be 3400 mm and this should not be more than 50 mm above M/L rail top.



3.3.2 Base Depot - At distance of 30 to 40 Km on either side from remotest work site or accessible by road. Three sidings of 500 m length each with a shunting neck to be provided.

3.4 Track Relaying Train:

This is fully mechanised system of laying & sketch of machine is placed at page no. 36.



3.4.1 Works by TRT – Following works can therefore be done by TRT

- Complete track renewal (CTR)
- Thorough Replacement of sleepers (TSR)
- Thorough Replacement of rails (TRR)

3.4.2 Advantages of TRT – Advantages of TRT vis-à-vis TLE are

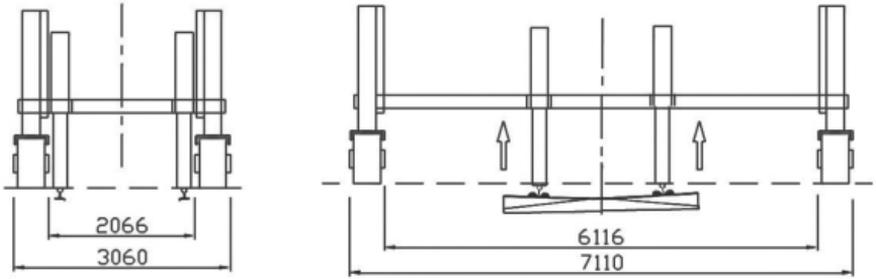
- There is no need to prefabricate panels and, therefore, base depot work is limited to loading and unloading of sleepers & fittings.
- No auxiliary track is to be laid at work site
- Concrete sleepers loaded on modified Flat wagons are directly taken to work site and relayed one by one.
- New rails unloaded at work site on shoulders and duly paired and fish plated are exchanged with old rails simultaneously with sleeper renewals.

3.5 Points and Crossing Changing Machine (T-28) –

It is a set of two cranes used for renewal/laying new turnouts on PRC sleepers. Four trolleys (two motorised and two non-motorised trolley). Important parameters of portal crane are given below:

Parameter	Value
Load capacity (max.)	30 tonnes
Speed with full load (max.)	0.8 km/h
Speed with no load	10 km/h
Max. lift with full load	2300 mm
Height in closed position	3065 mm
Height in lifted position	4744 mm
Crawler width	360 mm
Crawler lateral clearance	2066 mm (min.) 6116mm (max.)
Moving width	3060mm (min.) 7110mm (max.)
Max. axle load	6.0 tonnes
Total weight	24.0 tonnes

The crawler's lateral clearance and moving width are shown below.

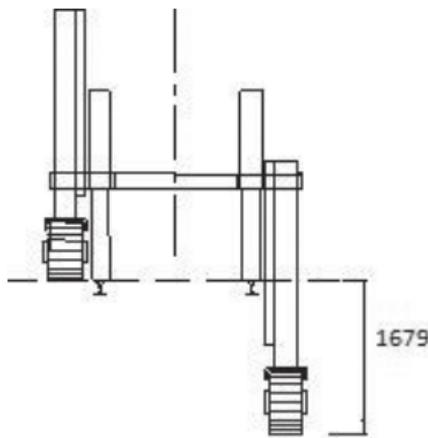


Important parameters of Motorized trolley are given below:

Parameter	Value
Height	510 mm
Lateral Shift	+(-) 300 mm
Upper table rotation	+ 10°
Vertical lift	+ 300 mm
Capacity	25 tonnes

Working capability of AMECA T-28:

- Lateral Shifting**-With 1 in 12 T/O, maximum lateral shifting of switch side of T/O assembly is 1.5 m approximate and on crossing side is 0.75 m approximate in each shifting operation.
- The Portal crane can negotiate a level difference of 1679 mm while moving on the ground as shown.



3.6 Rail Grinding Machine:

Indian Railways is using two 72 stone Rail Grinding Machine. The composition of machine is given in sketch below.



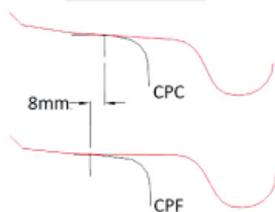
The technical detail of machine is tabulated below:-

Items	Description
No. of stone	Total 72 Nos., (36 Nos. on each side of rail)
Tilting of each individual stone	+70° (towards gauge face side) to -30° (towards field side) from vertical
Working capability	on curves up to 10° and gradients up to 3%
Working requirements	Check rails on curves to be removed, No need to remove the Bridge guardrails Level crossings, points & crossings, SEJs and axle counters- to be skipped by raising the grinding stones joggled fish plates, fish plate- to be removed.
Working Speed	2.4 - 24 kmph Desirable working speed 8-20 kmph
Maximum Cutting Depth	0.15 mm at the working speed of 15 Kmph 0.22 mm at the working speed of 10 kmph.

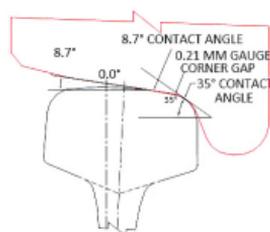
3.6.1 Rail Profiles

Location	Line/Curve	Rail Section	Grinding Template/Profiles
Tangent (straight track)	UP	60 Kg	CPF
Tangent (straight track)	DN	60 Kg	CPC
Tangent (with hunting)	UP/DN	60 Kg	CPF
Tangent (single line)	Single	60 Kg	CPF/CPC (alternate CPC and CPF)
High sharp	$> 1.25^\circ$	60 Kg/52 Kg	HRS
High mild	$\leq 1.25^\circ$	60 Kg/52 Kg	HRM
Low sharp	$\leq 1.25^\circ$	60 Kg	CPF
Low mild	$> 1.25^\circ$	60 Kg	CPC
Tangent	UP/DN	52 Kg	CPC
Low sharp and mild	UP/DN	52 Kg	CPC

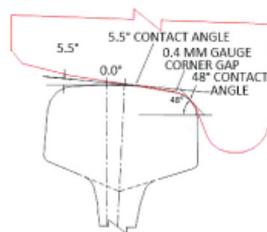
CPC AND CPF



HRM RAIL PROFILE



HRS RAIL PROFILE



3.6.2 Grind Pattern

Pattern is arrangement of grinding stone for achieving a profile. There are 50 patterns in RGM for choosing as per requirement

3.6.3 Grind Cycle

Cumulative GMT in the section from start of grinding	Cycle #	Track Classification			
		Tangent (Straight) Track	Mild Curves	Sharp Curves	Test Sites
0	Grind 1	Single Pass at 15 kmph	3 passes at 18 kmph	3 passes at 18 kmph	Monitor Profile
25 (Approx)	Grind 2	Single Pass at 15 kmph	3 passes at 18 kmph	3 passes at 18 kmph	Monitor Profile and RCF
75 (Approx)	Grind 3	Single Pass at 15 kmph	3 passes at 18 kmph	3 passes at 18 kmph	Monitor Profile and RCF
125 & so on (Approx)	Grind 4 & so on	Single Pass at 15 kmph	3 passes at 18 kmph	3 passes at 18 kmph	Monitor Profile and RCF

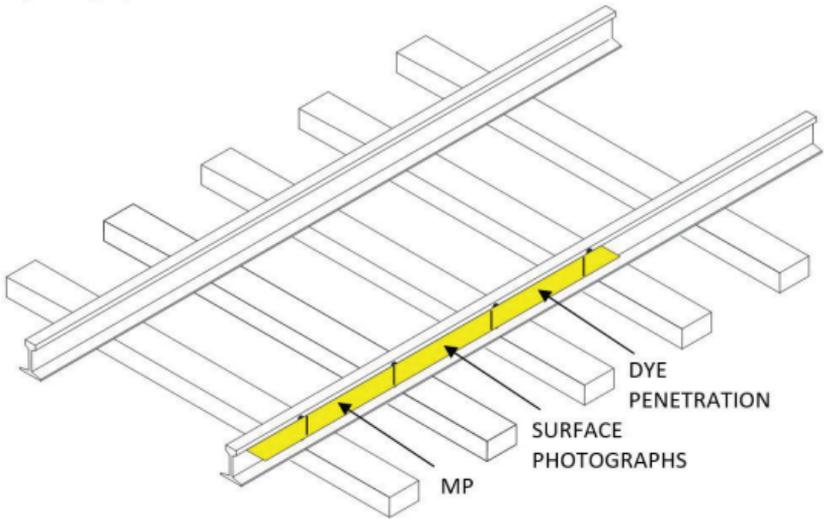
The grind cycle may vary for some special sections like KK line, for which separate guidelines will be issued by RDSO.

Where more than one pass is required (generally on curves), speed and patterns for the second and the third pass will be as suggested by GDMS software

3.6.4 Test Site – for monitoring grinding benefits.

- (i) Every 20 -50 Km distance.
- (ii) Separate test sites should be chosen for different track structures (52 kg/60kg)
- (iii) For any major change in gradient or formation structure, separate test site should be selected.
- (iv) Typically one SSE/P.Way section should have minimum one test site each for mild curve, sharp curve and tangent track.
- (v) Test site should be accessible by road for ease of taking measurements.
- (vi) The rail of the test site should not be due for renewal in next 3-4 years.

- (vii) It should be away from signals, Level crossing, yards, Bridges etc. so that it is on a stretch on which traffic normally moves at normal speed of the section.



3.6.5 Instruments used for monitoring grinding benefit

- MINIPROF
- Bar Gauge
- Star Gauge
- Digital Inclinator
- Surface Roughness Measuring Gauge
- Rail Hardness

3.7 Switch Grinding Machine

For grinding of switch portion of track.

3.8 Milling Machine

Like grinding it removes material from rail top and reprofiles rail. However, it uses chiselling technique and its capacity to remove material is more than grinder.

3.9 Rail Inspection Vehicle (RIV)

It is used to measure the rail profile in advance of grinding. On that basis, the desired profile and pattern for achieving that profile is decided in advance for feeding into grinding machine.

3.10 Utility Vehicle (UTV)

Different crane capacity machines are available

1.5 t at 7.5 m (11.25 tm)

2.0 t at 7.5 m (15 tm)

3.0 t at 7.5 m (22.5 tm)

3.11 Rail Borne Maintenance Vehicle

Item	Description
Payload	15 t
Can carry	2 rails of 13m length of 60 kg or two sets of switch and stock rail assembly along with fittings.
Space for tools	One cabin to hold small track machines, tools and equipment, PWay materials as listed for Mobile Maintenance Unit (MMU)
Space for carrying men	Seating arrangement (12 Nos) for officials
Crane for loading material	Hydraulic Crane for material handling with 1ton at 8 meter lifting capacity.
Generator	Diesel operated Portable generator of 5 KVA for general lighting, welding& other works

3.12 Muck Disposal Unit (MDU)

- For collecting BCM muck and disposing it at appropriate place.
- Not self-propelled and requires Locomotive or can be attached in front of BCM.
- Has conveyor belt at floor and a waste conveyor. Thus can transfer muck from one wagon to other or dispose it outside.
- Capacity to carry muck-65 cum

CHAPTER-IV

Planning and Deployment of Machines

4.0 Annual Planning of deployment.

- Deployment to be planned by CE/TMC based on Zonal targets for the year.
- Annual Targets for the year for each machine is fixed by Railway Board.
- Deployment Planning to be done for 18 months with firm planning for 12 months starting 1st April of every year and for 6 months from 1st April of next year.
- Requirement of construction organisation should also be taken while finalising deployment plan.

4.1 Prerequisite for deployment of track machines on construction projects:

- (1) Requisite track geometry standards shall be ensured before deployment of track machines on construction projects
 - (a) Track laying standards in respect of gauge, joints, expansion gaps and spacing of sleepers for the new track as specified in Para 316 of IRPWM should be followed.
 - (b) A minimum clean ballast cushion of 250 mm on main line and 150 mm for yard line along with adequate ballast on shoulders and cribs should be ensured before deploying the tamping machines.
 - (c) Proper recording of levels and versines should be done by a trained personnel and lift & slews values should also be calculated in advance for lining/ levelling for design mode of tamping.
 - (d) The track geometry prior to deployment of track machines for new works of new line, doubling, gauge conversion etc. should be as under

Peak value of Unevenness	15mm on 3.6m Chord
Peak value of Twist	15mm on 3.6m Chord
Peak value of Alignment	15mm on 7.2m Chord

- (e) The above track geometry standards are not safety/slow down tolerances but are only a prerequisite for deployment of track tamping machines for better machine productivity and their optimum utilization.
- (f) For achieving the track geometry parameters as above, suitable small track machines such as off-track tampers etc. may be used. Recording of achieved track parameters should be done using motorized trolleys.

- (2) The track should be certified fit for a speed of 30 kmph before deploying tamping machine.
- (3) On receipt of request from Dy.CE/(C), Sr.DEN will direct joint inspection of track to be done by at AEN(C) and AEN/XEN/TM.
- (4) Based on the joint inspection, Dy.CE (C) shall certify the track geometry as mentioned above, before deploying the track machines, after attending to deficiencies, if any. Sectional Sr.DEN/DEN shall confirm suitability of track for deployment of machine(s) by field verification or otherwise before machine is deployed.
- (5) Two rounds of tamping along with consolidation by DTS should be carried out at construction projects prior to opening of section.
- (6) After opening of section for traffic, another round of Tamping along with consolidation by DTS may be done on need basis.

4.2 Types of Traffic Blocks:

As stipulated by the Railway Board, on-track machines should work under traffic blocks as per the following options depending upon the track maintenance requirement and traffic patterns.

(1) Regular Traffic Blocks

(a) On Single Line Section

Either one block of at least 4 hours or 2 blocks of 2-1/2 hours or in exceptional cases minimum two hours wherever 2-1/2 hours are not possible.

(b) On Double Line Section

(i) One spell of 4 hours on "Up" or "Dn" line daily.

(ii) Two 2-1/2 hours split blocks on "Up" or "Dn" line on alternate days. (5 hours daily on one of the lines)

(2) **Blocks on Construction Projects and Multiple Lines**– On construction projects and multiple lines, additional working hours/blocks should be planned.

(3) **Special Blocks** – In addition to regular traffic blocks, special blocks as envisaged in Engineering and operating JPOs issued by Railway Board from time to time should be considered

(a) Mega Block Running into Several Days/Weeks

(b) Mega Block of 6 Hours Duration or More

4.3 Output of machines:

M/c Type	Minimum Block (hr.) (min)	Ineffective time (hr.) (min)	Output / eff. Hr.
DUO	2.50 (150 min)	0.50 (30 min)	800 m
CSM	2.50 (150 min)	0.50 (30 min)	1200 m
TEX	2.50 (150 min)	0.50 (30 min)	1600 m
UNIMAT	2.50* (150 min)	0.50 (30 min)	1 turnout
BCM (Plain)	3.00 (180 min)	1.00 (60 min)	200 m
BCM (P&C)	4.50 (270 min)	3.00 (180 min) #	One turnout =750 m track
SBCM	2:30 (150 min)	0.50 (30 min)	400 m
TLE	3.00 (180 min)	0.75 (45 min)	200 m
TRT	4.00 (240 min)	1.25 (75 min)	400 m
RGM	2.00 (120 min)	0.75 (45 min)	10 – 12 ** km

- *Time for turnout is for main line & turnout side and connection and disconnection time required for S&T
- **Depending on the length on curves in the section
- # For deep screening of P&C, ineffective time includes movement, preparatory works and S&T works
- Output may vary depending upon the age of the machine and track features
- For output less than 90% of the normal output, the reason should be analyzed and corrective action taken if any
- MPT is used for spot attention of both plain track and Points and Crossing , hence requirement will vary depending on work to be performed.
- For group working of BCMs the ineffective time will have to be increased by 30 min for second machine and so on for third machine.

4.4 Frequency of Tamping:

- CTE shall fix the frequency based on various factors like GMT, Formation condition, Geometry of track etc for various sections of his zone.
- As a general guideline, the frequency of tamping would be 1 year and above.
- Tamping of track having bad formation and other factors in short stretches of around 200 m or more necessitating more frequent tamping should be called spot attention.
- TMS module should have the provision for feeding such spot attentions.
- Frequency of tamping may be reviewed, as and when one or more of the above factors get modified.

CHAPTER-V

Rules for Movement and Block Working

5.0 Provision of G & SR

GR provision 4.65 deals with Track Machines and reads as "Track Laying or on track tamping or maintenance machines shall be worked only with the permission of the station master and in accordance with special instructions".

This provision supplemented with SR or Operating manual of zonal railway shall act as a guiding provision for movement and block working of these machines.

5.1 Salient Features Written on Track Machines

Following information shall be painted on the track machine at pre-decided locations: -

- a. Designation of Controlling Officer (Dy.CE/TM/Line).
- b. Name of owning Railway
- c. Track Machine No. with model
- d. Transportation Code
- e. Month and Year of commissioning
- f. Date of last POH and last IOH done
- g. Maximum permissible speed when self-propelled, coupled with other Track Machine and when attached with train formation as per speed certificate of RDSO sanctioned by Railway Board.
- h. Maximum height and width of Track Machine in closed condition
- i. Axle load, Wheel base and overall length of machine
- j. Jacking Point i.e. Lift here

5.2 Competency of Track Machine Staff;

- a. SSE/JE/TM shall be competent to operate the machine only if he possesses valid machine competency certificate.
- b. Machine Competency to be issued by Dy CE/TM/Line only after ascertaining the completion of:
 1. Valid Technical Training (IRTMTTC/ALD)
 2. G & SR training (ZTC)
 3. Periodical Medical examination (A-3)
- c. Validity of Machine Competency -3 years from the date of issue.
- d. In addition, SSE/JE/TM should take Route Learning from competent LI/SSE as per G & SR provision of Railway. SSE/JE/Pway of section should accompany him if he is not taken Route Learning as prescribed.

The competency certificate will be as in **Annexure 7.3** of IRTMM. Separate competency for working in ghat section to be issued.

5.3 Some Important Working Instructions:

a. General

- Machine shall be run and operated by competent SSE/JE/TM only.
- SSE/JE/TM shall issue a written machine ready memo (as per **Annexure 7.4** of IRTMM) after necessary maintenance/repairs/schedules and Brake Power testing and other stipulated checks, if any, to on duty SM, indicating time and date, under advice to SSE/JE/P.Way deputed to work with the machine.
- SSE/JE(P.way) shall be responsible for taking and clearing block after ensuring safety of track after work including coordinating all shunting operations involved .
- SSE/JE(P.way) shall work as guard for shunting of machines like UTV with only BFR.
- The machine shall be berthed in the sidings safely as stipulated in the G&SR and the P.Way staff shall arrange for watchman for the machine during the non-working shift. The watchman for the machine should not be frequently changed.
- The machine in-charge and SSE/JE (P.Way) shall jointly inspect and finalize the week's work in advance and discuss the day's programme and share with each other all information required for the working.
- SSE/JE (P.Way) shall ensure availability of requisite men and tools & plant to work with the machine and for rendering possible assistance to clear the section in case of breakdowns.
- SSE/JE (P. Way) shall be responsible for arranging necessary lighting etc. for night works and coordinate with other divisional staff such as Signal/OHE etc.
- If due to non-availability of path etc., it is not possible to bring the machine back to the siding where camping coach of machine is stabled, Sr. DEN/DEN/AEN shall have the powers and provision to hire the road vehicle to bring the staff back to machine stabling station.
- **Duty Roaster of Machine Staff:**
- Track Machine staff falls under continuous classification as per HOER. Normally , Roaster should be weekly, however following two types of Roasters are followed:

Weekly Roster. The staff is rostered to work for a period of 6 days at a stretch followed by one day of rest.

Three Weeks Roster. Staff working on Track Machines may be rostered to work for a period of 3 weeks at a stretch followed by continuous rest for a period of one week at headquarters.

In addition **Daily Duty Hours** for Field are decided by **Sr DEN**.

b. Safety Related Provisions:

Total Men in Machine Cab:

Total no of railway staff allowed in driving cab of each machine shall not exceed five.

Group Working of Machines:

- Number of machines that can work together in group working in same block section is normally not limited, however GR & SR provision and operating manual instructions of railway may be referred for this.
- Normally machines shall not work in a group while visibility of track is restricted due to sharp curves and steep gradients. Where the working of track machines in group is indispensable i.e. like deep screening, track relaying site etc., the necessary block protection shall be done as per para 806 of IRPWM and special precaution shall be taken as per para 811 of IRPWM for the first machine facing the direction of traffic in double line section and for the front and rear most machines in single line section.
- Minimum distance between machines when working in group shall be 50m.
- Minimum safe distance between machines while moving in group to site of work shall be 200m.
- Run through movement of the track machines in-group is not allowed. They can however transit as coupled vehicle under one authority. However, the machines can move in group by taking a short duration block and rules as for group movement for block shall be followed.

Working in Ghat Section:

- SSE/JE/TM with competency to work in ghat section to only operate the machine.
- A locomotive will be used for transiting the machine to and from site of work. However, during working it will be detached.
- Other precautions as in para 712 of IRTMM to be followed.

Night working

- Proper lighting to be done at site of work by SSE/JE/P.Way

Safety of men

- SSE/JE/P.way should ensure safety of men at site and deploy lookout men as per IRPWM provision.
- Hooters to be provided on the track machines to be operated by machine operator for warning the staff working at site.
- In addition remote control hooters to be kept at site by SSE/JE/P.way to be operated by lookout men from at least 150 m distance to warn worker of approaching train.
- At work site where visibility is likely to be hampered like BCM,TLE or TRT sie, caution order of 30 to 50 Kmph be imposed on adjacent line and driver be instructed to whistle freely while passing the site of work.

Failure of Machine in Block Section

- Failure in Block section shall be treated as accident in “class J-Equipment failure”.
- Accidents involving track machines shall be taken as train accident. All actions accordingly shall be taken.
- Assistance of Break Down gang or ART may be taken as per requirement

Other Instructions

- All supervisory staff in the track machine and as well as at the track machine site is prohibited from use of mobile phones during movement and working of track machine, except in emergencies or when it is extremely necessary.
- SSE/JE (P.Way) shall be responsible for protection of the site of work and also protection of adjoining track(s) in case of infringement.
- Safety equipment as listed below should be available with the machine.

c. Working of Track Machines in Single- and Double-Line Sections:

The procedure as detailed in G & SR to be followed. However, general instructions are reiterated in para 706 of IRTMM.

5.4 Safety Equipment

- (1) **General** - SSE/JE/TM in-charge shall be responsible to ensure that the following equipment in working condition are available on the track machine
 - (a) Two red and one green hand signal flags
 - (b) Two tri-colour hand signal lamps /LED torch
 - (c) Two chains with padlocks

- (d) One Fire extinguisher
 - (e) Two Hooters (manually controlled)
 - (f) Two Jacks 10 t.
 - (g) Four wooden blocks
 - (h) Four crow bars
 - (i) One hydraulic hand pump
 - (j) Emergency pneumatic/hydraulic hose off sizes suiting to different machines (Complete with end fitting)
 - (k) Wire rope with close loops at both ends 2 meters and 9 meters long for BCM : One of each length
 - (l) Machine specific equipment, if any, listed in Chapter 2, 3, 4 and 5.
 - (m) Ten Fog signals (detonators) in a tin case
 - (n) A copy of the Working timetable of the section where the machine is working
 - (o) G&SR book with up to date amendment slips
 - (p) One 4 cell flasher light LED lamp cum flasher light (rechargeable)
 - (q) Two banner flags
 - (r) One first aid box
 - (s) Two Skids
 - (t) Safety helmets for all machine staff
 - (u) Protective clothing, safety shoes and safety gloves
 - (v) Walkie Talkie with frequency of SM, Guard and Loco Pilots
 - (w) Internal Communication system like walkie-talkie and/or head mounted system
 - (x) Track Machine Manual with up to date correction slips
 - (y) Accident Manual
 - (z) Tail lamp
- (2) **Head and Tail Lights** – Each track machine must be equipped with prescribed head and tail lights, marker lights and flasher lights as per GR 4.14, 4.15 & 4.16 and SRs thereof. Each machine shall display LV board/tail lamp when moving alone. While moving in convoy or coupled, the LV board/tail lamp shall be fixed on the last Vehicle; in the direction of movement.

5.5 Introduction of New Machines and Speed Certificates

- a. **Speed Certification of New Machines** (Railway Board Policy Circular No-6): Issued by ED (Motive Power)/RDSO.

Provisional Speed:

- On the basis of design features of machines, provisional speed certificate normally lower than maxm permissible speed but not more than 65 Kmph is issued.
- It can be increased to 75 Kmph or further to speed permitted for similar vehicle following laid down procedures.

Final Speed Certificate:

- This is normally issued after conducting detail oscillation trial.
- For rolling stock which is not new, detailed oscillation trials may be dispensed with by RDSO following laid down procedure (consultation with related dte).
- Separate speed certificate for conducting oscillation trial will be issued. Trial to be done at speed 10% in excess of proposed maxm speed except on curves.

One Time Movement of New Vehicle. (From Dock, for testing etc.)

- Speed certificate to issued by RDSO and shall not be more than provisional speed.
- PCE and PCME shall approve this movement on the basis of RDSO speed certificate and a JSC shall be issued for track, bridge and OHE.
- If there is any infringement to SOD or axle load is more than permitted, GM's approval will be required.

b. Procedure for Permitting Induction of New Machine.

As per Railway Board Gazette Notification dated 1.10.2018:

- RDSO shall apply for introduction of any new types of rolling stock different from those already running on any section or division of Railway administration to the central govt through Commissioner.
- The application to commissioner will include
 - Full particulars of axle loads, infringements to SOD etc.
 - Provisional or final speed certificate etc.
- The application shall be scrutinised and submitted to Central Govt (Rly Bd) with recommendations.
- Commissioner may ask for oscillation trials for permitting new design of locomotives.
- Railway board shall give permission and also condonation to infringement based on the recommendation for running of the vehicle as requested.
- For running of the vehicle in other railway, GM of Govt Railway

may sanction the use of any rolling stock already introduced on Indian Railway by central govt on any section or division of Railway under his control. For this GM will be approached with following information's

- Provisional or Final speed certificate.
- Infringement etc.
- Sanction of Central Govt.
- JSC signed by Chief Engineer, Chief Mechanical Engineer, Chief Electrical Engineer (If electric stock) etc and include Track Certificate, Bridge certificate & OHE certificate(Proforma given in Rly Boards's Policy Circular No-6)
- GM shall communicate the sanction to commissioner 10 days in advance of its implementation

The sanction speed of different machines, their transportation code and infringements to SOD are given as **Annexure-VI**.

CHAPTER-VI

Maintenance of Machine

6.0 Maintenance Setup over Indian Railways:

Five types of repairs and maintenance facilities/ workshops are to be developed as below: -

- Central Periodical Overhauling Workshop (CPOH)
These are centralised workshop for POH of machines from all railways.
- Intermediate Overhauling Workshop (IOH)/Zonal Machine Depot (ZMD)
One ZMD in each railway for IOH of machines.
- Satellite depot
At least one in each division for breakdown and other maintenance of m/c.
- Mobile Workshop cum Transport Van
Mobile van with tools and plants attached to satellite or Zonal depot for attending breakdown at site.
- Camp Coach Workshop
With each machine and serves as rest van as well as workshop.

Detail of works to be performed by each of them is described in IRTMM.

6.1 Maintenance Schedule of Different Machines :

Schedules for maintenance of machines are -

1. Schedule I to IV at TM siding.
2. Schedule V at satellite / zonal depot.
3. Schedule VI at zonal depot.
4. Schedule VII at CPOH.

The detail are given at page no. 56

Maintenance Schedule of Track Machines

(A) Schedule I to V

Group of Machines	Type of Schedule	Schedule -I	Schedule -II	Schedule -III	Schedule IV	Schedule -V
All machines except RGM	Periodicity	Daily	50 Hrs.	100 Hrs.	200 Hrs	1000 Hrs
	Location	TM Siding	TM Siding	TM Siding	TM Siding	SD/ZMD
	Duration	One Hour	Two hours	01 day	02 Days	07 days
RGM	Periodicity	Daily	50 Hrs.	250 Hrs.	1000 Hrs	3000 Hrs
	Location	TM Siding	TM Siding	TM Siding	TM Siding	CPOH
	Duration	08 Hour	10 hours	12 hrs.	03 Days	10 days

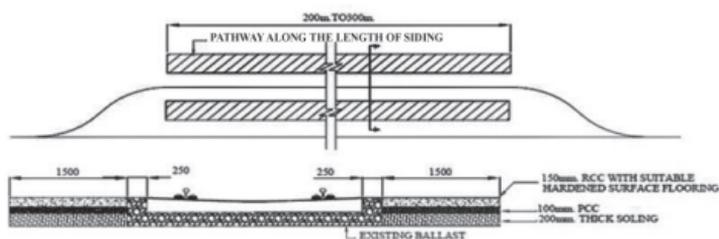
(B) Schedule VI (IOH) and VIII (POH)

Schedule Type	Periodicity (Engine hours)	MACHINE OTHER THAN RGM						FOR RGM		
		Machine Group - I (TLE, BRM, RBMV & UTV) (PCCM, DTS & TRT)		Machine Group - II (WST-08-32, UNIMAT-2S & 3S & HOT-CSM)		Machine Group - III (HOT-3X & UNIMAT-4S) (BCM, SBCM)		Periodicity (Engine hours EH)	Machine Group IV (RGM)	
		Duration	Location	Duration	Location	Duration	Location			
Schedule - VI (IOH)	2000 (IOH)	PCCM, DTS: 21 Days, TRT: 45 days and other 15 days.	ZMD	30 days	ZMD	For BCM/SBCM 45 days. For others 30 days	ZMD	6000	20 days	CPOH
Schedule - VII (POH)	1 st - 8000, 2 nd - 14000 and then at 4000	For TRT 1 st - 70 days, 2 nd - 90 days. For Other 1 st - 45 days, 2 nd - 60 days	ZMD/ CPOH	1st - 60 days, 2nd - 75 days	CPOH	For BCM/SBCM 1 st - 90 days, 2 nd - 105 days. For Other 1 st - 75 days, 2 nd - 90 days	CPOH	15000 or 60 months which ever is later	1st POH-45 Days	CPOH

6.2 Infrastructural Facility for Operation and Maintenance of Track Machines:

For proper working with machine and its maintenance, following facilities to be provided:

- Facility for storage and transportation of fuel and Oil.
- Transportation arrangement for carrying spare parts and assemblies.
- Communication facility like walkie-talkie and VHF set for communication from block section.
- Stabling and repairing facility for machines: At every 10-30 Km distance a stabling siding with maintenance facility be provided. The minimum facility to be provided are given below:

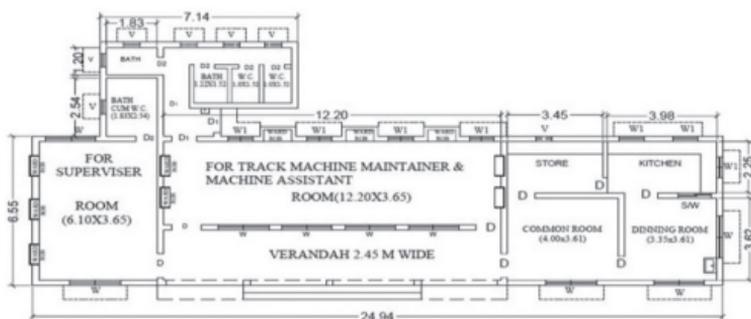


NOTE :

- All dimensions are in millimeters.
- Length of siding should preferably be of 300m and in no case it should be less than 200m.
- Pathway preferably of 1500mm width should be provided on both side of siding. In no case it should be less than 1000mm width.
- An all weather approach road up to siding pathway must be provided to carry heavy equipment, fuel drums etc.
- Adequate water connection and lighting to be provided.
- Electric connection to be provided for battery charging, lighting in coaches and welding (3 phase connection) to carry out minor repair should also be provided.
- Toilet to be provided where there is no track machine staff rest room.
- Minor changes in the lay out necessary as per local requirement may be carried out with the approval of principal chief engineer.

Covered shed of 25 m over track may also be provided for protection from heat and rain.

- Rest house facilities** attached to SSE/JE (P.Way) office for track machine staff be provided. A sample layout and facility is as shown at page no. 58.



Sl	TYPE	SIZE
1	DOOR (D)	1.80 X 2.10
2	DOOR (D)	0.90 X 2.10
3	DOOR (D)	0.75 X 2.10
4	WINDOW (W)	1.80 X 1.20
5	WINDOW (W)	0.90 X 1.20
6	VENTILATOR (V)	0.60 X 0.30

- NOTES:
1. ALL DIMENSIONS ARE IN METERS.
 2. MINOR CHANGES IN THE LAY OUT NECESSARY AS PER LOCAL REQUIREMENT MAY BE CARRIED OUT WITH THE APPROVAL OF PRINCIPAL CHIEF ENGINEER.
 3. BUILDING CONSTRUCTION, ITS FINISHING AND FACILITIES TO BE PROVIDED AS PROVIDED IN LOCO DRIVER'S RUNNING ROOM.

f. **Camp Coach :**

Passenger coach to be converted to camp coach as per approved drawing of RDSO. Railway may convert select cabins to Air-conditioned cabin. The detail works to be done during conversion is given in para 810 of IRTMM.

The amenities to be provided are:

S.No	Name of Item	Qty.
A.	Kitchen Area	
1	Fire extinguisher	02nos.
2	Commercial Gas Connection with double cylinder	01set
3	Four burner LPG Gas stove	01no.
4	RO+UV water purifier	01no.
5	Refrigerator-210 Litres.capacity	01no.
6	Dinner set	01no.
7	Thermos 02 Lts. capacity.	02nos.
8	Gas Lighter	02nos.
9	Presser cooker 5 Litres cap	01no.
10	Presser cooker 3 Litres cap.	01no.
11	Casserole 10"dia.	04nos.
12	Bhagona Copper base as per required sizes	04nos.
13	Plate steel 12"dia.	10nos.
14	Kadhaee	02nos.
15	Spatula (Karchhul) of various sizes	03nos.
16	Service spoon Big	03nos.
17	Service spoon small	03nos.

18	Service bowl big	03nos.
19	Gripper	02nos.
20	Tea mug	12nos.
21	Stainless Steel Spice Box	01no.
22	Stainless steel Container 2 Litres	06nos.
23	Stainless Steel Container for Floor 15 Litres	01no.
24	Stainless Steel Container for Rice 15 Litres	01no.
25	Stainless Steel Container for water 20 Litres	01no.
26	Stainless Steel Bucket 15 Litres	01no.
27	Hot chapatti case	02nos.
28	Sink	01no.
29	Stool for work	02nos.
30	Tea set	01no.
31	Tea Strainer(Stainless Steel)-4"	01no.
32	Teaspoon-	12nos.
33	Stainless Steel Utensil Stand (Wall Hanging)	01no.
34	Stainless Steel Sauce-Pan (Copper Base) 1 Litre	01no.
35	Hot plate iron (Tawa) -12"with handle	01no.
36	Pastry Board (Chakla) 10"	01no.
37	Pastry Roller (Belna)	01no.
38	Fridge water Bottle 1 Litre	06nos.
39	Dustbin	01no.
B.	LIVING AREA	
1.	LCD/LED Television28".	01no.
2.	Satellite. antennafor TV(DTH)	01no.
3.	230VAC Desert cooler or	04nos.
4.	1 ton AC Unit	03nos.
5.	LapTop	01no.
6.	Foldable tubular chairs	06nos.
7.	Folding tables-1000x500mm.	03nos
8.	Wooden Centre Table1000X500mm.	01no.
9.	Radio/ Audio Player	01no.
10.	Pillow Durafoam/ Sleepwell	10nos.

11.	Pillow cover	20nos
12.	Curtain	on each window
13.	Bed sheets (Single Bed}	20nos.
14.	Mosquito net	10nos.
15.	WoolenBlanket(Ravmond)	10nos.
16.	Sofa	One 3 Seater as per the Requirement.
17.	Insulated Water jug 10lit.cap	
c.	BATH AREA	
1.	Gevser 20lit.cap.	01no.
2.	Bucket 20lit.capacity	06nos.
3.	Mug	02nos.
4.	Aluminium/ Stainless Steel Stool	02nos.
D.	STORE	
1.	Welding set5KVA	01no.
2.	Water lifting pump	02nos.
3.	Portable Drilling machine	01no.
4.	Portable grinding machine	01no.
5.	Diesel filling pump	01no.
6.	Silent DG set 10'tWA	01no.
7.	Folding Cot(Single Bed)	06nos.

Colour Scheme of camp coach shall be:

The specification of paint is given in IRTMM.



- Gray
- Golden Yellow
- Indigo
- Light Turquoise
- Black

CHAPTER-VII

Manpower for Machine Working & Maintenance at Worksite

7.0 Manning of Machine:

- Each machine is manned by *SSE'S/JE'S/TM including one Incharge (I), MCM & TMMs (Technician) and Machine Assistants (Helper)*
- Each machine shall be worked under the direct charge of SSE/JE/TM during the movement and working of track machine. He shall be in possession of the valid competency certificates, road learning and medical fitness certificate for working the machine.
- *SSE/JE/TM/I shall have* additional responsibility of Maintaining records of repair/Block/Spares and coordinating with Division and Staellite depot incharge etc.

7.1 Man power on different machines:

Man power required in different category of machines are given below:

S. No	Name of Machine	SSE (TM) / JE (TM)	Track Machine Maintainers (TMM)	Machine Assistant	Cook	Total (Excluding Cook)
1	Plain Track Tamper (DUO/Worksite & CSM)	2	3	3	1	8
2	Tamping Express (09-3X-CSM)	2	4	4	1	10
3	P&C Tamper (UNIMAT)/ Multipurpose Tamper	3	3	3	1	9
4	Dynamic Track Stabilizer	2	2	2	Nil	6
5	Ballast Cleaning Machines	3	3	4	1	10
6	Shoulder Ballast Cleaning Machine	3	3	4	1	10
7	Ballast Regulating Machine Regulator	2	2	3	1	7
8	Track Relaying Train	6	8	14	2	28
9	Portal Crane (one No.)/ Spoil Disposal Unit/ Tie Crane/ Tie Exchanger / Rail Lifting Units/Rail Cum Road Vehicles	1	1	1	1 Per set of Portals (2 or 3 Nos.) for TLE and one per set of 4 SDUs	3

10	P&C laying Machine (Two T- 28 Cranes + one Jib Crane)	3	3	3	1 per Set of 2 T-28 & 1 jib crane	9
11	Utility Vehicle (Self Propelled), Rail Borne Maintenance Vehicle.	2	2	3	1	7
12	Rail Grinding Machine (72 stones)	10	12	12	2	34

- (i) Posts of SSE/TM, JE/TM, MCM, TMM and MA shall be operated as cadre posts and the post of cook shall be operated as ex-cadre.
- (ii) The requirement of a cook for DTS shall be met with out of the provision made for the machine to which these machines are attached.
- (iii) For all the above categories, additional requirements of Leave Reserve (LR) @ 12.5%, Rest Giver (RG) @ 47% (for 3 weeks roster) and @ 16.5% (for weekly roster) & Trainee Reserve @ 4% shall be considered to work out total requirement.
- (iv) Distribution and designation of individual posts in various categories shall be based on restructuring formulae and percentage distribution of various types of grades applicable from time to time.
- (v) The nomenclature of track machine maintainer covers all types of artisan staff required for operation and maintenance of machine.

7.2 Training:

a. Officers-

- Initial IRICEN/Pune & IRTMTC
- Officers working in Track Machine Organization shall undergo special courses on Track Machines conducted from time to time by IRICEN, IRTMTC and OEMs.

b. SSE/JE/TM(s)-

- Initial course at the time of joining or after empanelment for the post of JE/TM from MCM/TMM at IRTMTC and ZTC.
- Refresher courses at IRTMTC and ZTC once in 3 years.

c. Technical Staff-

- Initial at IRTMTC
- Refresher courses at IRTMTC every 5 years.

d. Machine Assistant-

- Initial 2 weeks training on the lines similar to that of trackman.

7.3 Medical Category:

SSE/JE(Track Machines), Technician and machine assistant shall be all A3 category.

CHAPTER-VIII

Inventory Management and Life of Machine

8.0 Source of components and spares:

The spares for procurement is obtained through:

- OEM or Authorised dealer .
- Branded items of same specification as OEM
- DGS & D rate contracts.
- Indigenous sources

8.1 Modes of procurements/repairs:

The officers of Engineering Department, dealing with track machines at HQ as well as in Zonal and Satellite Depot, shall have the powers to procure spares, consumables and small tools to meet the requirements of track machines, as available to the officers of Stores Department in corresponding posts (PCE equivalent to COS, CE/TM equivalent to CMM, Dy. CE equivalent to Dy. COS and XEN/TM equivalent to SSO). Methods of getting spares and repair are:

- Cash Imprest
- Emergency Repairs/Purchase
- Annual Maintenance Contract(AMCs)
- Rate Contract
- Contracts other than AMCs
- Indenting of special and costly items:

8.2 Codal Life of machines and Procedure for condemnation:

The codal life of machines are as given below:

Machines	Codal Life
Rail Grinding machines (RGM)	15 years
All tamping machines i.e. Duomatic, CSM, Tamping Express, MPT, UNIMAT etc.	20 years
Ballast screening machines BCM, SBCM, Ballast Regulating machines etc	20 years
Track renewal machines like TLE, TRT, Points and Crossing changing machines, Dynamic Track stabilizer.	20 years
Material handling machines UTV, RBMV	25 years

Check List for P. Way Officials

A. Check list for track machines –Tamper with DTS

S. N.	Item	Yes/ No
1.	Has glued joint marked & S&T cable made clear from tamping zone? Glued joint to be attended manually after passing of machine. (Advance)	
2.	OHE bonds has been made clear of tamping Zone? (Advance)	
3.	Has wooden block & joggled fish plates if any removed? (Advance)	
4.	Has minimum cushion of 150 mm been ensured? (Advance)	
6.	Whether sleepers uniformly spaced & squared? (Advance)	
5.	Has the L-Xing been opened in advance? (Advance)	
7.	Has the ballast heaped up in the tamping zone to ensure effective packing? However, sleeper top should be visible to the operator and the ballast should not obstruct the lifting roller. (Advance)	
8	Is ALC being used for track parameter correction? (Advance)	
	If yes, then	
	• Is it working in unknown track geometry mode (measuring run mode)?	
	• Is it working in known track geometry mode	
	If working in unknown track geometry mode, has proper computation with defined constant area been done for reaching at final alignment and level. (Reqd. during work)	
	If in known track geometry mode, has correct Fd, Y and R been calculated. (Advance)	
9	If ALC is not being used has the following values been calculated? (Advance) For lining: • Working in 4-point- Versine correction values • Working in 3-point- Versine values (H) For Levelling • Horizontal curve- K correction • Vertical curve-X correction Has the field survey been carried out to decide for design lining and lifting? (Advance) • lifting (Y) & • Slewing (Fd) The survey should be done in advance as per guidelines in IRTMM.	
10.	Has the lift value or general lift been decided properly taking into account the existing cant and required cant in curve falling in the section? (Advance)	
11.	Has the beginning and the end of curves/transition curves, all obligatory locations marked on sleepers? (Advance)	

12.	Has all the required values like Fd, Y, Versine correction(4-point), Versine values (3-point), K, X & Super-elevation marked on alternate sleepers with direction to act as guide for the operator? (Advance)	
13.	Are all tamping tools provided in good condition? (Advance)	
14.	Is DTS being planned behind tamper? (Advance)	
15.	Is available safety equipment's on the machine as per para 704 of IRMM? (Advance)	
16.	Does the operator poses valid competency certificate as per para 703 of IRTMM for operating the machine ? (Advance)	
17.	Has tamping parameters like tamping depth, squeezing time, squeezing pressure properly set? (Reqd. during work)	
18.	Is DTS being used in proper mode and parameters correctly set. (Reqd. during work)	
19.	Is tamping quality including lining, levelling and cant achieved – good and acceptable. (Reqd. during work)	
20.	Has ramp been provided at start and close of work? (Reqd. during work)	
21.	Has proper lighting for night working been ensured. (Reqd. during work)	

B. Check list for track machines –UNIMAT with DTS

S. N.	Item	Yes/ No
1.	Is available safety equipment's on the machine as per para 704 of IRMM? (Advance)	
2.	Does the operator poses valid competency certificate as per para 703 of IRTMM for operating the machine ? (Advance)	
3.	Whether layout including spacing of sleepers as per relevant drawings ensured? (Advance)	
4.	Is the nose of the crossing wear within permissible limit. If not is it planned to be reconditioned before tamping? (Advance)	
5.	Has glued joint marked & S&T cable made clear from tamping zone? Glued joint to be attended manually after passing of machine. (Advance)	
6.	Has wooden block & joggled fish plates if any removed ? (Advance)	
8.	Has minimum cushion of 150 mm been ensured? (Advance)	
9.	Whether Hogged, battered and low joints attended? (Advance)	
10.	Whether low cess made-up? (Advance)	
11.	Has the track drainage improved, and ballast recouped for better retentively of packing? (Advance)	
12.	Has deficient or Loose fittings and fastenings made good? (Advance)	
13.	Has broken and damaged sleepers replaced? (Advance)	

14.	Whether the machine have full complement of tamping tools in good condition? (Wear not more than 20%)(Advance)	
15.	Is ALC being used for track parameter correction (Advance)	
16.	If yes, then <ul style="list-style-type: none"> • Is it working in unknown track geometry mode (measuring run mode)? • Is it working in known track geometry mode 	
	If in unknown track geometry mode, has proper computation with defined constant area been done for reaching at final alignment and level? (Reqd. during work)	
	If in known track geometry mode, has correct Fd, Y and R been calculated? (Advance)	
17.	If ALC is not being used, has the following values been calculated. (Advance) For lining: <ul style="list-style-type: none"> • Working in 4-point- Versine correction values • Working in 3-point- Versine values (H) For Levelling <ul style="list-style-type: none"> • Horizontal curve- K correction • Vertical curve-X correction 	
18.	Has the field survey been carried out to decide for design lining and lifting? (Advance) <ul style="list-style-type: none"> • lifting (Y) & • Slewing (Fd)) (The survey should be done in advance as per guidelines in IRTMM.)	
19.	Has the lift value (Y) for design levelling or general lift (for smoothing) been decided properly taking into account the existing cant and required cant in curve? (Advance)	
20.	If Points & Crossing is in curve then, has the beginning and the end of curves/transition curves, all obligatory locations marked on sleepers? (Advance)	
21.	Has all the required values like Fd, Y, Versine correction(4-point), Versine values (3-point), K, X & Super-elevation marked on alternate sleepers with direction to act as guide for the operator? (Advance)	
22.	Has DTS been planned behind UNIMAT? (Advance)	
23.	Has during and before tamping, S&T and Electrical staff been associated to complete their portion of work? (Reqd. during block)	
24.	Has all obstructions such as rail lubricators, signal rods, cable pipes OHE bonds etc which are likely to obstruct the tamping tools clearly marked or made clear of tamping tool zone? (Reqd. during work)	

25.	Has it been ensured that the proper lighting arrangement is there in night working? (Reqd. during work)	
26.	Has tamping parameters like tamping depth, squeezing time, squeezing pressure properly set? (Reqd. during work)	
27.	Has tamping of Turnout side with lining, levelling system in cut off mode been ensured? (Reqd. during work)	
28.	Has DTS been used in proper mode with proper parameters set? (Reqd. during work)	
29.	Is tamping quality including lining, levelling and cant achieved – good and acceptable. (Reqd. during work)	
30.	Has ramp in and ramp out been provided at start and close of work? (Reqd. during work)	
31.	Are all cables and bonds disconnected being reconnected? (Post work)	
32.	Has setting of points been checked immediately after tamping jointly with S&T staff. (Post work)	

C. Check list for track machines –BCM

S. N.	Item	Yes/ No
1.	Is available safety equipment's on the machine as per para 704 of IRMM? (Advance)	
2.	Does the operator poses valid competency certificate as per para 703 of IRTMM for operating the machine ? (Advance)	
3.	Is cutter chain and its fingers in good condition? (Advance)	
4.	Is Screen of BCM in good condition? (Advance)	
5.	Has it been ensured that the gas cutting equipment's is available on the machine? (Advance)	
6.	Has it been ensured that approaches to bridges which cannot be screened by the machine screened manually in advance of the machine working? (Advance)	
7.	Has it been ensured that there is no obstruction in the width of 4500mm (2250 mm from C/L on both side) to avoid infringement to cutter chain? (Advance)	
8.	Has it been ensured that L-Xing should is opened in advance so as to enable machine to work? (Advance)	
9.	Is Tamping machine and DTS planned behind BCM? (Advance)	
10.	Has it been ensured that UNIMAT machine is available while doing deep screening of turnout? (Advance)	

11.	Has it been ensured that a trench of 300 mm depth & 1-meter width is prepared for lowering of cutter bar in advance? (Reqd. during work)	
12.	Has it been ensured that proper lighting arrangement is there for night working on machines? (Reqd. during work))	
13.	Has cutter ban been removed and ballast filled for proper tamping and speed relaxation after DTS working? (Reqd. during work)	
14.	Has it been ensured that proper protection of worksite done with banner flag & detonators during block. Also lookout caution/Speed restriction of 30-50 Kmph imposed on adjacent line? (Reqd. during work)	
15.	Is screening quality good? (Reqd. during work)	
16.	Is proper cross slope being achieved by BCM? (Reqd. during work)	
17.	Has it been ensured that watchman is posted round the block at the location while cutter bar & chain are left at site? (Post work)	
18.	Has cleaning of haunches been done after deep screening by BCM and cess lowered/raised as per requirement? (Post work)	
19	Is speed being relaxed as per IRPWM provision? (Post work)	
20	Is all disconnected cables and bonds being provided back behind BCM? (Post work)	

D. Check list for track machines –SBCM

S. N.	Item	Yes/ No
1.	Is available safety equipment's on the machine as per para 704 of IRMM? (Advance)	
2.	Does the operator poses valid competency certificate as per para 703 of IRMM for operating the machine ? (Advance)	
3.	Is cutter chain and its fingers in good condition? (Advance)	
4.	Is Screen of BCM in good condition? (Advance)	
5.	Has it been ensured that there is no obstruction in the width of 5400 mm (2700 mm from C/L on both side) to avoid infringement to cutter chain? (Advance)	
6.	Has it been ensured that L-Xing should is opened in advance so as to enable machine to work? (Advance)	
7.	Has all obstructions coming in working Zone of machine been disconnected/ shifted or exposed for making it visible to operator during working? (Advance)	
8.	Has it been ensured that proper lighting arrangement is there for night working on machines? (Reqd. during work))	

9.	Is screening quality good? (Reqd. during work)	
10.	Is proper depth of cut being maintained to avoid making channel? (Reqd. during work)	
11.	Is all disconnected cables and bonds being reconnected back behind SBCM? (Post work)	

E. Check list for track machines –TRT

S. N.	Item	Yes/ No
1.	Has existing alignment, level and obligatory points been marked on fixed references like OHE mast or separate post and proposed alignment and level also marked? (Advance)	
2.	Has proper loading of PRC on BRN/BRH (before loading, floor free from ballast, wooden batten 75 mm x 75 mm or light rail between each layer of PRC been placed) in base depot? (Advance)	
3.	Has all bridge rails been provided properly in base depot? (Advance)	
4.	Has long/broken/extremely rough bottom surface PRCs removed in base depot? (Advance)	
5.	Has crib ballast 4" to 5" from top of sleepers been removed at site in advance? (Advance)	
6.	For TRR(P), has enough rail been unloaded at site and has it been brought close to track? (Advance)	
7.	Are fastening (ERC's) free (not jammed). (Advance)	
8.	Has squaring of sleepers been ensured in advance?(Advance)	
9.	Has the broken sleepers are removed? (Advance)	
10.	Has any lateral obstruction min.50 cms from the end of PRC removed? (Advance)	
11.	Has SEJ falling in length to be renewed, removed in advance? (Advance)	
12.	Has isolated locations of hard bed overhauled? (Advance)	
13.	Has joint survey for pre attention work with PWI & Machine in charge carried out? (Advance)	
14.	Has it been ensured that level crossing opened/overhauled properly in advance? (Advance)	
15.	Has it been ensured that the electrical cables buried in the ballast lowered down 10" to 12" below the bottom of PRC sleepers? (Advance)	
16.	Has tamping machine and DTS planned behind TRT? (Advance)	

17.	Have all obstructions like Water Pipes, OHE bonds, Signal wires, rail post etc been removed or disconnected in advance of TRT working? (Reqd. during block)	
18.	Has long size fish plate bolts/Joggle plate removed? (Reqd. during block)	
19.	During night working has proper lighting, in the length of work to be targeted + the length of Rake provided? (Reqd. during block)	
20.	Is contractor Supervisor and enough work force available? (Reqd. during block)	
21.	Has proper ramping at close of work been done? (Reqd. during block)	
22.	Is abrasive rail cutter and gas cutting equipment-1 set (min), with operator/blacksmiths available? (Reqd. during block)	
23.	Has availability of 6 sets of rail closures of rail section being laid in various sizes from 10 mm to 30 mm lengths, been arranged and availability of enough fish plates /junction fish plates with bolts ensured? (Reqd. during block)	
24.	Has it been ensured that proper protection of worksite done with banner flag & detonators during block to follow the lookout caution /Speed restriction of 30-50 Kmph imposed on adjacent line? (Reqd. during work)	
25.	Is site being cleared of released rails/other materials of previous days? (Post work)	
26.	Is speed restrictions being relaxed as per IRPWM provision? (Post work)	
27.	Is post relaying work like providing SEJ, L-Xing sleeper etc being done in shadow block? (Post work)	
28.	Is all disconnected cable and bonds being reconnected in shadow block? (Post work)	

F. Check list for track machines –PQRS

S. N.	Item	Yes/ No
1.	Has existing alignment, level and obligatory points been marked on fixed references like OHE mast or separate post and final proposed alignment and level marked. (Advance)	
2.	Has ballast been loosened at caked up ballast location up to the bottom of sleepers to facilitate lifting? (Advance)	
3.	Is sufficient ballast available for achieving a level bed for laying of new panel? (Advance)	

4.	Has auxiliary track laid at 34000 mm gauge on CST-9 or wooden blocks with spacing at 1.5 to 2.0 meters?(Advance)	
5.	Has auxiliary track of sufficient length laid in advance to match with the daily progress of work. (Advance)	
6.	Has the auxiliary track ben kept between 0- 50 mm high than existing track. (Advance)	
7.	Has removal of ballast from the crib and shoulders upto the bottom level of the sleepers ensured? (Advance)	
8.	Have full fittings of the old sleepers ensured avoid their falling off while lifting released panels? (Advance)	
9.	Has all broken sleepers been removed or replaced in advance? (Advance)	
10.	Has on girder bridges, the guard rails at the approaches on both ends removed temporarily? (Advance)	
11.	Has level crossing opened properly in advance? (Advance)	
12.	Has proper planning and insertion of Switch Expansion Joints at correct locations ensured? (Advance)	
13.	Has availability of under noted equipments ensured at site? (Advance) a. One set of each of rail cutting and gas cutting equipments in good working condition.(Daily). b. Two sets of rail closures of the each rail section being laid in various sizes from 0.5 m to 3 m lengths and sufficient sets of junction/ordinary fish plates with bolts arranged.	
14.	If TRR(P) is also planned, has cutting of LWR/SWR to single rails ensured for lifting released panels? (Advance)	
15.	If only TSR(P) planned, has the existing running rail replaced by service rails for the stretches which are to be re-laid during the next day? (Advance)	
16.	Has all obstructions like cables, signalling rods, embedded rail piece, tie bar etc removed or disconnected in advance. (Advance)	
17.	Has extra number of track panels fabricated in the base depot to maintain a buffer stock for one or two days of relaying work. (Advance)	
18.	Has tamping machine and DTS planned for relaxation of speed to normal? (Advance)	
19.	Has proper protection of worksite done with banner flag & detonators during block & follow the lookout caution /Speed restriction of 30-50 Kmph imposed on adjacent line? (Reqd. during work)	

20.	Has all disconnected cables and bonds, been connected after work? (Post work)	
21.	Is Rail renewal, welding and tamping being done in shadow block. (Post work)	
22.	Is speed restriction behind renewal site being relaxed as per provision in IRPWM. (Post work)	
23.	Is post relaying work like providing SEJ, L-Xing sleeper etc being done in shadow block? (Post work)	

G. Check list for track machines – T-28

S. N.	Item	Yes/ No
1.	Has turnout assembled at proper place near the site of turnout to be replaced? (Advance)	
2.	Has infringements on the way checked in advance and movement with slewing accordingly planned? (Advance)	
3.	Has rails on either side of existing turnout of the same section as that of new turnout? (Advance)	
4.	Has deep screening of turnout portion done? Ensure required cushion and proper drainage (Advance)	
5.	Has rail level taken for sufficient length on either side of turnout? (Advance)	
6.	Has the layout calculation been checked & new SRJ location decided (Advance)	
7.	Has point machine disengaged and turn out non – interlocked before taking its replacements? (Advance)	
8.	Has fish bolts should be lubricated and worked to facilitate easy removal during block. (Advance)	
9.	Has ballast from crib and shoulder of sleepers removed upto sleeper bottom for full turnout length? (Reqd. during working)	
10.	Has 60 wooden blocks, each approximately 60 cm long kept ready for facilitating passage of crawler on the obstacles? (Reqd. during working)	
11.	Has 4 nos. of rail pieces, each 70 cm long kept ready for housing below the rail wheels of the crane? (Reqd. during working)	
12.	Has Jumpering of both ends of the turnout done by OHE staff before lifting and removing of existing turnout? (Reqd. during working)	
13.	Has adequate arrangement made for protection of the line involved and adjacent line while the machine is working? (Reqd. during working)	

14.	Has location where clamp of each crane will hold the crossing and switch portions for lifting marked on the assembled turnout? (Reqd. during working)	
15.	Is UNIMAT deployed behind T-28 machine? (Post work)	
16.	Has all cables and Bonds Disconnected been reconnected (Post work)	

H. Check list for track machines – UTV

S. N.	Item	Yes/ No
1.	Is available safety equipment's on the machine as per para 704 of IRMM? (Advance)	
2.	Does the operator poses valid competency certificate as per para 703 of IRTMM for operating the machine ? (Advance)	
3.	Has it been ensured that the proper lighting arrangement is there in night working? (Advance)	
4.	Has the rails/PRCs shifted towards cess side from centre of the track in multiple line section? (Advance)	
5.	Has the PTW (Permit to work) been obtained from OHE staff during working in OHE section when ever required? (Advance)	
6.	Has availability of all attachments to crane for lifting P.Way materials been ensured before going to block? (Advance)	
7.	Have the Rails been centrally marked by P.way staff & two trackman with crow bar deputed to protect rail from tilting ? (Reqd during work)	
8.	Has proper physical locking of crane boom been ensured before departure from site? (Reqd during work)	

I. Check list for track machines – BRM

S. N.	Item	Yes/ No
1.	Has Ballast position and equalising planning been done in advance? (Advance)	
2.	Has all Obstructions to working which can be removed been removed? (Advance)	
3.	Has hidden posts likely to obstruct BRM working to be exposed for machine operator to take necessary precaution during working.(Advance)	
4.	Are all the safety items available with machine as per Para No.704 of IRTMM? (Advance)	
5.	Does the operator poses valid competency certificate as per para 703 of IRTMM for operating the machine ? (Advance)	

6.	Is necessary protection in case of Infringement to adjacent track being ensured? (Reqd during working)	
7.	Has specific person been assigned the duty of repeating the location of RE Mast to avoid any infringement? (Reqd during working)	
8	Has proper physical locking of all ploughs before departure from site been ensured? (Reqd during working)	

J. Check list for track machines – RGM

S. N.	Item	Yes/ No
1.	Is available safety equipment's on the machine as per para 704 of IRMM? (Advance)	
2.	Does the operator poses valid competency certificate as per para 703 of IRTMM for operating the machine ? (Advance)	
3.	Is there proper stabling facility for the machine? (Advance)	
4.	Has the RCD been identified and supply of diesel to machine been ensured ? (Advance)	
5.	Is water supply arrangement available for meeting RGM requirement? (Advance)	
6.	Is the track detail in GDMS format available with the machine for section being ground? (Advance)	
7.	Has the location where grinding is to be skipped been identified? Also has they be painted for identification by operator? (Advance)	
8.	Is all grinding stones provided in the machine? (Advance)	
9.	Is RGM dust collection system working properly? (Advance)	
10.	Has the SSE/P.way ensured that control has been informed to not allow any train load carrying inflammable like diesel, petrol etc. is not allowed in adjacent track during RGM working. (Advance)	
11.	Has SSE/P.way ensured that any object close to track likely to catch fire has been adequately shifted for the period of machine working? (Advance)	
12.	Are following equipment available for monitoring grinding result (Advance) a. Miniprof b. Bar gauge c. Star Gauge d. Digital inclinometer e. Surface Roughness measuring gauge f. Rail Hardness	

13.	Is the grinding being done after passage of GMT as per decided grind cycle. (Advance)	
14.	Is enough test location provided in the section for monitoring of grinding? (Advance)	
15.	Has the staff been provided with safety gadgets for their safety during RGM working? (Reqd. during working)	
16.	Does the GQI show improvement after grinding? (Reqd. during working)	
17.	Is the surface left after grinding visibly of good quality? (Post work)	
18.	Is the rail crown radius closer to 250 mm and roughness less than 20 microns. (Post work)	
19.	Are following measurements being taken at test locations for ensuring quality and for monitoring grinding: (Post work) a. Measurement of before and after profile of rail by Miniprof b. Photograph before and after grinding c. Measurements for monitoring contact band d. DPT before and after grinding.	
20.	Is report being sent to RDSO in desired proforma for their monitoring and analysis.(Post work)	

Position of Trolleys in Tamping machines

S.No	Machine	AB	BC	CD	AC	BD	AD
1	0 8 - 32 (8018-8045)	5	5	10	10	15	20
2	08-275 (8249-8060)	5	5	10.6	10	15.6	20.6
3	08-275 -3S (8292-8312)	4.2	5.69	12.71	9.89	18.4	22.6
4	UNIMAT COMPACT- M (2000-2002)	5	5.4	11	10.4	16.4	21.4
5	UNIMAT COMPACT- M (2003-2008)	5	5.6	10.8	10.6	16.4	21.4
6	0 9- 32 CSM (901-953)	6	4.7	10.05	10.7	14.75	20.75
7	0 9-3X Tamping Express (2954-3963)	4.35	5.475	11.075	9.825	16.55	20.9
8	0 8-32 New (8049-8059)	5	5.115	9.8	10.115	14.915	19.915
9	08-275 UNIMAT-3S (8261-8291)	4.2	5.18	12.82	9.38	18	22.2
10	08-475 UNIMAT-4S (8401-8418)	5.85	6.09	12.71	11.94	18.8	24.65
11	0 9-3X Tamping Express (2964-3965)	4.35	5.475	11.075	9.825	16.55	20.9
12	0 9-3X Tamping Express (3966-3971)	4.35	5.475	11.075	9.825	16.55	20.9
13	0 9- 32CSM (954-967)	6	3.79	10.96	9.79	14.75	20.75
14	UNIMAT MFI SPLIT HEAD (2009-2018)	5	6.05	11.2	11.05	17.25	22.25
15	08-32 C (8128-8140)	5	5.3	9.35	10.3	14.65	19.65
16	09-32 CSM (968 -984)	6	3.79	10.96	9.79	14.75	20.75

Versine correction and its value for M/s Plasser make MPT- a sample

RT - 4 - 41700 9

$$V_{\max} = \frac{124791}{R * L} \quad AD = 22.25 \text{ m} \quad AC = 11.05 \text{ m} \quad AB = 5.00 \text{ m}$$

Meter R \ L	20	25	30	35	40	45	50	55	60	65	70	75	80
120	52	42	35	30	26	23	21	19	17	16	15	14	13
130	48	38	32	27	24	21	19	17	16	15	14	13	12
140	45	36	30	25	22	20	18	16	15	14	13	12	11
150	42	33	28	24	21	18	17	15	14	13	12	11	10
160	39	31	26	22	19	17	16	14	13	12	11	10	10
170	37	29	24	21	18	16	15	13	12	11	10	10	9
180	35	28	23	20	17	15	14	13	12	11	10	9	9
190	33	26	22	19	16	15	13	12	11	10	9	9	8
200	31	25	21	18	16	14	12	11	10	10	9	8	8
220	28	23	19	16	14	13	11	10	9	9	8	8	7
240	26	21	17	15	13	12	10	9	9	8	7	7	6
260	24	19	16	14	12	11	10	9	8	7	7	6	6
280	22	18	15	13	11	10	9	8	7	7	6	6	6
300	21	17	14	12	10	9	8	8	7	6	6	6	5
320	19	16	13	11	10	9	8	7	6	6	6	5	5
340	18	15	12	10	9	8	7	7	6	6	5	5	5
360	17	14	12	10	9	8	7	6	6	5	5	5	4
380	16	13	11	9	8	7	7	6	5	5	5	4	4
400	16	12	10	9	8	7	6	6	5	5	4	4	4
420	15	12	10	8	7	7	6	5	5	5	4	4	4
440	14	11	9	8	7	6	6	5	5	4	4	4	4
460	14	11	9	8	7	6	5	5	5	4	4	4	3
480	13	10	9	7	6	6	5	5	4	4	4	3	3
500	12	10	8	7	6	6	5	5	4	4	4	3	3
520	12	10	8	7	6	5	5	4	4	4	3	3	3
540	12	9	8	7	6	5	5	4	4	4	3	3	3
560	11	9	7	6	6	5	4	4	4	3	3	3	3
580	11	9	7	6	5	5	4	4	4	3	3	3	3
600	10	8	7	6	5	5	4	4	3	3	3	3	3
650	10	8	6	5	5	4	4	3	3	3	3	3	2
700	9	7	6	5	4	4	4	3	3	3	3	2	2
750	8	7	6	5	4	4	3	3	3	3	2	2	2
800	8	6	5	4	4	3	3	3	3	2	2	2	2
850	7	6	5	4	4	3	3	3	2	2	2	2	2
900	7	6	5	4	3	3	3	3	2	2	2	2	2
950	7	5	4	4	3	3	3	2	2	2	2	2	2
1000	6	5	4	4	3	3	2	2	2	2	2	2	2
1500	4	3	3	2	2	2	2	2	1	1	1	1	1
2000	3	2	2	2	2	1	1	1	1	1	1	1	1
2500	2	2	2	1	1	1	1	1	1	1	1	1	1
3000	2	2	1	1	1	1	1	1	1	1	1	1	1
3500	2	1	1	1	1	1	1	1	1	1	1	0	0
4000	2	1	1	1	1	1	1	1	1	0	0	0	0
4500	1	1	1	1	1	1	1	1	0	0	0	0	0
5000	1	1	1	1	1	1	0	0	0	0	0	0	0
6000	1	1	1	1	1	0	0	0	0	0	0	0	0
7000	1	1	1	1	0	0	0	0	0	0	0	0	0
8000	1	1	1	0	0	0	0	0	0	0	0	0	0

straight - transition

V - VALUES

curve - transition

ADJUSTMENT FROM FRONT CABIN

Meter	2.0	4.0	6.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	20.0	22.0	22.3	0.0	0.0
Vo	0.00	0.01	0.05	0.12	0.17	0.23	0.31	0.40	0.50	0.61	0.71	0.81	0.88	0.94	0.99	1.00	1.00	0.00	0.00
2	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	0	0	0
4	0	0	0	0	1	1	1	2	2	2	3	3	4	4	4	4	4	0	0
6	0	0	0	1	1	1	2	2	3	4	4	5	5	6	6	6	6	0	0
8	0	0	0	1	1	2	2	3	4	5	6	6	7	8	8	8	8	0	0
10	0	0	1	1	2	2	3	4	5	6	7	8	9	9	10	10	10	0	0
12	0	0	1	1	2	3	4	5	6	7	9	10	11	11	12	12	12	0	0
14	0	0	1	2	2	3	4	6	7	9	10	11	12	13	14	14	14	0	0
16	0	0	1	2	3	4	5	6	8	10	11	13	14	15	16	16	16	0	0
18	0	0	1	2	3	4	6	7	9	11	13	14	16	17	18	18	18	0	0
20	0	0	1	2	3	5	6	8	10	12	14	16	18	19	20	20	20	0	0
22	0	0	1	3	4	5	7	9	11	13	16	18	19	21	22	22	22	0	0
24	0	0	1	3	4	6	7	10	12	15	17	19	21	23	24	24	24	0	0
26	0	0	1	3	4	6	8	10	13	16	19	21	23	24	26	26	26	0	0
28	0	0	1	3	5	7	9	11	14	17	20	23	25	26	28	28	28	0	0
30	0	0	2	4	5	7	9	12	15	18	21	24	26	28	30	30	30	0	0
32	0	0	2	4	5	7	10	13	16	19	23	26	28	30	32	32	32	0	0
34	0	1	2	4	6	8	11	14	17	21	24	27	30	32	34	34	34	0	0
36	0	1	2	4	6	8	11	14	18	22	26	29	32	34	36	36	36	0	0
38	0	1	2	5	6	9	12	15	19	23	27	31	34	36	38	38	38	0	0
40	0	1	2	5	7	9	12	16	20	24	28	32	35	38	40	40	40	0	0
42	0	1	2	5	7	10	13	17	21	26	30	34	37	39	42	42	42	0	0
44	0	1	2	5	7	10	14	18	22	27	31	35	39	41	44	44	44	0	0
46	0	1	2	5	8	11	14	18	23	28	33	37	41	43	46	46	46	0	0
48	0	1	2	6	8	11	15	19	24	29	34	39	42	45	48	48	48	0	0
50	0	1	3	6	8	12	15	20	25	30	36	40	44	47	50	50	50	0	0
51	0	1	3	6	9	12	16	20	26	31	36	41	45	48	51	51	51	0	0
54	0	1	3	6	9	13	17	22	27	33	38	43	48	51	53	54	54	0	0
56	0	1	3	7	9	13	17	22	28	34	40	45	49	53	55	56	56	0	0
58	0	1	3	7	10	13	18	23	29	35	41	47	51	54	57	58	58	0	0
60	0	1	3	7	10	14	19	24	30	37	43	48	53	56	59	60	60	0	0
62	0	1	3	7	11	14	19	25	31	38	44	50	55	58	61	62	62	0	0
64	0	1	3	8	11	15	20	26	32	39	46	52	56	60	63	64	64	0	0
66	0	1	3	8	11	15	20	26	33	40	47	53	58	62	65	66	66	0	0
68	0	1	3	8	12	16	21	27	34	41	48	55	60	64	67	68	68	0	0
70	0	1	4	8	12	16	22	28	35	43	50	56	62	66	69	70	70	0	0
72	0	1	4	9	12	17	22	29	36	44	51	58	64	68	71	72	72	0	0
74	0	1	4	9	13	17	23	30	37	45	53	60	65	69	73	74	74	0	0
76	0	1	4	9	13	18	24	30	38	46	54	61	67	71	75	76	76	0	0
78	0	1	4	9	13	18	24	31	39	48	56	63	69	73	77	78	78	0	0
80	0	1	4	10	14	19	25	32	40	49	57	64	71	75	79	80	80	0	0
Meter	-10	-8	-6	-4	-2	-1	0	1	2	3	4	5	6	7	8	10	12	0	0

ADJUSTMENT

BEFORE

ÜA / ÜE

ADJUSTMENT

AFTER

ÜA / ÜE

ADJUSTMENT FROM REAR CABIN

X and K correction to lift value for M/s Plasser make MPT- a sample

Plasser & Theurer

NT- 28 E-2

GAUGE= 1676 mm

K= 50 * \ddot{U} /R

\ddot{U}	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
R																
180	3	6	8	11	14	17	19	22	25	28	31	33	36	39	42	44
190	3	5	8	11	13	16	18	21	24	26	29	32	34	37	39	42
200	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40
220	2	5	7	9	11	14	16	18	20	23	25	27	30	32	34	36
240	2	4	6	8	10	13	15	17	19	21	23	25	27	29	31	33
260	2	4	6	8	10	12	13	15	17	19	21	23	25	27	29	31
280	2	4	5	7	9	11	13	14	16	18	20	21	23	25	27	29
300	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27
320	2	3	5	6	8	9	11	13	14	16	17	19	20	22	23	25
340	1	3	4	6	7	9	10	12	13	15	16	18	19	21	22	24
360	1	3	4	6	7	8	10	11	13	14	15	17	18	19	21	22
380	1	3	4	5	7	8	9	11	12	13	14	16	17	18	20	21
400	1	3	4	5	6	8	9	10	11	13	14	15	16	18	19	20
450	1	2	3	4	6	7	8	9	10	11	12	13	14	16	17	18
500	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
550	1	2	3	4	5	5	6	7	8	9	10	11	12	13	14	15
600	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	13
650	1	2	2	3	4	5	5	6	7	8	8	9	10	11	12	12
700	1	1	2	3	4	4	5	6	6	7	8	9	9	10	11	11
750	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11
800	1	1	2	3	3	4	4	5	6	6	7	8	8	9	9	10
850	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9
900	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9
950	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
1000	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
1100	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7
1200	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7
1300	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6
1400	0	1	1	1	2	2	3	3	3	4	4	4	5	5	5	6
1500	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
2000	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4
2500	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3

$$X = 83586 / R$$

Part of X	.01	.02	.05	.10	.15	.22	.29	.38	.48	.60	.84	X
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M. after AA	1	2	3	4	5	6	7	8	9	10	13	15.6
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RADIUS

2000	0	1	2	4	6	9	12	16	20	25	35	42
2200	0	1	2	4	6	8	11	15	18	23	32	38
2400	0	1	2	3	5	8	10	13	17	21	29	35
2600	0	1	2	3	5	7	9	12	16	19	27	32
2800	0	1	2	3	4	6	9	11	14	18	25	30
3000	0	1	2	3	4	6	8	11	14	17	23	28
3500	0	1	1	2	4	5	7	9	12	14	20	24
4000	0	1	1	2	3	4	6	8	10	13	18	21
4500	0	0	1	2	3	4	5	7	9	11	16	19
5000	0	0	1	2	3	4	5	6	8	10	14	17
5500	0	0	1	1	2	3	4	6	7	9	13	15
6000	0	0	1	1	2	3	4	5	7	8	12	14
6500	0	0	1	1	2	3	4	5	6	8	11	13
7000	0	0	1	1	2	3	4	5	6	7	10	12
8000	0	0	1	1	2	2	3	4	5	6	9	10
9000	0	0	1	1	1	2	3	4	4	6	8	9
10000	0	0	0	1	1	2	2	3	4	5	7	8
12000	0	0	0	1	1	2	2	3	3	4	6	7
15000	0	0	0	1	1	1	2	2	3	3	5	6
20000	0	0	0	0	1	1	1	2	2	3	4	4
30000	0	0	0	0	0	1	1	1	1	2	2	3
50000	0	0	0	0	0	0	0	1	1	1	1	2
100000	0	0	0	0	0	0	0	0	0	1	1	1

Infringements, Transportation Code & Speed of Different Track Machines

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimension as per SOD (mm)	Speed in kmph	
							Self propelled	In train formation
1.	Continuous Tamping Machine (09 - 32 CSM)	M/s Plasser		i) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face.	730	914	60	40
				ii) Min. rigid wheel base.	1800	1830		
2.	Points & Crossing Tamping Machine (UNIMAT 08-275-3S)	M/s Plasser		i) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face.	730	914	60	40
				ii) Min. rigid wheel base.	1800	1830		
				iii) Max. distance between any two adjacent axles.	12200	11890		
3.	Dynamic Track Stabilizer (DGS-62N)	M/s Plasser		i) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face	730	914	60	50
				ii) Min. rigid wheel base for bogie.	1500	1830		
4.	Ballast Cleaning Machine (RM-80)	M/s Plasser		i) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face.	900	914	40	30
				ii) Max. distance apart of bogie centres.	22200	14785		
				iii) Max. length of bogie or roof.	29360	21340		
				iv) Max. length of under frames over headstocks.	29360	21030		
				v) Max. length over side buffers.	30600	22300		
				vi) Max. distance apart between adjacent axles.	20370	11890		
5.	Ballast Regulator (66-4)	M/s - Kershaw USA		i) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face.	838.2	914	50	40
				4-wheeler vehicles.	9120	8540		
				ii) Max. length of body or roof for 4-wheeler vehicles.	10389	9810		
6.	Track Relaying Train (P-811-S)	Mis Tamper Corporation, USA		iii) Max. length over side buffers	838.2	914	5	50
				i) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face.	1727.2	1830		
				ii) Min. rigid wheel base for bogie truck.	12072.94	11890		

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimension as per SOD (mm)	Speed in kmph		
							Self propelled.	In train formation	
7.	Points & Crossing Cleaning Machine (RM-76 UHR)	M/s Plasser		i) Min. dia. of new wheel tread measured at 63.5 mm from wheel gauge face. ii) Max. distance apart of bogie centre. iii) Max. length of body or roof for bogie vehicles. iv) Max. length of under frames over headstocks. v) Max. length over side buffers vi) Max. distance apart between two adjacent axles	900	914	40	30	
8.	Points & Crossing Changing Machine (AMECA-T-28)	M/s -Ameca Italy		i) Wheel Gauge: Maximum Minimum ii) Min. dia of new wheel tread measured at 63.5 mm from wheel gauge face	1604 1598 400	1602 1599 914	10	-	
9.	Ballast Cleaning Machine (RM80-92-l)	M/s Plasser		j) Min. dia on wheel tread. ii) Max. distance apart of bogie centre iii) Max. length of body iv) Max. length over head stock v) Max. length over side buffers. vi) Max distance apart between any two adjacent axles.	900 22200 28300 28300 29540 20370	914 14785 21340 21030 22300 11890	50	40	
10.	Shoulder Ballast Cleaning Machine (FRM-80)	M/s Plasser		i) Min. dia on wheel tread. ii) Max. distance apart of bogie centres iii) Max. length of body iv) Max. length over head stocks v) Max. length over side buffers. vi) Max distance apart between any two adjacent axles.	900 16000 38200 38200 39470 14170	914 14785 21340 21030 22300 11890	40	30	
11.	UTV 502 L	M/s -Tamper Corporation USA		j) Min. dia on new wheel tread. ii) Max. rigid wheel base. iii) Max. length of body for 4-wheel vehicle 3200 mm wide. iv) Max. length over head stocks. v) Max. length over side buffers.	838.2 8000 11303 11303 12522	914 6100 8540 8540 9810	60	40	

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimension as per SOD (mm)	Speed in kmph	
							Self propelled.	In train formation
12.	P&C Tamping Machine 08-275 (UNIMAT).	M/s Plasser		i) Min. dia on wheel tread.	730	914	60	40
				ii) Min. distance apart of bogie centres.	11500	11933		
				iii) Min. bogie wheel base.	1500	1830		
13.	Ballast Regulator 56-3	M/s -Kershaw USA		i) Min. dia on wheel tread.	832	914	60	40
				ii) Max. length of body.	11074	8540		
				iii) Max. length over headstocks.	11074	8540		
				iv) Max. length over side buffers.	12344	9810		
14.	Multipurpose Tamping Machine.	M/s Plasser		i). Min. dia on wheel tread measured at 63.5mm from gauge face.	730	914	60	40
				ii) Min. rigid wheel base for bogie truck of any vehicle.	1800	1830		
15.	High Output Tamping Machine (09-3X) 20.0t axle load.	M/s Plasser	CHTMD 9-3XP1	i). Min. dia on the tread of new carriage wheel, measured at 63.5mm from the wheel gauge face.	730	914	60	60
				ii) Max. distance apart of bogie centres for bogie vehicles 3250 mm wide.	15700	14785		
				iii) Min. rigid wheel base for bogie truck of any vehicle.	1500-Satellite bogie. 1800-Front and Rear bogies			
				iv) Max. length of underframes over headstocks for bogie vehicles 3250mm wide.	21700	21030		
				v) Max. length over side buffers for bogie vehicles 3250mm wide.	22940	22300		
				vi) Distance apart for centres of buffers.	1956	1955		
16.	Utility Track Vehicle	M/s-BHEL		ii) Max Length of body or roof for 4 wheeler vehicle 3200 mm wide.	10516	8540	50	50
				i) Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face.	900	914		
17.	Shoulder Ballast Cleaning Machine (FRM-85F).	M/s Plasser	CSBC85 FP	ii) Max. distance apart of bogie centres .	16000	14785	40	30
				iii) Max. Length of body or roof.	38200	21340		
				iv) Max. Length of under frames over head stocks.	38200	21030		
				v) Max. Length over side buffers.	39440	22300		
				vi) Max. distance apart between any two adjacent axles.	14170	11890		

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimension as per SOD (mm)	Speed in kmph	
							Self propelled.	In train formation
18.	Worksite Tamper Model-VPR-02M	M/s -Metex		i). Min. dia of wheel tread measured at 63.5mm from gauge face.	710.325	914	40	40
				ii) Minimum projection for flange of new tyre, measured from tread at 63.5mm from wheel gauge face.	27.675	28.50		
				iii) Max. thickness of flange of tyre, measured from wheel gauge face at 13 mm from outer edge of flange.	32.31	28.5		
				iv) Max. Length over side buffers for bogie vehicle 3250mm wide.	23550	22300		
19.	Utility Track Vehicle.	M/s -OEPL		i) Max. thickness of flange of tyre, measured from wheel gauge face at 13 mm from outer edge of flange.	29.4	28.5	60	50
				ii) Max. rigid wheel base.	6500	6100		
				iii) Max Length of body or roof for 4 wheeled vehicle 3200 mm wide.	9000	8540		
				iv) Max. Length of under frames over head stocks.	9000	8540		
				v) Max. Length over side buffers.	10270	9810		

Infringements, Transportation Code & Speed of Different Track Machines

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimensi on as per SOD (mm)	Speed in kmph	
							Self propelled.	In train formation
1	High Output Tamping Machine (09-3X) 18.5t axle load.	M/s Plasser		i) Min. dia on the tread of new carriage or wagon wheel, measured at 63.5mm from the wheel gauge face. ii) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. iii) Maximum height above rail level for floor of any unloaded vehicle. iv) Max. distance apart of bogie centres for bogie vehicles . v) Min. rigid wheel base for bogie truck of any vehicle	730-for Satellite bogie. 850- for Front and Rear bogies.	914	50	65
					28.68	28.50		
					1370	1345		
					15700	15241		
					1500-for Satellite bogie. 1800-for Front and Rear bogies.	1830		
					21700	21340		
					22940	22300		
					730-for Satellite bogie.	914	50	65
2.	High Output Tamping Machine (09-3X) 21.0t axle load.	M/s Plasser	CHTM09-3XP	i) Min. dia on the tread of new carriage or wagon wheel, measured at 63.5mm from the wheel gauge face. ii) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. iii) Max. height above rail level for floor of any unloaded vehicle. iv) Distance apart of centres of buffers v.) Max. distance apart of bogie centres for bogie vehicles v) Min. rigid wheel base for bogie truck of any vehicle. vi) Max. Length of body or roof for bogie vehicles. vii) Max. Length over side buffers for bogie vehicles.	730-for Satellite bogie.	914	50	65
					29.46	29.4		
					1370	1345		
					1955	1956		
					15700	14900		
					1500-for Satellite bogie. 1800-for Front and Rear bogies.	1830		
					21700	21340		
					22940	22300		

SN	Name of the Machine	Make	Trans- portation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimensi on as per SOD (mm)	Speed in kmph	
							Self pro- pelled.	In train formation
3.	Utility Track Vehicle with Mobile Crane.	M/s Phooltas		i) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. ii) Distance apart for centres of buffers. iii) Max. rigid wheel base iv) Max. Length of body or roof for 4 wheeled vehicle. v) Max. Length over side buffers for 4 wheeled vehicle	29.4	28.5	50	60
					1956	1955		
					8000	6100		
					11900	8540		
					13170	9810		
4.	Utility Track Vehicle.	M/s BEMIL	CUTVB	i) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. ii) Distance apart for centres of buffers. iii) Max. rigid wheel base for four wheeled vehicles. iv) Max Length of body or roof for 4 wheeled vehicle. v) Max. Length over side buffers for 4 wheeled vehicle.	29.4	28.5	50	50
					1956	1955		
					7000	6100		
					10850	8540		
					12120	9810		
5.	Dynamic track Stabilizer	M/s BHEL	CTSBH	i) Maximum height above rail level for floor of any unloaded vehicle.	1450	1345	50	50
6.	Ballast Regulating Machine Model-USP 2000 SWS	M/s Plasser	BRM/USP- 2000SWS	i) Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face. ii) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. iii) Maximum height above rail level for floor of any unloaded vehicle. iv) Distance apart for centres of buffers	850	914	50	60
					28.64	28.5		
					2100	1345		
7.	Point & Crossing Tamping Machine (UNIMAT 08-475-4S)	M/s Plasser	PCTM/08- 475-4S	i) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. ii) Maximum height above rail level for floor of any unloaded vehicle. iii) Distance apart for centres of buffers. iv) Min. rigid wheel base for bogie truck of any vehicle. v) Max. Length over side buffers for bogie vehicle.	1955	1956	50	65
					29.46	28.50		
					1370	1345		
					1955	1956		
					1800	1830		
				28370	22300			

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Dimension as per SOD (mm)	Speed in kmph	
							Self propelled.	In train formation
8.	Lifting, Lining ,Levelling and Tamping Machine Model-08-32C DUOMATIC	M/s Plasser		i) Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm. from wheel gauge face. ii) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. iii) Distance apart for centres of buffers.	850	914	50	50
					28.64	28.50		
					1955	1956		
9.	Dynamic Track Stabilizer (Model DSP-C8T)	M/s Metex	DTSC8TMX	iv) Min. rigid wheel base for bogie truck of any vehicle. i) Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face. ii) Maximum height above rail level for floor of any unloaded vehicle.	1800	1830	50	50
					860	914		
					1635	1345		
10.	Ballast Regulating Machine Model-PBR 400R	M/s Plasser	CBRM400R P	i) Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face. ii) Max. thickness of flange of tyre ,measured from wheel gauge face at 13 mm from outer edge of flange. iii) Distance apart for centres of buffers. iv) Max Length of body or roof for 4 wheeled vehicle. v) Max. Length over side buffers for 4 wheeled vehicle. vi) Maximum height above rail level for floor of any unloaded vehicle.	730	914	50	50
					28.64	28.50		
					1955	1956		
					9750	8540		
					11020	9810		
					1683	1345	50	65
11.	Rail Grinding Machine(RGI-72)	M/s Loram	CRG 72L	i) Maximum height above rail level for floor of any unloaded vehicle. ii) Maximum height above rail level for floor of any unloaded vehicle.	1700	1345	50	50
					1955	1956		
					1600	1345	50	50
12.	Ballast Regulating Machine Model-RPB-01	M/s Metex	CBRM/RPB -01MX	i) Distance apart for centres of buffers. ii) Maximum height above rail level for floor of any unloaded vehicle. iii) Max. distance apart of bogie centres for bogie vehicles. iv) Max. Length of body or roof for bogie vehicles v) Max. Length over side buffers for bogie vehicles. vi) Max. distance apart between any two adjacent axles	18000	15241		
					23840	21340		
					25110	22300		
					15900	12345		
					732	914	50	50
13.	Ballast Cleaning Machine	M/s BHEL		i) Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face.	1600	1345	50	50
					1955	1956		
14.	Worksite Tamper without flat car Model-VPR-02M	M/s Metex	TTM/VPR-02M		732	914	50	50

SN	Name of the Machine	Make	Transportation Code	Infringement Description	Actual Dimension of Machine (mm)	Speed in kmph		
						Dimension as per SOD (mm)	Self propelled. In train formation	
15.	Ballast Regulating Machine Model SPZ 210k	M/s Gemac China	CBRMG	i) Max. rigid wheel base for four wheeled vehicles. ii) Max. length of body or roof for 4 wheeled vehicle. iii) Max. Length over side buffers for 4 wheeled vehicle.	7500	6100	50	60
					13590	8540		
					14780	9810		
16.	Multipurpose Tamping Machine Model-Unimat Split Head MFI	M/s Plasser	CMTUSHP	i)Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face . ii)Distance apart from centres of buffers. iii) Max. Length over side buffers for bogie vehicles.	730	914	45	45
					1955	1956		
					28570	22300		
17.	Rail Borne Maintenance Vehicle (RBMV) Model-RBMV.01	M/s Phooltas	RBMVP	i)Min. Dia on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face ii) Distance apart from centres of buffers . iii)Max. Length over side buffers for bogie vehicles	952	914	65	65
					1956	1956		
					21337	21340		

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