



**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)**

**INDIAN RAILWAYS
SMALL TRACK MACHINE MANUAL**

July, 2005

FOREWORD

Mechanised track laying and maintenance has been introduced in a big way on Indian Railways. It is expected to completely mechanise the track maintenance and laying operation by the year 2012.

Based on the field experience and recommendations from zonal railways/small track machine manufacturers, number of instructions have been issued from time to time by the zonal railways and Railway Board. However, these were not documented at one place.

I am happy to note that Indian Railways Small Track Machines Manual, covering every aspect of working of small track machines, has been published. It is hoped that this manual will be quite useful to officers and staff associated with track maintenance and laying operations.

**New Delhi
July-2005**

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Preface

Mechanised maintenance of track on Indian Railways was introduced during early sixties. Modern track can't be maintained and laid manually and thus use of machines has become a basic necessity. Track Machines on Indian Railways have been categorized as Small Track Machines & Large Track Machines. Manual covering Large track machines was first published in March 2000. For working of small track machines, instructions have been issued by Railway Board & Zonal Railways from time to time. For documentation of these instructions at one place it was felt necessary to publish small track machine manual. To achieve this objective Railway Board vide letter no. 90/Track-III/TK/9/vol-III dated 07-5-2003 appointed a committee consisting of CE/TP/C.Rly., CE/PL/W.Rly., Dean/IRICEN/Pune & ED/TMM/RDSO.

The following officers participated in the Committee from time to time:-

- | | | |
|-------|----------------------|----------------------|
| (i) | Shri S.N.Agrawal, | CE / TP /C. Rly , |
| (ii) | Shri Sanjeev Mittal, | CE / PL / W . Rly. , |
| (iii) | Shri Ajit Pandit, | Dean/IRICEN/Pune |
| (iv) | Shri Surendra Kumar, | ED /TMM/ RDSO. |
| (v) | Shri Vijay Sharma | ED/TMM/RDSO |
| (vi) | Shri Adesh Sharma | CE / TM / C. Rly |
| (vii) | Shri Hitesh Khanna | CE / TM / N . Rly. |

While preparing the manual, efforts have been made to cover the following aspects of small track machines working:

1. Description and use of small track machines.
2. Guidelines for using, handling, transporting and storing of machines, safely and efficiently.
3. Maintenance schedules and type of maintenance in each schedule.
4. Requirement of manpower.
5. Requirement of consumables.
6. Type of power pack to be used.

The committee held its first meeting on 4th and 5th Nov. 2003 at RDSO/Lucknow. Subject matter of various chapters of the manual was discussed by the committee during subsequent meetings. Draft of the manual was finalized in the last meeting of the Committee held on 7th & 8th July, 2004 at Mumbai CST. The prevailing instructions in regard to working of small track machines over different railways, instructions issued by Railway Board, provision in IRPWM, Indian Railways General rules and other relevant codes and manuals and circulars issued by RDSO had also been kept in view while writing this manual.

While every effort has been made to cover all aspects of small track machine working, it is not possible to make any manual absolutely complete. Chief Engineer of zonal railways may issue such supplementary instructions as necessary to suit local conditions on the railways. Such instructions, however, should not contravene any of the provision in this manual and other codes/manuals.

The committee was rendered valuable assistance & contributions by S/Shri Pradeep Singh, Narender Kumar (both Directors, RDSO) during deliberation and preparation of this manual.

Though every care has been taken in preparing this manual, any error or omission may be brought to the notice of Railway Board. Suggestions for further improvement in this manual are welcome. The same may be addressed to ED/Track Machine, RDSO or ED/TK (Machine), Railway Board.

New Delhi
July 2005

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Chapter-1

General

(Organizational Set Up, Procurement, Inspection and Training)

1.1 Preamble: Due to growing traffic and introduction of heavier track structure, faster and more efficient methods of maintenance are needed to be evolved. In the changed socio-economic scenario, role of small track machines has increased for quality maintenance of track. Different types of small machines have been developed for various activities on track. These small track machines are to be used for day-to-day maintenance, laying and construction of track. Based on field experience, recommendations of small track machine committee and manufacturer's instructions, this manual has been documented.

1.2 Organisational setup: The organisation shall be under the overall charge of CTE or CE/TM of the railway. CTE/CE(TM) shall be assisted by one Dy. Chief Engineer/ Sr. Engineer for small track machines as convenient.

At divisional level each Sr.DEN/DEN shall guide AENs for smooth functioning of Small Track Machine depot at sub division level. Small Track Machine depot in each sub division shall be under the charge of one SSE/P.Way.

1.3.1 Yardstick of Small Track Machines: The yardstick of the availability of various small track machines, section engineer wise is given in Annexure-I. Additional requirement of small track machines wherever required shall be worked out by the Division/Railway.

1.3.2 Requirement of Manpower: The indicative manpower requirement for operation of different machines is given in the manual. However, the actual requirement will depend on the nature of track maintenance operations to be carried out, grouping of machines and local conditions as all the machines will not be required to work every day in each section. The requirement of maintenance activities and thus the requirement of manpower will be different for various sections. Leave reserves have not been included in the requirement of manpower indicated in the manual. The actual requirement for individual section shall be worked out by the division.

1.3.3 Creation of posts: The posts sought to be created for operation and maintenance of small track machines should be done by surrender of equivalent money value of live revenue charged posts of Gangman/other category involved in the track maintenance. The component of unskilled staff being created should be barest minimum. The proportion of skilled personnel should form at least 75% of the total posts to be created.

1.3.4 Gazetted posts: No gazetted posts are to be created either at divisional level or at HQ level.

1.4 Procurement: Procedure for procurement of small track machines/tools shall be as following:

- a. The officers of Engineering Department, dealing with small track machines, shall have the powers to procure small track machines/tools and their spares, consumables and small tools to meet the requirements, as available to the officers of Stores Department in corresponding posts (CE equivalent to COS, CTE/MC equivalent to CMM, Dy.CE equivalent to Dy.COS and SEN/MC equivalent to SSO).
- b. All rules and procedures as laid down for procurement by the Stores Department, shall be followed by Engineering Department while exercising powers as per para (a) above.
- c. The Tender Committee wherever necessary may be constituted with the Engineering Officers of appropriate level as a convenor and the other members from Finance and Stores as per the schedule of powers delegated on the zonal railways.
- d. The Small Track Machines shall be charged to proper sanctioned estimates under Demand No.16 or revenue budget (Demand No.4 – P.Way Works).
- e. Before procurement of any machine, it shall be ensured that similar machines/tools available on division are being effectively utilised.
- f. Small track machines/tools shall be procured only from the manufacturers/suppliers, approved by RDSO/Railway Board and as per specification and drawing approved by RDSO/Railway Board.
- g. Small track machines/tools shall be accepted only after the firm arranges one field demonstration cum training at railway premises.
- h. All Small Track Machines & tools shall be purchased under at least two years manufacturers warranty. Negotiations for AMCs after warranty period shall be held & finalised at the time of initial purchase.
- i. For emergency repairs and purchase of spares incidental to such repairs, following powers are delegated to the officers of Engg. Deptt. as under:

i) PHOD, HOD, DRM,ADRM	Rs.25,000/- (Rupees Twenty five thousand only) instead of Rs. one lakh per breakdown, with finance concurrence.
ii) Dy.CE/TT	Rs.5,000/- (Rupees five thousand only) per breakdown without finance concurrence with an annual ceiling limit of Rs.1 lakh.
iii) XEN/TT	Rs.2,500/- (Rupees two thousand five hundred only) without finance concurrence with an annual ceiling limit of Rs.50 thousand.

The overall annual ceiling limit for purchase/repairs for each zonal railways will be Rs. Five lakhs. Cases exceeding Rs.25,000/- would require AGM's sanction. All other conditions laid down in para (ii), (iii) & (iv) of Board's letter no.96/Track-III/TK/28 dated 9/9/98 should be followed.

The clauses at (f), (g) and (h) above should form part of the tender conditions.

1.4.1 Sub Divisional Depot: Each sub division shall have nucleus depot, preferably at sub divisional HQ for maintenance and repair of all the small track machines/tools of that sub division. The existing repairing, maintenance and welding/reconditioning workshop in each sub division may be utilised for small track machines/tools also.

Base workshop in each sub-division shall be modernised to take the responsibility of repairs of all small track machines/T&P. This may be kept directly under control of AEN assisted by SE in charge. Required cash imprest and AMC shall be made available to SE Incharge and AMC for all machines shall be arranged covering entire division.

At least one SE (Small Track Machine) and one fitter with minimum two Khalasis shall be posted for the sub divisional depot as in-charge of the maintenance and repairing of small track machines/tools, within the existing manpower. Accountal of consumables specially fuel, lubricants, greases etc. shall be done by the stock holder as per the existing instructions/norms.

- 1.5 Inspection:** As laid down in correction slip no.6 to IRPWM 1986, AEN shall carry out inspection of all the Small Track Machines once in 6 months, while the Section Engineer shall inspect all his machines/tools once in a fortnight.
- 1.5.1** Sr.DEN/DENs/AENs shall pay special attention to repairs, maintenance and effective use of Small Track Machine during their regular inspection of Section Engineer's offices and stores. They shall also scrutinise the Small Track Machines Register. Sr.DEN/DENs shall monitor the availability, use and performance of each type of machine under the control of each AEN/DEN and the report shall be submitted to HQ office regarding their performance in their monthly PCDOs. The problematic aspects of Small Track Machines as brought out in PCDOs by the division shall be inspected by an officer nominated by Zonal HQ and report about problems and suggested solutions shall be endorsed to Sr.DEN/Co-ord. and CTE, who shall endeavour to communicate the solutions to the users.
- 1.6 Training:** Sr.DEN(Cord.) shall organize training of staff for operation and maintenance of small track machines/tools through the machines/tools manufacturers. It shall also be ensured that adequate training facilities are made available in Divisional Training School at divisional level and Zonal training Schools at Zonal Level.
- 1.6.1** Centralized training for operation, maintenance and repair of small track machines/tools shall be organized and Zonal Railway Training centres/Divisional Training Centres.
- 1.7** This manual is issued with the concurrence of Finance Directorate of Railway Board.

YARDSTICK OF VARIOUS SMALL TRACK MACHINES

S. No.	TYPE OF MACHINE	QUANTITY
1.	Abrasive Rail Cutter	3 per SE (Suburban) 1 per SE (Other than suburban) 1 per ART
2.	Abrasive Rail Cutting Wheel	As required
3.	Rail Cutting Machine (Saw Type)	2 nos. per SE (other than Suburban) 1 per ART
4.	Hacksaw Blade for cutting Rails	As required
5.	Rail Drilling Machine	2 per SE (Suburban) 1 per SE (other than suburban) 1 per ART
6.	Chamfering Kit	1 per SE
7.	Hydraulic Rail Tensor (non-infringing type), 70 t capacity	2 per SE
8.	Hydraulic Rail Bender (Jim Crow), Heavy duty	1 per SE
9.	Hydraulic Rail Joint Straightener	1 per Sub division
10.	Rail Creep Adjuster	1 per SE
11.	Hydraulic Sleeper Spacer	2 per SE
12.	Concrete Sleeper Breaker with Angle Grinder	1 per ART
13.	Concrete Sleeper Drilling Machine	1 per Division
14.	Portable DC Welding Generator	1 per SE
15.	Double Action Weld Trimmer for AT Welding (Power Pack Version)	1 per Welding-unit
16.	Rail Profile Weld Grinder	1 per Welding-unit
17.	Heavy Duty Hydraulic Extractor for Jammed ERCs	1 per SE 1 per ART
18.	Toe Load Measuring Device (Mechanical)	1 per SE
19.	Electronic Toe Load Measuring Device	1 per SE
20.	Mechanical Track Jack	2 per gang/unit
21.	Hydraulic Track Jack	4 per gang/unit
22.	Portable track lifting & slewing device (TRALIS)	2 per SE
23.	Self Propelled light weight Trolley	1 per AEN
24.	Powered Material Trolley	1 per SE
25.	Light Weight Rail (Mono) cum Road Trolley	2 per gang

S. No.	TYPE OF MACHINE	QUANTITY
26.	Jib Crane Attachable to BFR-BRH for handling concrete Sleeper	As required
27.	Attachment for Rail Dolly for PRC sleeper	4 per SE
28.	Powered Rail Hauling System	1 per PQRS site
29.	Hand Held Off Track Tamper	3 per SE
30.	Portable Ballast Cleaner (Semi-Mechanised)	1 per gang
31.	Portable Shoulder Ballast Compactor	1 per SE

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Chapter –2.1 --- Abrasive Rail Cutter

2.1.1 Use :

Abrasive rail cutter is used for - quick cutting of all types of rail sections including wear resistant, head hardened rails up to 110 UTS.

2.1.2 Description :

The machine comprises of petrol driven Engine, integrated with a cutting unit fitted with an abrasive disc.

Salient features:

Prime mover : A petrol engine of about 7 HP at 7000 RPM .

Fuel Tank Capacity : The fuel tank capacity shall be at least 1 litre, which shall be sufficient for at least 5 cuts in 52 kg 90 UTS rails.

Overall weight : Maximum 35 kg.

Tolerance : ± 1 mm both from vertical and lateral faces of railhead.

No. of cuts per disc : Minimum 7 numbers of cuts on 52 Kg 90 UTS

Cutting time :

Rail		Recommended time in minutes
(i)	60 Kg/m, 110 UTS	5
(ii)	60 Kg/m, 90 UTS	4
(iii)	52 Kg/m, 90 UTS & other rails	3
(iv)	52 Kg/m, 72 UTS & other rails	2



2.1.3 Guidelines for using, handling, transporting and storing of machines.

2.1.3.1 Using :

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

- Inspect wheel for cracks or other damages.
- Test disc by striking lightly with a piece of wood. If the disc does not make a full ringing sound, it is damaged.
- Check the contact surfaces of cutter disc and ensure that flanges are flat and free of foreign material.

- (iv) The disc shall be within its expiry date of use.

2.1.3.1.1 Precautions in operation:

- (i) The operator shall be fully conversant with use of the machine. The operator shall not be tired, under stress or under influence of any drug or alcoholic drink.
- (ii) The operator shall read and understand the safety precaution mentioned in the operation's manual and shall strictly follow the instructions.
- (iii) The operator shall wear safety clothing, shoes and goggles before starting the machine.
- (iv) No inflammable article shall be in vicinity of the cutting location. During cutting of rails in track circuit area care should be taken to avoid signal cable from burning.

2.1.3.2 Handling:

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

2.1.3.3 Transportation

The machine shall not be transported while the cutting disc is mounted on it. Fuel Tank Shall be empty while transporting from one place to another place. There shall not be rough handling during transporting . The machine may be transported on push trolley/material trolley.

2.1.3.4 Storage:

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

2.1.4 Maintenance schedule:

Instructions contained in the maintenance manual supplied with the machine shall be followed during maintenance. Following procedures shall be observed as general maintenance practice.

2.1.4.1 Daily Maintenance:

- (i) Check the main filter
- (ii) Check the tension of the drive belt.
- (iii) Check the condition of the cutting wheel.
- (iv) Check the starter and starter chord, clean the outside of the starter's air intake.
- (v) Check that all nuts and bolts are tightened correctly.
- (vi) Check the function of the stop switch.

2.1.4.2 Weekly Maintenance:

- (i) Check the backup paper filter.
- (ii) Check that the handles and the anti vibration elements are not damaged.
- (iii) Clean the spark plug.
- (iv) Clean the cooling fans on the flywheel. Check the starter and the recoil spring.
- (v) Clean the cooling fans on the cylinder.
- (vi) Clean the muffler.
- (vii) Check the starting mechanism.

2.1.4.3 Monthly Maintenance:

- (i) Check the clutch drum, drive pulley and clutch springs with regard to wear.
- (ii) Clean the carburettor.
- (iii) Check the fuel filter, fuel hose, change if necessary.
- (iv) Clean the fuel tank.
- (v) Check all cables and connections.

2.1.4.4 Trouble Shooting:

S.N.	Problem	Probable - cause	Remedy
1.	Engine does not start	i) Engine starting switch is off. ii) Fuel in tank is not enough. iii) Carbon deposition in spark plug. iv) Improper spark during ignition. v) Fuel not reaching carburettor.	i) Put it in 'ON' position. ii) Fill the tank with fuel. iii) Clean the spark plug. iv) Check spark plug gap. It shall be 0.5 mm. Adjust gap. Change the spark plug if damaged. v) Check and repair fuel oil line.
2.	Cutting is slow	i) Improper surface speed of cutting wheel. ii) Driving belt loose.	i) Check the engine r.p.m. which shall match the required r.p.m. of the wheel. ii) Tighten the belt.
3.	Rotation of cutting disc stops during cutting while engine runs continuously	i) Driving belt is run out. ii) Defective alignment.	i) Stop the engine. Replace/tighten driving belt. ii) Stop the engine and re-align the machine properly.

2.1.5 Requirement of manpower

Two persons – one skilled person to operate the machine and one unskilled person to carry it.

2.1.6 Requirement of consumables

- (i) Abrasive disc (400 X 4 X 22.23) mm (As per latest RDSO specification)
- (ii) Driving belt.

- (iii) Petrol.

2.1.7 Details of Abrasive Rail Cutting Wheel:

2.1.7.1 Use:

The abrasive rail cutting wheel is a disc used with abrasive rail cutting machine for cutting rails for various permanent way maintenance works of Indian Railways.

2.1.7.2 Description:

The abrasive rail cutting wheel is a thin circular cutting disc made of abrasive sand and bonding material.

Salient features:

- (i) Diameter : 400 + 5 mm
- 3 mm
- (ii) Thickness : 4.0 ± 0.25 mm
- (iii) Bore : 22.23 mm
- (iv) Nominal size : 400 x 4 x 22.23 mm
- (v) Operating speed : 100 m per sec. approx.
- (vi) Performance : Minimum 7 nos. of cuts on 52 kg 90 UTS rail and
6 nos. of cuts on 60 kg 90 UTS rail at discard
diameter of 260 mm.
- (vii) Rail cutting wheels shall carry legible and indelible markings indicating:
 - a) Name, initials and trade mark,
 - b) Expiry date or shelf life,
 - c) Manufacturing lot number and year of manufacturing.

2.1.7.3 Guidelines for using, handling, transportation and storage:

2.1.7.3.1 Using:

Following instructions shall be observed:

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

2.1.7.3.2 Precautions in Operation:

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

2.1.7.3.3 Handling:

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

2.1.7.3.4 Transportation:

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

2.1.7.3.5 Storage:

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

2.1.7.3.6 Maintenance Instructions:

Supplier's booklet shall be referred to for maintenance of the disc. The cutting wheel shall be kept clean and dry when not in use.

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Chapter 2.2 - Rail cutting machine (saw type)

2.2.1 Use :

Rail cutting machine (saw type) is used for cutting of rails.

2.2.2 Description :

The machine comprises of a driving engine with cutting unit coupled together rigidly in a compact unit. Fixing clamp is also provided with the machine as an integral part.



Salient Features:

- | | |
|--|--|
| (i) Prime mover | : Petrol start, kerosene/petrol run engine 2.0 to 3.0 HP capacity at 3000-4000 rpm |
| (ii) Fuel tank capacity | : Sufficient for making 4 to 5 rail cuts |
| (iii) Overall weight of the machine including wheel arrangement shall not exceed | : 70 Kg |
| (iv) Cutting time for each cut | : Maximum time is 30 minutes |
| (v) Tolerance of squareness both vertical and lateral | : ± 1.0 mm |
| (iv) Fuel consumption | : Minimum two cuts for 1 litre fuel. |

2.2.3 Guidelines for using, handling, transporting and storing of machines :

2.2.3.1 Using:

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

- (i) Check oil in the engine sump and fill the sump with the recommended grade of oil if required. For checking and filling oil in the sump, instructions given in engine manual shall be followed.
- (ii) Check gear oil level in the machine gear box. For checking oil level, open the plug and see if oil oozes out of the hole; if not, add more oil till it starts oozing out of the hole. Tighten the plug in the hole.
- (iii) Fill up petrol and kerosene in the respective compartments of the fuel tank.

- (iv) Fix the machine firmly on the rail to be cut.
- (iv) Fix the blade tightly on the hacksaw frame with the help of spanners.
- (v) Lift the hacksaw frame from the lock and place it exactly at the point to be cut and again put the hacksaw frame on the lock.
- (vi) Tighten the clamping device.
- (vii) Start the engine with the rope provided with the engine (as per instructions given in the engine hand book).
- (viii) After starting, lift the hacksaw frame from the lock and put it on the rail in the cutting motion.
- (ix) Open the coolant (water) tap and adjust it so that the water falls on to the cutting point. After the cut is completed, lift the hacksaw frame and put it on the lock provided on the frame.
- (x) Stop the water supply.
- (xi) In the kerosene run engine, put the engine fuel supply on to petrol immediately after the cut is completed. This will avoid restart trouble as there will be petrol in the carburetor at the time of restarting.
- (xii) Stop the engine, loosen the clamping device and shift the machine to the second place of cut.
- (xiv) Repeat the above cycle for all the cuts.

2.2.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The operator shall be fully conversant about the use and operation of the machine. He shall be knowing the safety precaution and trouble shooting as mentioned in the operating and maintenance manual issued by the manufacturer/supplier of the machine.
- (ii) Blade of appropriate size shall be used and the blade shall be properly aligned and tightened before starting the machine.
- (iii) The Machine shall be placed evenly during cutting to avoid unusual vibration.

2.2.3.2 Handling:

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

2.2.3.3 Transportation :

- (i) The machine is fitted with mono-rail wheel arrangement at both ends and a handle of convenient height to enable it to be pushed over one rail by one person to take it to the work site. Nylon wheels are also provided at the bottom to move on cess/plain surfaces.
- (ii) Powered material trolley, dip lorry and inspection trolley with detachable trailer can be used for transportation of the rail cutting machine (saw type) on track. The machine can also be carried by a road vehicle.

2.2.3.4 Storage :

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

2.2.4 Maintenance schedule :

In addition to the instructions contained in the engine operating manual, supplied with the machine, following maintenance instructions for the engine and cutting unit shall be followed:

2.2.4.1 DAILY CHECK :

- (i) Check the engine oil level for lubrication , add if required.
- (ii) Check the start grip and rope. Replace if found damaged.
- (iii) Check air cleaner for dirt in the air cleaner element. If it is dirty, clean air cleaner element.
- (iv) Change oil in air cleaner cup if found dirty.
- (v) Check the oil level in gear box. To check the oil level, open the oil level plug and see if the oil oozes out of the hole. If not, add oil through this hole till the oil starts oozing out. Replace the plug in the hole.
- (vi) Lubricate the guides of hacksaw frame by pouring little oil into the holes provided on the upper surface of hacksaw frame.
- (vii) Check all nuts and bolts. Tighten if found loose.

2.2.4.2 MONTHLY CHECK :

- (i) Change Engine oil after 20 hours of operation in first instance.
- (ii) Change oil in gear box after one month of operation in first instance. Open drain plug and drain the oil. Open the oil level/ filling plug and fill oil till oil starts coming out of the hole in drops. Replace the filling plug.
- (iii) Check wear on blade tightening pins and replace if necessary.

2.2.4.3 QUARTERLY CHECK:

- (i) Change engine oil.
- (ii) Change oil in the air cleaner cup.

- (iii) Clean air filter element.
- (iv) Check oil in gear box and replace if found dirty or add as necessary.
- (v) Check and tighten all nuts and bolts.

2.2.4.4 YEARLY CHECK :

- (i) Clean the fuel oil tank.
- (ii) Clean the cylinder head.
- (iii) Inspect all the spares in gear box.
- (iv) Inspect Hacksaw driving arrangement i.e. connecting rod bearing, connecting rod arm and bearings for support housing.

2.2.4.5 BI- YEARLY CHECK :

Overhaul the complete machine

2.2.4.5 Trouble Shooting:

No.	Problem	Probable cause	Remedy
1.	Engine does not start	i) Engine starting switch is off. ii) Fuel in tank is not enough. iii) Improper spark during ignition. iv) Engine does not start This may also happen when engine is stopped while running on Kerosene.	i) Put it in 'ON' position. ii) Fill the tank with fuel. iii) Check and clean the spark plug. Replace spark plug if found damaged. Check the electric wire & connection to spark plug iv) Following sequences should be adopted ai) Stop the fuel supply b) Drain out kerosene from the carburetor by opening the drain valve c) Close the drain valve d) Switch to petrol supply e) Start the engine
2.	Hacksaw blade breaks during cutting	i) Blade may be loose. ii) Clamp is loose.	i) Tighten the blade properly. ii) Tighten the clamp.
3.	Blade not cutting properly	Blade may have worn out	Check visually and replace the blade if required.

2.2.5 Requirement of Manpower:

Manpower required- 02 Nos. (1 Skilled + 1 Un-skilled).

2.2.6 Requirement of Consumables :

- (i) Hacksaw blades, as per current specification of hacksaw blade issued by Rly. Board / RDSO.
- (ii) Kerosene/Petrol
- (iii) Lube. oil as per engine manufacturer's recommendation.

2.2.7 Details of Hacksaw blades for cutting rails

2.2.7.1 Use:

Hacksaw blades are used for cutting rails up to 90 UTS .

2.2.7.2 Description:

The hacksaw blades are made of high speed steel according to designation XT 87 W 6 Mo 5 Cr 4 V2 as per IS : 7291-1981. The blades are required to be of the type "All Hard (Type A)" conforming to IS: 2594 : 77 (Specification for hacksaw blades).

Salient Features:

- (i) Blade sizes:
 - (a) For cutting rails up to and including 52 kg section:

300 x 25 x 1.25 x 2.5 (10 TPI)
350 x 25 x 1.25 x 2.5 (10 TPI)
 - (b) For rails having section 60 kg:

350 x 25 x 1.25 x 2.5 (10 TPI)
350 x 32 x 1.60 x 4.0 (6 TPI)
 - (c) For cutting rails with the help of portable (saw type) cutting machines following blades are suitable:

350 x 25 x 1.25 x 2.5 (10 TPI)
350 x 32 x 1.60 x 4.0 (6 TPI)
 - (d) For hand-held hacksaw frame following blades are suitable:

300x 25 x 1.25 x 2.5 (10 TPI)
350 x 25 x 1.25 x 2.5 (10 TPI)

- (ii) Cutting Performance: The hacksaw blades of following sizes are expected to have cutting performance capability as indicated below:

<u>Size</u>	<u>No. of cuts (rail section)</u>
a) 300 x 25 x 1.25 x 2.5 (10 TPI)	12 nos. (52 kg 72 UTS)
b) 350 x 25 x 1.25 x 2.5 (10 TPI)	15 nos. (52 Kg 72 UTS) or 7 nos. (52 Kg 90 UTS)
c) 350 x 32 x 1.60 x 4.0 (6 TPI)	8 nos. (52 kg 90 UTS)

Notes :-

- (i) Maximum time consumed in each cut shall not exceed 30 minutes. Preferably it shall be in the range of 10 to 25 minutes.
- (ii) The test shall be carried out on stress free rail in shade.
- (iii) Cutting test shall be performed using water as lubricant.
- (iv) The testing of a sample blade is done on a self propelled (mechanically/ electrically driven) portable hacksaw cutting machine (saw type).

2.2.7.3 Guidelines for using, handling, transportation and storage:

2.2.7.3.1 Using :

- (i) For manual/ machine cutting of rail, hacksaw blade of required size is to be selected and the blade shall be tightened to the frame of rail cutting machine or handsaw in proper way.
- (ii) Cutting operation (by machine) shall be done as per the operating instructions furnished by the manufacturer of the machine.
- (iii) During cutting of rail, water shall be used as lubricant and cooling agent.

2.2.7.3.1.1 Precautions in Operation:

Following precautions shall be observed during rail cutting with hacksaw blade:

- (i) When cutting is done by machine, the operator shall be fully conversant with the working of the machine, its trouble shooting and maintenance practices.
- (ii) In case of hand sawing, the operator shall keep the hacksaw frame straight to avoid breaking of blade due to misalignment.
- (iii) The blade shall not be operated dry.
- (iv) Extra pressure shall not be given on the frame.

2.2.7.4 Handling:

The hacksaw blades shall be handled carefully to protect them from damage.

2.2.7.5 Transportation:

These can be transported by carrying the packets of blades on bicycle or by push trolley/material trolley.

2.2.7.6 Storage:

The blades shall be kept in packets in a carton or box and stored in covered and dry place.

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CHAPTER 2.3 - Rail Drilling Machine

2.3.1 Use:

Rail drilling machine is used for drilling of holes in rail web of all types of rails.

2.3.2 Description :

The machine comprises of driving engine with drilling unit coupled together rigidly. Fixing arrangements with rail i.e., clamping unit is also provided to ensure straight and correct position of drilling the holes.



Salient Features:

Overall weight	: 65 Kg (approx)
Drilling time	: 3 to 4 minutes
Fixing time	: 2 minutes
Prime Mover (Engine)	: Petrol start, kerosene/petrol run 3 HP engine at 3000 to 4000 rpm.
Fuel tank capacity	: 2.0 Litres (approx)
Fuel consumption	: Minimum 10 Nos. of holes in 60 Kg/90 UTS rails with 1 litre of fuel
No. of holes that can be performed in a day	: 60 holes (approx.)
Drill spindle rotation	: 60 to 90 rpm
Tolerance for diameter and position of the hole	: + 0.7 mm
Drill bit	: As per I.S : 5103-1969, and shall last for 100 fish bolt holes in 60 Kg/90 UTS rails.

2.3.3 Guide-lines for using, handling, transporting and storing of machines:

2.3.3.1 Using:

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

- (i) Check engine oil level : To check oil level, take out level gauge , clean it with clean cloth , refit it and again take it out. On the level gauge see whether the oil mark matches with the level mark on the scale .If not , add engine oil and again check with level gauge. Repeat the procedure till it shows the correct level.
- (ii) Gear box oil : For gear box , a plug has been provided on the feed screw side of gear box .Open the plug and see whether the oil flows out through this hole in drops .If not , add oil till it starts flowing out. Put the plug in position.
- (iii) Fill water in water tank.

- (iv) Check drill bit : On the shank of drill bit, size of the drill bit is given. Select the size of drill bit to suit the requirement. Use taper shank drill bit only.
- (v) Fixing Drill Bit : For fixing and taking out the drill bit, manufacturer's manual shall be strictly followed.
- (vi) Fix template of proper size in the machine as per rail section.
- (vii) Clamp the machine to rail section by operating handle provided with clamping device.
- (viii) Start engine on petrol and shift to kerosene for running in kerosene run engines.
- (ix) Slowly give feed to drill bit for drilling by rotation of drive sprocket.
- (x) Open the knob of water tank.
- (xi) After drilling of hole, remove the drill bit from the drilled hole by rotation of drive sprocket in anti-clockwise direction.
- (xii) For kerosene run engines, before switching off, turn the fuel knob from kerosene to petrol so that at the time of switching off, the engine is running on petrol.
- (xiii) De-clamp the fixtures and fix it as above for next drilling.
- (xiv) After the drilling work is over, clean the machine with a clean dry cloth.
- (xv) If the work is not to be continued, take out petrol, kerosene oil and water. The drill bit shall be taken out from the socket.

2.3.3.1.1 Precautions in operation :

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

- (i) The operator shall be fully conversant about the operation of the machine and shall be knowing the safety precautions mentioned in the operating and maintenance manual issued by the manufacturer/supplier.
- (ii) Excessive feed shall not be given at a time.

2.3.3.2 Handling:

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

2.3.3.3 Transportation :

- (i) The machine is fitted with mono-rail wheel arrangement and a handle of convenient height, to enable it to be pushed over one rail by one person to take it to the work site. Nylon wheels are also provided at the bottom to move it on cess/plain surfaces.
- (ii) Powered material trolley, dip lorry and inspection trolley with detachable trailer can be used for transportation on track. The machine can also be carried by a road vehicle.

2.3.3.4 Storage :

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

2.3.4 Maintenance Schedule:

In addition to the instructions contained in the engine operating manual, supplied with the machine, following maintenance instructions for the engine and drilling machine shall be followed:

2.3.4.1 DAILY CHECK

- (i) Check engine oil level for lubrication, add if required.
- (ii) Check the start grip and rope. Replace if found damaged.
- (iii) Check air cleaner element. If it is dirty, clean air cleaner element.
- (iv) Change oil in air cleaner cup if found dirty.
- (v) Check oil level in gear box. Add if necessary.
- (vi) Lubricate chain drive of feed screw.
- (vii) Check drill bit for sharpness. Sharpen on Grinder if required.
- (viii) Check all nuts and bolts. Tighten if found loose.
- (ix) Adjust tension on `V` belt if necessary.

2.3.4.2 MONTHLY CHECK:

- (i) Change engine oil after 20 hours of operation in first instance.
- (ii) Change oil in gear box after one month of operation in first instance.
- (iii) Check the wear of gun metal bushes and replace if necessary.
- (iv) Check wear of drill housing and replace as necessary.

2.3.4.3 QUARTERLY CHECK:

- (i) Check `V` belt drive. Replace `V` belt if found worn-out.
- (ii) Inspect chain and sprocket. Replace if found worn-out.
- (iii) Change engine oil
- (iv) Change oil in the air cleaner cup.
- (v) Clean air filter element.
- (vi) Check oil in gear box and replace if found dirty or add as necessary.

2.3.4.4 YEARLY CHECK:

- (i) Clean the fuel oil tank.
- (ii) Clean the cylinder head.
- (iii) Inspect worm shaft and worm gear in gear box for any damage.
- (iv) Inspect spindle.

2.3.4.5 BI-YEARLY CHECK:

Overhaul the complete machine.

2.3.4.6 TROUBLE SHOOTING

No.	Problem	Probable Cause	Remedy
1.	Engine does not start	i) Engine starting switch is off. ii) Fuel in Tank is not enough. iii) Fuel is not reaching carburetor. iv) Improper spark during ignition. This may also happen when engine has stopped while running on kerosene and fuel knob is not turned to petrol immediately after the engine stopped.	i) Put it in 'ON' position. ii) Fill the tank with fuel. iii) Check and repair fuel line. iv) Check and clean the spark plug. Replace spark plug if found damaged. Check the electric wire and connection to spark plug. Following sequences should be adopted : i) Stop the fuel supply. ii) Drain out kerosene from the carburettor by opening the drain valve. iii) Close the drain valve. iv) Switch to petrol supply and v) Start the engine.
2.	Drill Bit does not drill	i) Drill bit worn out. ii) Rotational speed of drill bit is too slow	(i) Sharpen the drill bit on grinder or renew the drill bit. ii) Check speed of the spindle/engine.
3.	Feed screw does not rotate	i) Chain may be loose causing it to slip on sprocket. ii) Chain slips on sprocket	i) Tighten chain ii) Sprocket might have worn out. Inspect and replace sprocket.

2.3.5 Requirement of manpower :

Two persons- one skilled and one unskilled .

2.3.6 Requirement of consumables :

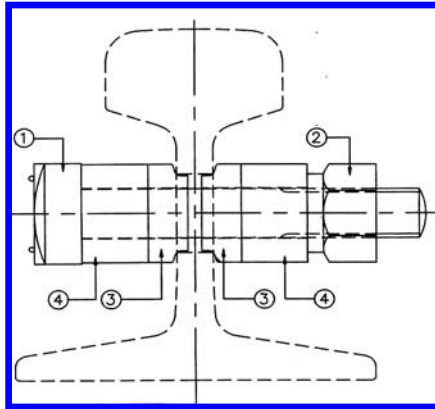
- (i) Drill bits, as per IS : 5103 – 1969.
- (ii) Kerosene/Petrol
- (iii) Lube. Oil as per engine manufacturer's recommendations.

Chapter-2.4 : Chamfering Kit

2.4.1 Use:

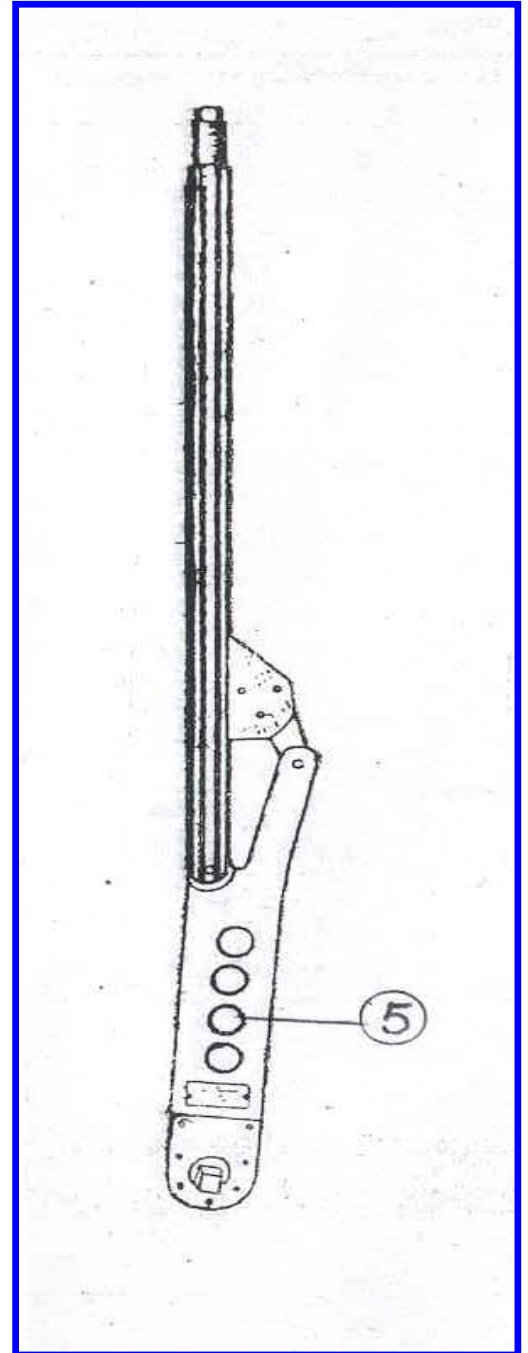
Chamfering kit is used to chamfer rail holes to eliminate chances of developing crack at the sharp edge of drilled holes in rail.

2.4.2 Description: The chamfering kit comprises of following items.



1. H.T. Bolt.
2. H.T. Nut.
3. Chamfering Bit.
4. Packing Piece.
5. Torque Wrench.

(i)	High tensile fish bolt 130 x 20 mm with nut as per drawing no. TM/0512 (Alternately high tensile hexagonal head bolt M 20 x 17.3 with nut as per IS-1367).	1 set
(ii)	Sets of 02 high speed steel chamfering bits.	1 set
(iii)	19 mm square drive sockets size 32 mm	2 nos.
(iv)	Sets of two packing pieces (sleeves)	1 set
(v)	T-400 torque-wrench with ratchet mechanism 1.25m long.	1 no.
(vi)	Square box wrench of nominal size 19 mm (if hexagonal head bolt is used).	1 no.



Chamfering kit is a tool used for chamfering and work hardening the sharp edges of the periphery of a fish bolt hole. This tool is used in a pair on both sides of the

rail web on the drilled fish bolt hole to be chamfered. The dimensions and assembling of different parts i.e. H.T.bolt, packing sleeves chamfering kits and the H.T.S nut shall be as per drawing no. TM/0512.

2.4.3 Guidelines for using, handling, transportation and storage of machine.

2.4.3.1 Using:

- (i) The hole, to be chamfered, is to be cleaned to remove iron-chips/burrs.
- (ii) The bolt is to be fixed in the rail hole keeping one packing piece and one chamfering bit on one side of the hole and similar set on the other side of the hole. The nut is to be hand tightened first.
- (iii) The torque-wrench is to be set at 52 kg-m torque and to be fixed to the square drive socket.
- (iv) The nut is to be tightened by the torque wrench, engaging the square drive socket to the nut.
- (v) Tightening is to be continued unless the torque wrench sounds a 'click', which indicates that the pre-set torque is achieved.
- (vi) The nut is then loosened by the torque wrench by reversing its square drive and turning the nut in reverse direction.
- (vii) The bolt, packing pieces and chamfering bits are removed from the hole.

2.4.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The operator shall be conversant with the use of this kit properly.
- (ii) During tightening of bolt, the operator shall not lean over the wrench.
- (iii) Drive sockets shall be properly fitted to the nut before operating the torque wrench.
- (iv) The tip of the chamfering bits shall properly match the hole.
- (v) Ensure correct dia. of hole before chamfering to avoid breakage of chamfering bit.

2.4.3.2 Handling

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

2.4.3.3 Transportation:

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

2.4.3.4 Storage:

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

2.4.4 Maintenance Schedule:

- (i) The bolt shall be lubricated before every use.
- (ii) The packing pieces and chamfering bits are to be kept free of dust.

- (iii) A thin film of grease shall be applied on the packing pieces, chamfering bits and bolt when the kit is not in use.
- (iv) The torque wrench, when not in use, shall be kept set at its minimum range of setting.
- (v) The torque wrench shall be periodically calibrated as per instructions of the manufacturer.

2.4.4.1 Trouble Shooting:

- (i) If bolt fails, replace the same by the H.T. bolt as specified in RDSO specification.
- (ii) For any trouble with torque wrench, its manufacturer may be consulted.

2.4.5 Manpower required:

One skilled and one unskilled.

2.4.6 Consumables:

- (i) Lubricating oil/grease as per manufacturer's recommendation.

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Chapter-2.5 Hydraulic Rail Tensor (non-infringing type) 70 t capacity

2.5.1 Use:

Hydraulic rail tensor is used for de-stressing of LWR track and for maintaining specified gap at rail joints for A.T welding.

2.5.2 Description :

The main components of the machine are :-

- (i) Rail gripping heads or yokes
- (ii) Right hand lever arm assembly
- (iii) Left hand over arm assembly
- (iv) Cylinders
- (v) Connecting rods
- (vi) Pins
- (vii) Pump with tank



Salient features :

- (i) Maximum total weight including hand pump : 375 Kg.
- (ii) Maximum weight of any individual part : 115 Kg
- (iii) Maximum pulling force : 70 t
- (iv) Maximum pushing force : 30 t
- (v) Hydraulic ram stroke : 300 mm (minimum)
- (vi) Rail section to be handled (to pull up to 150 mm) : 90 R/52 Kg/60 Kg.

2.5.3 Guidelines for using, handling, transportation and storage :

2.5.3.1 Using :

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

- (i) The rail extension required for distressing of LWR track at the prevailing temperature is determined first. Accordingly, the gripping heads of the machine shall be placed at rail webs on either side of the rail joint to be welded.
- (ii) The gripping heads are connected with the hydraulic rams through lever arms and connecting rods.
- (iii) The hydraulic rams are connected with the pumping unit through hydraulic hoses. Before operating the pump, the lever arms are pulled manually for engaging the gripping blocks on the rail web firmly.
- (iv) While operating the hydraulic pump manually it is ensured that the rams move equally. Incase an unequal extension of the two rams is observed, the same shall be rectified after referring the supplier's instruction manual.

- (v) The hand pump is operated unless the required gap is achieved at the rail joint.
- (vi) After completion of the AT welding and allowing for its cooling, the rail tensor is dismantled carefully from the track and its components kept safely.
- (vii) Traffic block is required for installation and operation of the rail tensor on a track open to traffic.

2.5.3.1.1 Precautions in operation:

Following precautions shall be taken during operation of the tensor:

- (i) The operator shall be fully conversant about the operation of the tensor.
- (ii) The pump shall not be run if oil is deficient.
- (iii) The pumping operation shall be started only after ensuring proper fitting of the yoke, lever, connecting rods and cylinders.
- (iv) The system shall not be used beyond its rated capacity and the ram shall not be extended beyond its specified stroke.

2.5.3.2 Handling:

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

2.5.3.3 Transportation:

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

2.5.3.4 Storage :

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

- (i) The rams of the cylinders shall be in fully retracted position.
- (ii) Pump plungers shall be in fully closed position.
- (iii) Oil filter plug cum air vents shall be accurately closed.
- (iv) Cylinders shall be placed in horizontal position.
- (v) The entire unit shall be free from dirt .
- (vi) The unit shall be stored in a box in a covered place.

2.5.4 Maintenance Schedule:

In addition to the instructions contained in the operating and maintenance manual, supplied with the machine, following maintenance instructions shall be followed in general:

- (i) Always keep hydraulic fittings clean, especially the self-sealing couplings.
- (ii) Replace all dust caps immediately when couplings are disconnected.
- (iii) Check hydraulic oil level before use and top up if necessary.
- (iv) Always place the equipment gently to avoid any damage due to impact.
- (v) Inspect all hydraulic hoses for any sign of damage. Replace if damaged.
- (vi) Check low pressure stage of pump unit.
- (vii) Check high pressure stage of pump unit and hoses.
- (viii) Check all nuts and bolts and tighten wherever required.

2.5.4.1 Trouble shooting:

S.N.	Trouble	Probable Cause	Remedy
1.	Pump delivers no oil to actuators	i) Less hydraulic oil in the tank ii) Release screw is loose. iii) Pump plunger seal damaged. iv) Leakage through the loose connections etc.	i) Top up hydraulic oil level. ii) Tighten the release screw. iii) Damaged seals shall be replaced. iv) Leakage shall be prevented by tightening the hose connections / using thread seal tape in the connections.
2.	Cylinders provide insufficient pulling effort.	i) Setting of pressure release valve (safety valve) is faulty. ii) Pump delivers insufficient oil to cylinder. iii) Leakage at the release valve. iv) Leakage at the hose connections/ cylinder buckets (seals).	i) Set the pressure release valve to correct pressure. ii) Rectify pump output. iii) Repair the release valve to stop leakage. iv) Using proper coupler/banzo & thread seal tape leakage shall be stopped. Replace cylinder buckets/seal if found damaged.

Note : For any other trouble, the manufacturer shall be consulted.

2.5.5 Manpower :

4 (1 skilled + 3 unskilled)

2.5.6 Consumables :

Hydraulic oil (as recommended by the machine manufacturer).

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Chapter 2.6 -Hydraulic Rail Bender (Jim crow) Heavy duty

2.6.1 Use :

Hydraulic Rail Bender is used for bending/ de-kinking of all types flat bottom rails in horizontal plane .

2.6.2 Description :

The machine consists of hydraulic hand pump, C-frame with holding jaws, double flanged wheels and handle. The stroke i.e. lateral movement of rail that can be effected, is minimum 40 mm.



Salient features :

Bending force	: 60 tonnes
Maximum piston stroke	: Not less than 40 mm
Weight	: Maximum 115 Kg
Holding span for bending	: 725-900 mm
Time for operation	: 10 minutes (approx.)
Time for fixing	: 2 minutes (approx.)

2.6.3 Guidelines for using, handling, Transportation and storage of machine

2.6.3.1 Using: Following instructions shall be followed.

- (i) Positioning of Jim Crow :
At de-kinking site, the Jim Crow is placed parallel to the rail and laid in such a way that its ram is centrally located at the rail kink and its arms hold the rail head. The jim crow is kept horizontal.
- (ii) Actuating hydraulic power :
At de-kinking position.
 - a) Open Breather tap on the hydraulic oil reservoir.
 - b) Tighten release screw by box wrench.
 - c) Insert effort handle in the effort lever and operate. The ram will start moving towards the kink and eventually exert high de-kinking thrust at the rail
- (iii) Releasing hydraulic power :
 - a) Turn the release screw anti-clockwise. The ram automatically retracts and releases the rail.
 - b) Close breather tap. The Jim Crow is free to be lifted out.

2.6.3.1.1 Precautions in operation:

- (i) The operator shall read and understand the supplier's operation manual before operating the rail bender. He should follow the precautionary measures mentioned therein.

- (ii) While bending/breaking any rail, all the workmen shall stand on the side of the rail bender.
- (iii) Hydraulic ram shall not be extended beyond its specified limit and the bender shall not be operated if any leakage is observed.

2.6.3.2 Handling:

Care should be taken while unloading the machine either at work spot or on sighting the approaching trains so as not to damage the machine. The bender shall be kept horizontally with its ram in closed position while not in use.

2.6.3.3 Transporting:

The machine has mono - rail double flanged wheel arrangement at the C-frame and it can be pushed over the rail by one person assisted by another to take it to the work site. The machine can also be transported to site by 'Rail dolly' with a suitable attachment to hook the machine.

2.6.3.4 Storage :

The machine should be kept under the custody of SE. The following precautions are to be taken while storing the machine when not in use.

- (i) The oil filler plug cum air vent should be closed tightly.
- (ii) The machine should be free from external dirt and foreign particles before storing.
- (iii) The machine should be stored under a covered place to protect from rain, heat and dust.

2.6.4 MAINTENANCE SCHEDULE: In addition to the instruction contained in the maintenance and operating manual supplied with the machine, following procedures shall be adopted as general maintenance practice.

(i) HYDRAULIC OIL RESERVOIR:

Daily -a) Check the oil in the reservoir. Top up if required.
 b) Check for any leakage from the joints, repair if required.

Quarterly - Check the release valve.

Half Yearly -Replace the hydraulic oil if the colour of the oil has turned brown or light black.

(ii) HYDRAULIC CYLINDER:

Daily - Check for any leakage from the cylinder and tighten the nuts to remove leakage , if any.

OVERHAULING :

- (i) To replace piston seals, the cylinder has to be taken out from Jim Crow Steel Frame. Now take out the Piston from cylinder. If the piston seals are found worn out, replace all seals.
- (ii) A release valve is located next to plunger pump for easy and fast access for releasing the hydraulic pressure on the ram.
- (iii) The unit is to be greased at the wheel pins only and is virtually maintenance free.
- (iv) Care must be taken to open and close breather tap/inlet oil before and after the operation so that no oil is drained out.

2.6.4.1 TROUBLE SHOOTING AND REMEDY

S.N	Trouble	Probable cause	Remedy
1.	Ram of Hyd. Rail Bender not retracting completely.	Air Under Ram	Bleed out air by pushing air breather pin.
2.	Handle stroke is only partially effective.	Air in pump Chamber.	Open release valve and pump rapidly several times.
3.	Handle raises without efforts.	Sticky suction (in take) valve.	Remove pump and clean valve unit.
4.	Handle snaps back.	Sticky Delivery (Discharge) valve.	Open release valve and pump rapidly for several times. Close release valve.
5.	Bender bends and retract during each stroke.	Leaky delivery (discharge) valve.	Tighten pump or replace steel ball in the valve. Replace brass seat and copper washer.
6.	Bender will not hold up load.	Leaky release valve.	Reseat release valve.

2.6.5 Manpower required:

2 (One Skilled + one Unskilled)

2.6.6 Consumable :

Hydraulic oil recommended by the machine manufacturer.

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Chapter – 2.7 Hydraulic Rail Joint Straightener

2.7.1 Use:

Hydraulic rail joint straightener is a manually operated hydraulic equipment for dehogging dipped welded / fish-plated joints for improving longitudinal profile of rail.

2.7.2 Description:

The rail joint straightener consists of the following main components:

- (a) Chassis i.e., main frame and hydraulic ram
 - (b) Lifting beam
 - (c) Out rigger with hand pump
 - (d) Loading bar and link
- By operating the pump, The ram is actuated which exerts pulling force at the lifting point through lifting bar.



Salient Features:

- (i) Maximum rated capacity : 80 tonnes
- (ii) Maximum Ram stroke : 60 mm
- (iii) Total weight : 275 Kg (Max.); Heaviest component–120 Kg
- (iv) Time for straightening of 60 Kg 90 UTS rail joint : 8 minutes (maximum)
- (v) Assembling/dismantling time : 2 minutes (maximum)
- (vi) Maximum lift : 60 mm

2.7.3 Guidelines for using, handling, transportation and storage:

2.7.3.1 USING:

- (i) Take the required traffic block and protect the line as per safety rules.
- (ii) Clean the ballast underneath the joint to accommodate the equipment .
- (iii) Place wheel frame on rail to be straightened.
- (iv) Locate the rigger on wheel frame. Ensure that pins are located and the wheels are seated on rails and move freely.
- (v) Place lifting beam on the wheel frame. Ensure that pivot end of lifting beam, head of ram and socket of adjusting screw are correctly seated.
- (vi) Locate side links on lifting beam.
- (vii) Connect pump and cylinder with hose and quick release couplings. Ensure that ram scale return to zero, when pressure is released. Also ensure that all maintenance instructions have been attended.
- (viii) Tighten all fish plates and shims where required before straightening.
- (ix) Measure rail dip at joint by using a metre straight edge and stepped filler

- gauge/taper gauge. Mark dip on sleeper.
- (x) Locate machine centrally over joint.
 - (xi) Remove wheel securing pins and rest the machine on rail top.
 - (xii) Position side links and locate load bar under rail foot correctly.
 - (xiii) Turn adjusting screw till the machine is firmly clamped to the rail and the load bar is in firm contact with rail foot.
 - (xiv) Determine the required lift.
 - (xv) Tighten the pressure release valve screw and operate hand pump till desired lift is achieved.
 - (xvi) Hold lift for at least 10 seconds and pack both joint sleepers in lifted position.
 - (xvii) Release pressure slowly by unscrewing pressure release valve.
 - (xviii) Slacken adjusting screw and remove load bar.
 - (xix) Raise machine mainframe on to wheel using lever handles.
 - (xx) Lock wheels in position with securing pins and move machine off the joint.
 - (xxi) Clear the traffic block.
 - (xxii) Check joints after straightening to ensure that correct amount of deflection is achieved.

2.7.3.1.1 Precautions in operation:

Following precautions shall be observed during working of the rail joint straightener / rail de-hogging equipment:

- (i) The operator shall be fully conversant with the working, maintenance and trouble shooting of the equipment.
- (ii) The pumping operation shall be started only after ensuring firm clamping of machine to rail and the load bar in firm contact with rail foot.
- (iii) The machine shall not be operated if any leakage is found.
- (iv) The machine shall not be overloaded.

2.7.3.2 Handling

The machine shall be handled carefully to avoid physical damage. The ram shall be kept in retracted position when not in use.

2.7.3.3 Transportation

The machine shall be dismantled into components and carried on a mono rail wheel trolley or on a rail dolly with a suitable attachment or on material trolley . The equipment may also be transported by road vehicle.

2.7.3.4 Storage:

The machine shall be kept in a dry place in a workshop under a cover. During storage, keep hydraulic fittings clean, especially self-sealing couplings; replace all dust caps immediately when couplings are disconnected.

2.7.4 MAINTENANCE

Following maintenance practices shall be observed as routine maintenance prior to take the equipment to work site In addition to these, instructions contained in the operating and maintenance manual supplied with the equipment, shall be followed:

- (a) Check fluid level in the pump .Top up if necessary.
- (b) Check quick release couplings on ends of hose for visible signs of damage. Replace if damaged.
- (c) Inspect hydraulic hose for damage/leakage. Replace if damaged.
- (d) Check whether the pump develops the required pressure.

2.7.4.1 Trouble Shooting:

S.N.	Trouble	Probable Cause	Remedy
1.	Pumping stroke is partially working.	Air in pump.	Open release screw and pump rapidly several times and then tighten the release screw.
2.	Ram doesn't come out on rated load.	Leakage in high-pressure line (at pump or release valve).	Reseat release valve/delivery valve or change the valves if necessary.
3.	Ram is not lowering.	i) Damaged release valve. ii) Bent ram.	i) Replace release valve. ii) Replace the ram.

2.7.5 Manpower requirement:

1 skilled and 1 unskilled person for operation. For short distance, the whole assembly in pieces may be carried by two or three men.

2.7.6 Consumable :

- (i) Hydraulic oil (as recommended by the manufacturer).

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Chapter 2.8 - Rail Creep Adjuster

2.8.1 Use :

It is a hydraulic jacking device for creep adjustment of fish plated track.

2.8.2 Description :

The rail creep adjuster comprises of a hydraulic cylinder with spigots for fixing on rail web at fish bolt holes and a pumping unit with direction control valve. The pump is connected to creep adjusting unit through hydraulic hoses. The cylinder, being double acting in nature acts in both pulling and pushing mode to enable the adjuster to close or widen the gap at rail joint as per site requirements.



Salient features :

(i)	Approx. weight	: 45 Kg.
(ii)	Minimum pulling force	: 6.5 tonnes
(iii)	Minimum pushing force	: 7.0 tonnes
(iv)	Maximum stroke	: 150 mm
(v)	Centre to centre distance between spigots	: 330 mm (approx.)
(vi)	Time for assembly	: 6 minutes (approx.)
(vii)	Time for operation	: up to 5 minutes
(viii)	Overall dimensions(max)	: Length : 720 mm Width : 350 mm

2.8.3 Guidelines for using , handling , transportation and storage :

2.8.3.1 Using :

- (i) Remove rail fastenings on joints and also along rail lengths which are to be adjusted.
- (ii) Remove excessive grease and loose scales on rail web around fish bolt holes and connect hose ends to adjuster.
- (iii) Remove nuts from spigots and partially open breather plug on pump reservoir.
- (iv) Fix adjuster on to the rail joint on the non gauge face .
- (v) Fasten the nuts to the spigots and tighten their screws.
- (vi) Open / close the rail end gap until desired gap is achieved .
- (vii) For further adjustment of the rail after reaching the limit of the ram stroke, remove adjuster from the rail end and close or extend the ram as the case may be, until the spigots are approximately spaced to fit to the bolt holes on the same rail end. Repeat the process unless the desired gap is achieved.

2.8.3.1.1 Precautions in operation:

Following precautions in operation shall be observed.

- (i) The operator shall be fully conversant with the working of the rail creep adjuster, its maintenance practice and trouble shooting.
- (ii) The cylinder shall not be operated beyond its rated capacity.
- (iii) The nuts shall be fully tightened before pumping operation.
- (iv) Hydraulic oil of recommended grade shall be used.

2.8.3.2 Handling

The equipment shall be handled carefully to avoid any damage to the pump unit and creep adjusting unit. The piston of equipment during transportation shall be in closed position and the hoses in dismantled condition.

2.8.3.3 Transportation :

The equipment can be transported to work site by any rail or road vehicle.

2.8.3.4 Storage :

The hydraulic creep adjuster shall be stored in a covered and dry place.

2.8.4 Maintenance Schedule :

Following maintenance practices shall be observed before commencement of days work:

1. Keep equipment in clean and tidy condition.
2. Check oil levels, Top up if required.
3. Examine spigot and nut threads to ensure easy movement of nut on spigot. Ensure that spigots are protected by nuts at all times other than when essentially removed for use or for checking.
4. Examine hoses, hose ends and hydraulic parts for leakage, damage or excessive wear. Replace, if damaged.
5. The machine shall be overhauled once a year.

2.8.4.1 Trouble Shooting:

S.N.	Trouble	Probable Cause	Remedy
1.	Pumping operation becomes partially effective.	Air in pump chamber.	Open release valve and pump vigorously several times.
2.	Creep adjuster is not providing sufficient pulling/pushing force.	i) Inadequate oil in reservoir. ii) Release valve is malfunctioning. iii) Delivery/suction valves are sticky.	i) Top up hydraulic oil. ii) Rectify release valve. iii) Remove pump and clean valve unit.
3.	Pump Handle retracts/raises without efforts.	Leaky intake/delivery valve.	Remove pump and clean valve unit.

2.8.5 Manpower requirement :

2 (One skilled and one unskilled) .

2.8.6 Consumable :

Hydraulic oil (as recommended by the manufacturer).

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Chapter 3.1 Hydraulic Sleeper Spacer

3.1.1 Use :

Hydraulic Sleeper Spacer is used for re-spacing/squaring of sleepers.

3.1.2 Description :

It is a light weight, non infringing type equipment used to re-space/square the sleepers. It consists of a 8t capacity hydraulic jack, back plate (having tapered thickness), saddle cap and reaction rods. When the pump is operated, the piston of the jack exerts sufficient pressure on the sleeper causing its lateral shifting.



Salient features :

- | | | |
|-------|--|---|
| (i) | Weight (without operating lever and reaction rods) | : 14 Kg (maximum) |
| (ii) | Rated capacity | : 8 tonnes |
| (iii) | Length of hydraulic jack in closed position | : 200 mm |
| (iv) | Hydraulic lift | : 125 mm (travel of ram) |
| (v) | Screw extension | : 75 mm (minimum) |
| (vi) | Time for squaring the sleeper | : 5 –7 minutes including fixing and removal |
| (vii) | Base size | : 150 mm x 140 mm |

3.1.3 Guidelines for using , handling , transportation and storage :

3.1.3.1 Using :

- (i) Remove the elastic rail clips from one end of the concrete sleeper which is required to be pushed. The elastic rail clips of the other end of the sleeper shall be intact.
- (ii) Tighten properly the elastic rail clips of the adjoining sleeper from which the reaction is to be taken.
- (iii) Remove the crib ballast to accommodate the sleeper spacer.
- (iv) Bind the two adjacent sleepers with reaction rods to maintain the spacing of these sleepers and to distribute the reaction to these two sleepers.
- (v) Place the sleeper spacer between the sleepers. Base plates are to be kept towards the sleepers from which reaction is to be taken. Fix the sleeper spacer with the help of back plate (tapered) and the saddle of the screw (extension) in between the two concrete sleepers.
- (vi) Operate the pump by operating hand lever to push the sleeper to the desired place.
- (vii) Re-fix the elastic rail clips after positioning the rubber pads and liners.

- (viii) Release the pump and take out the sleeper spacer and the reaction rods. Fill the crib ballast back.

(Note : For re-spacing of sleeper, these operations are carried out at both ends of the sleeper requiring re-spacing).

3.1.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The operator shall be fully conversant with the use, maintenance and trouble shooting of the equipment.
- (ii) Under no circumstance the equipment shall be used beyond its rated capacity and specified extension of the ram.
- (iii) Only hydraulic oil of specified grade (as per manufacturer's manual) shall be used.
- (iv) Extra pressure shall not be applied on release valve during tightening.

3.1.3.2 Handling:

The sleeper spacer, being a hydraulic equipment shall be handled carefully with the ram piston in closed position to avoid any damage to the piston surface/oil seal etc.

3.1.3.3 Transportation :

The equipment can be easily carried and transported by one man through powered material trolley, bicycle or by road vehicle.

3.1.3.4 Storage :

While storing the equipment , following precautions shall be taken :

- (i) The ram extension screw and pump plunger shall be in fully retracted position.
- (ii) The device shall be kept horizontally without removing the back plate and saddle.
- (iii) The device shall be kept free from dust.
- (iv) The device shall be stored in a covered place.

3.1.4 Maintenance instructions :

3.1.4.1 For servicing and maintenance of the equipment, manufacturer's maintenance manual shall be followed. For preventive maintenance following procedure shall be adopted :

- (i) Replace hydraulic oil if found non-usable.
- (ii) Replenish spares every three months when jack is under excessive use.
- (iii) Replenish spares every six months when the jack is in average use.
- (iv) Operator shall always keep one set of spares at the work site.

3.1.4.2 Trouble Shooting:

S.N.	Trouble	Probable Cause	Remedy
1.	Pumping works partially.	Air in pump chamber.	Open release valve and pump rapidly several times. Close the valve.
2.	Handle of the pump retracts/ raises without efforts.	Leaky suction (intake)/ delivery valve.	Remove pump and clean valve unit.
3.	Handle snaps back.	Sticky delivery (discharge) valve.	Remove pump, clean valve unit and reseal valve.

3.1.5 Manpower requirement :

Two (One skilled and one unskilled).

3.1.6 Consumables :

Hydraulic oil (as recommended by the manufacturer).

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Chapter-3.2 Concrete sleeper breaker and angle grinder

3.2.1 Use:

Concrete sleeper breaker and angle grinder is used primarily for breaking the concrete sleepers into pieces thereby facilitating quick removal of damaged concrete sleepers and restoration of railway track in case of accidents/derailments and other such emergent situations. It may also be used for breaking brick work, asphalt and rocks.

3.2.2 Description: Concrete sleeper breaker and angle grinder is an electrically /engine (petrol or diesel) driven breaking equipment which imparts vibrational impacts through a drill bit /chisel to break concrete sleepers/pavement/brick-work into pieces

Salient Features: (Angle Grinder)

- (i) Power Input : 1400 watts
- (ii) No-load Speed: 11000 rpm
- (iii) Weight : 2Kg (approx)



Angle Grinder

Salient Features: (Hammer Breaker)

- (i) Rated voltage (electric prime mover) : 220 V single phase or 440 V 3 – phase
- (ii) Power input full load (electric prime mover) : 1700-2200 W approx.
- (iii) Impact rate of rated speed : 1000 rpm.(approx)
- (iv) Action of the equipment is fast enough to break a concrete sleeper into pieces within ten minutes.
- (v) Impact Energy : 50 J
- (vi) Weight : 30 Kg(approx)
- (vii) The machine shall be electrically insulated as per IS : 1271-1985 (Reaffirmed-2001).



Hammer Breaker

3.2.3 Guidelines for using, handling, transportation and storage:

3.2.3.1 Using :

Instructions contained in the operation manual supplied by the manufacturer/supplier of the machine shall be followed for operation of the power hammer breaker. However following procedure shall be followed in general:

- (i) As per the site requirement, chisel/drill bit is to be fitted to the breaker as per the operating instructions.
- (ii) Place the breaker at the job and start the motor/engine.
- (iii) Grip the breaker firmly and the sleeper/brick/pavement is broken under the vibrating force exerted by the breaker.
- (iv) No extra effort shall be applied for breaking.
- (v) The condition of the insulated covering shall be checked by the user before every use and by all inspecting officials as per inspection schedule mentioned in clause no. 1.5 of chapter-1.

3.2.3.1.1 Precautions in operation:

Following precautions shall be observed during working :

- (i) The operator shall be fully conversant with the operation, maintenance and trouble-shooting of the machine.
- (ii) The operator shall wear protective clothing, shoes, goggles, ear protector and helmet during working.
- (iii) The operator shall not operate the breaker if he is tired or under the influence of any medicine/drug/alcoholic drink.
- (iv) The operator shall strictly follow the safety instructions mentioned in the operating manual supplied with the machine.
- (v) Any part of the power source shall not be touched during operation.

3.2.3.2 Handling:

The concrete sleeper breaker and angle grinder shall be handled carefully and be kept in a packing box supplied with each machine by the manufacturer/supplier.

3.2.3.3 Transportation:

The machine is portable in nature and can be transported by rail or road vehicle.

3.2.3.4 Storage:

When not in use, the concrete sleeper breaker and angle grinder shall be kept in a packing box and shall be stored in a covered place.

3.2.4 Maintenance Instructions:

For periodical overhauling, repair, maintenance and trouble-shooting, instructions laid down in manufacturer's manual shall be followed. However, following maintenance practice shall be observed in general:

- (i) Carbon brushes replacement after every 200 hours of operation.
- (ii) Lubrication after ever 200 hours of operation.

3.2.4.1 Trouble Shooting:

Instructions regarding trouble shooting contained in operating and maintenance manual supplied with the machine shall be followed.

3.2.5 Manpower requirement:

One skilled and one unskilled.

3.2.6 Consumables:

- (i) Chiselling bit.
- (ii) Petrol/diesel (for engine operated machine) as recommended by the engine manufacturer.
- (iii) Lubricant as recommended by the manufacturer.

Chapter –3.3 Concrete Sleeper Drilling Machine

3.3.1 Use:

Concrete sleeper drilling machine is used to drill hole (vertically) into concrete sleeper in-situ for fixing of guard rail and check rails on concrete sleeper track at specified location.

3.3.2 Description : Concrete sleeper drilling machine is a hand held drilling equipment powered by an electrical motor or an engine. The machine can drill hole in concrete sleepers from 10 mm Ø to 22 mm Ø up to a max. depth of 150 mm.



Salient Features:

- (a) For electrically driven machine:
 - Supply voltage : 230-250 Volts A.C., 50 Hz.
 - Weight : 10 kg (Maximum)
- (b) For engine operated machine:
 - Prime Mover : I.C. engine
 - Weight : 50 Kg (Maximum)
- (c) The machine shall be electrically insulated as per IS : 1271-1985 (Reaffirmed-2001).

3.3.3 Guidelines for using, handling, transportation and storage

3.3.3.1 Using :

- (i) For drilling a hole of a particular size, the suitable drill bit is to be fitted in the drilling machine.
- (ii) The position of holes to be drilled on the concrete sleeper shall be determined by the user in advance, taking into account reinforcement inside the sleeper.
- (iii) The location of the hole is marked on sleeper by centre punch.
- (iv) In case of electrically driven machine, the electric supply of proper rating shall be ensured . After starting the machine, the rotating drill bit is to be placed on the punch mark and shall be gently pressed downward. This operation shall be continued till desired depth is achieved.
- (v) After the drilling work is over, the machine shall be switched off and the drill bit taken out.
- (vi) The condition of the insulated covering shall be checked by the user before every use and by all inspecting officials as per inspection schedule mentioned in clause no. 1.5 of chapter-1.

3.3.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The operator shall be fully conversant with the operation, maintenance and trouble shooting of the machine.
- (ii) The operator shall wear all necessary protective clothings.
- (iii) Any part of the power source shall not be touched during operation.

3.3.3.2 Handling:

The machine shall be handled carefully and kept in a box after taking out the drill bit.

3.3.3.3 Transportation :

The machine can be carried by one man. It can be transported by a road or trolley.

3.3.3.4 Storage :

It shall be stored in a damp-proof, clean and covered place to avoid rain and dust.

3.3.4 Maintenance Schedule :

- (i) It shall be cleaned regularly by air blowing.
- (ii) Supplier's maintenance and service manuals shall be followed.

3.3.4.1 Trouble shooting :

Supplier's operation manual shall be followed.

3.3.5 Manpower required:

One skilled and one unskilled.

3.3.6 Consumables :

- (i) Petrol/kerosene/diesel (for engine driven machine)
- (ii) Lubrication oil (as per manufacturer's recommendation).
- (iii) Drill bit.

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Chapter – 4.1 - Portable D.C. Welding Generator

4.1.1 Use :

It is a portable generator for producing DC current for the operation of arc welding equipment for reconditioning of points and crossings at site. It also has an auxiliary AC unit for producing alternating current required for miscellaneous applications such as lighting at work-site, operation of electrically driven devices like rail profile grinder, rail drilling/cutting machine etc.

4.1.2 Description :

The portable D.C. welding generator comprises of an I.C. engine coupled with an alternator and control panel for welding as well as auxiliary output. For electric arc welding of worn out points and crossing, the generator supplies direct current whereas the auxiliary output supplies A.C. The generator set is mounted on a tubular frame having four nylon wheels to move on cess and two double flanged wheels to move on rail.



Salient features :

- (i) Engine : 15 h.p. Petrol / Diesel/kerosene run engine.
- (ii) Range of welding current: 60 to 200 amp.
- (iii) Rated current : Maximum welding current shall not be less than 200 amp at 60% duty cycle (one duty cycle of 5 minutes comprises of 3 min. welding load followed by 2 min. no load operation).
- (iv) Current regulation : Current is regulated by regulating switch/device with graduation to show the magnitude of current range.
- (v) Open circuit voltage : Max. 100 V.
- (vi) Auxiliary output : 2500 watts at 220-240 v (A.C.) at 50/60 Hz.
- (vii) Weight : Max 150 kg (excluding transportation arrangement)
- (viii) The machine shall be electrically insulated as per IS: 1271-1985 (Re-affirmed-2001).

4.1.3. Guidelines for using , handling , transportation and storage :

4.1.3.1 Using :

- (a) The generator shall be kept on dry and level ground. The operator shall wear gloves, apron and shoes during work.
- (b) The condition of the insulated covering shall be checked by the user before every use and by all inspecting officials as per inspection schedule mentioned in clause no. 1.5 of chapter-1.
- (c) Select and set the current range in the generator, as per the current requirement for welding depending on the application required.
- (d) Connect the power cable from generator to arc welding equipment.
- (e) Start the generator set.

- (f) To utilise auxiliary output (AC supply), connect the plug sockets (auxiliary output) in the generator with a device requiring AC supply at site such as grinder, cutting machine, lights etc.
- (g) After completion of work the engine shall be stopped and the electrical cable connections from the generator set to other devices like arc welding etc. shall be disconnected.

4.1.3.1.1 Precautions in operation:

Following precautions shall be followed during operation of the welding generator:

- (i) The operator shall be conversant with the operation, maintenance and trouble-shooting of the machine. He shall also be aware of his personal safety.
- (ii) Correct current range as per electrode sizes shall be set before starting the generator.
- (iii) Proper earthing shall be ensured before starting the generator.
- (iv) The welding generator shall not be exposed to rains for which rain guard/cover shall be used.
- (v) It shall be ensured that the insulation of the welding cable is proper.
- (vi) The operator shall wear gloves, apron and shoes during work.
- (vii) Any part of the alternator and distribution board shall not be touched while the generator is on.

4.1.3.2 Handling:

The D.C. Welding generator shall be handled carefully to avoid damage. Care shall be taken to protect the control panel and output sockets from external damage during shifting.

4.1.3.3 Transportation :

The machine has four nylon wheels fitted at the bottom frame . On cess/ ground the machine can be pulled to the work site on its nylon wheels. For transportation on mono rail, two double flanged wheels are also provided. The machine can also be transported by a road vehicle or a rail vehicle.

4.1.3.4 Storage :

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

4.1.4 Maintenance Schedule:

For the maintenance of the engine, instructions laid down in the operation and maintenance manual given by the manufacturer of the engine shall be followed. Following procedure shall be adopted as general maintenance practice.

- (i) Check the oil level in the engine regularly.
- (ii) Make sure that there are no obstructions in the aspirator/exhaust ducts of the alternator, in the engine or in the cover.
- (iii) Clean the output sockets (for welding as well as auxiliary output), control panel and voltmeter glass before starting the engine.
- (iv) Check the air filters. Clean/change if necessary.

4.1.4.1 Trouble shooting instructions for the generator :

PROBLEM	PROBABLE CAUSE	REMEDY
No welding current but auxiliary output is OK	1) Defective diode bridge 2) Problem with welding current control (Printed Circuit Board) PCB	1) Check the diodes of the bridge i) Check the diodes and (Silicon Control Relays) SCR's of the bridge. ii) Check the transformer which supplies power to the welding control PCB.
Welds poorly	1) Defective diode bridge	1) Check the open circuit welding voltage. If it is OK, the diode bridge is OK. If it is 1/3 or 2/3 of the nominal value, check the diodes.
No welding output and no auxiliary power output	1) Short circuit in wiring 2) Defective condenser 3) Defective stator 4) Short circuited diode bridge.	1) Check the wiring inside the set for a short circuit between cables or to ground. 2) If the wiring is OK, short circuit the condenser to be sure that it is discharged. Disconnect all wires from condenser and using an ammeter check that the condenser is not short circuited. 3) If the condenser box is OK, disconnect all leads from the stator except for those going to the condenser box and check the output from the alternator. If there is no output from the welding winding and the auxiliary winding, replace the stator. 4) If there is output from all windings, reconnect the diode bridge and check if there is welding current. If not, the diode bridge is defective. If there is welding current connect the auxiliary power leads one at a time until there is no output. At this point, the short circuit is in that line.

Note : In case , more instructions for trouble shooting in the supplier's instruction manual are given, those shall also be followed for guidance .

4.1.5 Manpower required :

2 (1 skilled + 1 unskilled).

4.1.6 Consumables:

- (i) Petrol/diesel/kerosene.
- (ii) Engine oil (as recommended by manufacturer).

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Chapter 4.2 - Double Action Weld Trimmer for AT Welding (Power pack version)

4.2.1 Use:

This machine is used for trimming the extra weld metal from rail (top and sides) of AT welded rail joint after the welding operation.

4.2.2 Description :

The equipment consists of a trimming unit and a power pack. Two shear blades of trimming unit travel towards each other by hydraulic force provided by two double acting cylinders. The power pack comprises of a hydraulic pump with direction control valve and an engine. The hydraulic cylinders are connected to the pump through hydraulic hoses.



Salient features :

- (i) Prime mover : Petrol start kerosene/petrol run engine of minimum rating 3 HP.
- (ii) Hydraulic stroke : 120-150 mm
- (iii) Minimum shearing force : 18 tonnes
- (iv) Total weight : 175 Kg (Max.)
- (v) Life of shear blade : Trimming of minimum 200 joints
- (vi) The machine is also provided with emergency hand pump device which can be used in case of failure of power pack for retrieving the trimming unit.
- (vi) Tolerance before grinding (with respect to standard dimensions of rail section):-

Top of rail head	: + 0.5 mm to + 1.5 mm
Side width of rail head	: + 1.00 mm to + 2.0 mm

4.2.3 Guidelines for using, handling, transportation and storage of machine:

4.2.3.1 Using:

Following steps shall be observed:

- (i) **Pre-start check –**
 - (a) Check engine oil and hydraulic oil level. Top up if necessary
 - (b) Check for loose bolts, nuts, screws etc. Tighten if necessary.
 - (c) Visually check all pipes/hoses for damage. Replace if damaged.
 - (d) Ensure correct hydraulic oil grade as recommended by the supplier.
 - (e) Check fuel and, fill up if necessary.
 - (f) Connect hose pipe to power pack.
 - (g) Start the engine. Run at rated speed. Check for leakage at joints.
 - (h) Check and clean cutting head of shear blade after each cut.
- (ii) **Operation :**
 - (a) Operate DC valve in forward direction till the rams of trimming unit are fully extended.
 - (b) Ensure that the gap between cutting heads is 0.5 to 1.0 mm in fully extended position.
 - (c) Retract the cutting heads by changing the oil flow.
 - (d) Place the machine on the rail, with the welding mould in between the two cutting heads. Waiting period is generally 3 to 4 minutes for 25 mm gap and 8 to 12 minutes for 75 mm gap after pouring hot metal. Operate the direction control valve to move cutting heads to inward direction for trimming excess metal. With reversal of direction control valve, cutting heads move outward. Trimming time is approximately half a minute to one minute for different rail sections.

4.2.3.1.1 Precautions in operation:

Following instructions shall be followed:

- (i) **DO's**
 - (a) Clean the cutting tool edge of shear blades after every cut.
 - (b) Always ensure that the gap between two cutting heads is 0.5 to 1.0 mm when fully extended.
 - (c) While changing the cutting heads, remove the cutting heads when ram is fully contracted.
 - (d) Leave all rams retracted when weld trimmer is not in use.
- (ii) **DON'Ts**
 - (a) Never open any hydraulic parts except during trouble shooting.
 - (b) Never use the machine on cold weld.
 - (c) Never operate power pack unless the hose connection with machine is fixed properly.
 - (d) Never run the engine beyond rated speed.

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

4.2.3.2 Handling :

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

4.2.3.3 Transportation :

The machine has been provided with mono-rail double flange wheel arrangement at the bottom with handle to enable it to be pushed over the single rail to take it to work site. Nylon wheels are also attached at either end of double flanged wheels to enable the machine to be moved on cess/plain surface. The machine can also be handled /transported with help of a light weight mono rail trolley by keeping the two units i.e., trimmer and power pack separately.

4.2.3.4 Storage :

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

4.2.4 MAINTENANCE SCHEDULE:

Instructions contained in the operation & maintenance manual of the engine shall be followed for maintenance of the engine. Following procedures shall be observed for maintenance of the trimmer:

(i) DAILY

- (a) Check cutting head edge. Ensure that it is sharp and clean, with cutting tip at correct angle and free from burrs or any other defect.
- (b) Check that the weld trimmer is fitted with correct cutting head to suit the rail section on which planned to be used.

(ii) WEEKLY

- (a) Check tightness of all nuts and bolts.
- (b) Check condition of hydraulic hoses and pipes for any sign of damage. Replace if damaged.
- (c) Check hydraulic oil level in tank. Top up if necessary.
- (d) Check engine as per engine manual.

(iii) QUARTERY (At every 250 hrs running or 3 months whichever earlier)

- (a) Drain the hydraulic oil and check condition of hydraulic oil. Replace hydraulic oil if necessary.
- (b) Remove suction line strainer and hydraulic oil tank filter. Clean and refit.

(iv) YEARLY

(a) Change Hydraulic oil.

(b) Check engine. Overhaul the engine as per engine manufacturer's instructions.

4.2.4.1 (i) TROUBLE SHOOTING CHART FOR WELD TRIMMER

Trouble	Probable cause	Remarks
Slow movement of ram	1. Hydraulic oil leakage around piston. 2. Less delivery from pump. 3. Direction control valve not shifting fully. 4. Low setting or any defect in relief valve.	Check and overhaul cylinder. Replace defective parts. Check pump. Consult Manufacturer. Consult manufacturer
Insufficient trimming force.	1. Hydraulic oil leakage around the piston. 2. Pump not delivering hydraulic oil. 3. Defective directional valve.	Check and overhaul cylinder. Replace defective parts. Check pump and arrange necessary repairs. Consult manufacturer.
Slow operations	1. Leakage through cylinder. 2. Direction valve not closing or shifting properly. 3. Internal oil leakage due to wear in pump . 4. Viscosity of oil too high.	Replace cylinder. Replace valve. Replace pump/oil seal(s). Follow manufacturer's recommendations for oil of correct viscosity grade for different temperatures.

(ii) TROUBLE SHOOTING CHART FOR POWER PACK

Trouble	Probable causes	Remedy
Pump delivering insufficient or no oil	1. Clogged strainer or suction pipe line. 2. Air leak in suction line 3. Low level of oil in the reservoir. 4. Oil viscosity too high or too low.	Clean strainer or suction pipe line. Remove foreign matter. Check for leak and repair. Add oil and check level in reservoir. Use oil as per recommendation.
Pump making unstable or no pressure	1. Pump not delivering oil for any of the above reasons. 2. Relief valve not working properly.	Apply the above remedies. Consult manufacturer.

Pump making noise.	1. Partially clogged suction line or suction strainer. 2. Air leak at pump's suction piping joints or from shaft packing of pump. 3. Air in pump. 4. Pump bolts loose. 5. Resonance noise in the system 6. Air bubbles or too much foam in suction oil. 7. Too high viscosity of oil.	Clean and remove foreign matter. Pour oil on suspected joint while listening for change in sound. If sound stops, tighten the joints. Eliminate all air through the air breather. Tighten the bolts. Consult manufacturer. Check and ensure that return lines are below oil level and well separated from suction line inside the tank. Use recommended oil
Internal leakage around pump	1. Shaft seal worn. 2. The top cover seal damaged.	Consult manufacturer Consult manufacturer
Breakage of parts for pumps.	1. Solid matter being wedged in pump. 2. Excessive tightness of head screw.	Replace pump Replace pump
Insufficient pressure in system	1. Leakage of oil within circuit. 2. Oil leakage in pump due to defective seals.	Detect and rectify. Replace seals.
Excessive heating of oil in system	1. Clogged lines 2. Large pump deliveries not unloaded properly	If lines are clogged, replace. If partially clogged for any reason, remove obstruction.
Power pack not functioning.	1. Due to failure of engine or any other part failure.	Operate hand pump to retrieve the trimming heads. Remove the trimmer. For further operation, rectify the defective part. Consult the manufacturer.

Note : For trouble shooting of the engine, operating and maintenance manual supplied with the engine shall also be referred to.

4.2.5 Manpower requirement :

2(One skilled and one unskilled).

4.2.6 Consumables :

- (i) Petrol/kerosene,
- (ii) Hydraulic oil (as per recommendation of the manufacturer).
- (iii) Shearing blade.

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Chapter 4.3 - Rail Profile Weld Grinder

4.3.1 Use :

Rail profile weld grinder is used for grinding of A.T. welded joints after weld trimming operation is complete.

4.3.2 Description :

The rail profile weld grinder consists of a grinding unit coupled with an engine/electric motor and fitted to a light weight frame. The grinding unit can be moved up or down by a feed screw fitted to the frame. The frame is having two set of rollers right angle to each other attached at its both legs for to and fro movement of the grinder during grinding operation.



Salient features :

- (i) Power pack : Generator or A.C. supply.
- (ii) Weight including power pack: 80 Kg (Maximum),
- (iii) Grinding tolerance :
 - (a) 0.5 mm on top of rail head, gauge and non gauge faces with 1 metre straight edge ,
 - (b) 0.2 mm on top of rail head with 10 cm straight edge ,
 - (c) 0.3 mm on gauge and non gauge faces of rail head with 10 cm straight edge,
- (iv) Grinding time : 15 minutes (max.).
- (v) The machine shall be electrically insulated as per IS: 1271-1985 (Re-affirmed-2001).

4.3.3 Guidelines for using, handling, transportation and storage:

4.3.3.1 Using:

Following procedure shall be observed:

- (i) Check level of the engine oil and refill if required. For AC power, check and ensure correct electrical connections.
- (ii) Check fuel level in fuel tank. Top up if necessary.
- (iii) Check the grinding wheel. It should be tightly fixed on the shaft.
- (iv) The condition of the insulated covering shall be checked by the user before every use and by all inspecting officials as per inspection schedule mentioned in clause no. 1.5 of chapter-1.
- (v) Ensure firm footing of trolley on level ground.
- (vi) Start the engine/motor. The grinding wheel automatically starts rotating. The machine can be moved to and fro over the welded joint by means of two rollers attached to the machine.
- (vii) For grinding, feed screw shall be slowly rotated clockwise.
- (viii) After the grinding is complete, turn the handle of feed screw anticlockwise till the grinding wheel has moved up from the rail.
- (ix) Stop the engine/motor and remove the machine from the top of the rail.

4.3.3.1.1 Precautions in operation:

- (i) Do not apply extra pressure on grinding wheel.
- (ii) Use safety goggles while grinding.
- (iii) Stop the engine fuel supply/switch off the electric motor immediately after the grinding is completed.
- (iv) Any part of the motor shall not be touched while the grinder is in operation.

4.3.3.2 Handling :

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

4.3.3.3 Transporting:

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

4.3.3.4 Storage :

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

4.3.4 Maintenance Schedule

In addition to the instructions contained in the operating and maintenance manual supplied with the machine, following procedure shall be adopted as general maintenance practice.

- (i) Check engine oil level. Top up if necessary.
- (ii) Check starting grip and rope. Replace if found damaged.
- (iii) Check air cleaner element and clean.
- (iv) Change oil in air cleaner cup, if found dirty.
- (v) Check electrical connections and OFF/ON switch.
- (vi) Check all bolts and nuts and tighten if necessary.
- (vii) Ensure that the grinding wheel is tightly fixed with the shaft.
- (viii) Inspect bearings in the housing of grinding stone to ensure their free movement.
- (ix) Overhaul the complete machine once in two years.
- (x) Maintenance instructions given by the manufacturer of the motor shall be followed.

4.3.4.1 Trouble Shooting :

Instructions regarding trouble shooting, contained in the operating and maintenance manual supplied with the machine shall be followed.

4.3.5 Manpower requirement :

2 (1skilled + 1 unskilled).

4.3.6 Consumables :

- (i) Petrol / kerosene,
- (ii) Engine oil (as per recommendation of the engine manufacturer).
- (iii) Grinding stone (as per machine manufacturer's recommendation).

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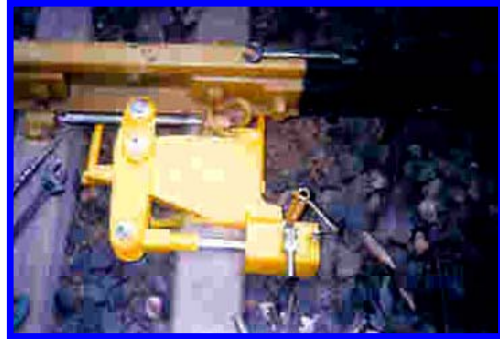
Chapter –5.1 Heavy Duty Hydraulic Extractor for Jammed ERCs

5.1.1 Use :

Heavy Duty Hydraulic Extractor for Jammed ERCs is used to remove jammed ERCs from concrete sleepers without any damage to the sleeper.

5.1.2 Description :

The equipment is compact and robust in design. It consists of a feed rod/pin and a hydraulic ram with pump fitted in a heavy and strong frame. The frame is having holding arrangement with the rail foot. The equipment can be operated without traffic block.



Salient Features:

Maximum weight	: 40 Kg
Extraction force exerted on clip	: 10 tonnes (minimum)
Extraction stroke	: 20 mm (minimum)
Ram screw extension	: 25 mm
Time taken for removing jammed ERC including fixing & removing	: 5-10 minutes

5.1.3 Guidelines for using, handling, transportation and storage of machine:

5.1.3.1 Using:

Following procedures are to be followed:

(i) POSITIONING OF HYDRAULIC EXTRACTOR :

The Heavy Duty Hydraulic Extractor for Jammed ERCs is clamped on the rail flange near the jammed elastic rail clip. One end of its feed-rod is butted against the tip of jammed ERC inside the insert of concrete sleeper. Force is exerted on the leg of ERC inside the insert.

(ii) ACTUATING HYDRAULIC POWER :

- Open Breather tap on the hydraulic reservoir.
- Tighten release screw.
- Insert handle in to the pump and operate. The ram will start moving forward and exert high pressure at elastic rail clip in opposite direction.

(iii) RELEASING HYDRAULIC POWER :

- Turn the release screw anti-clockwise. The ram automatically retracts.

- (b) Close breather tap. The Extractor is free to be lifted.

5.1.3.1.1 Precautions in operation:

- (i) Do not allow operation of extractor machine when operator is tired or feels laziness.
- (ii) Do not work alone at site. Make sure that operator has somebody with good sight and knowledge of railway safety rules to look out for approaching trains.
- (iii) Never mis-handle the machine while transporting or during operation and storing.
- (iv) Care must be taken to open and close the breather tap before and after the operation.

5.1.3.2 Handling :

The Heavy Duty Hydraulic Extractor for Jammed ERCs shall be handled carefully to avoid any physical damage. While not in use, the ram shall be in closed position. The extractor shall not be lifted by the operating handle.

5.1.3.3 Transportation:

The machine has mono rail double flanged wheels arrangement at the bottom and a handle of convenient height to enable the machine to be pushed over the rail by one person to take it to the work site.

5.1.3.4 Storage :

The machine shall be kept in a covered dry place.

5.1.4 MAINTENANCE SCHEDULE:

The principal components requiring maintenance are as follows :

- (i) Hydraulic Oil Reservoir
- (ii) Hydraulic Main Cylinder
- (i) Daily check :
 - (a) Check the oil in the reservoir and fill if necessary.
 - (b) Check for any leakage from the joints.
 - (c) Check for any leakage from the cylinder and tighten it to remove leakage if any.
- (ii) Quarterly check :
 - (a) Check the release valve.
 - (b) Apply grease at lever pins, feed rod block etc.
- (iii) Half yearly check:
Replace the hydraulic oil if the colour of the oil has turned brown or light-black.
- (iv) Yearly check :
Overhaul the machine :

To replace piston seals from cylinder take out the piston with Piston rod or Ram from cylinder. If found worn out, replace all seals.

5.1.4.1 TROUBLE SHOOTING:

Incase of any trouble in the operation like ram failing to move, check the following :

- (i) Check the oil reservoir . If no oil or less oil is found in the reservoir, open oil breather tap. Refill the reservoir with clean hydraulic oil.
- (ii) Check dirt in oil. If found, open oil breather tap and release screw. Drain out all oil. Fill the reservoir with Kerosene oil and operate the effort lever to clean valve ports. Drain the Kerosene oil completely. Refix the release screw and refill clean hydraulic oil in the reservoir.
- (iii) If the Extractor is still not working send the machine for servicing or contact the manufacturer.

5.1.5 Manpower requirement:

One skilled and one unskilled.

5.1.6 Consumables:

- (i) Hydraulic oil (as specified by the manufacturer).

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Chapter 5.2 - Toe load measuring device

5.2.1 Use :

Toe load measuring device is used to determine the toe load of elastic rail clips during service in the field.

5.2.2 Description :

The toe load measuring device consists of a pre-calibrated helical spring having a steel pointer attached to a lever arrangement through a link hanger for gripping elastic rail clip. When the spring is compressed by turning a rotating handle at the top of the device, the toe of the clip gets pulled up and compression of the spring causes a pointer to indicate displacement on a graduated scale. The Toe load (in Kg) exerted by the spring on the toe of the clip is measured by multiplying the displacement of the pointer and the spring constant. The device is supported on three legs, two resting on the sleeper and one on the rail head.



Salient features :

- | | | |
|-------|--|---|
| (i) | Weight (max.) | : 12 Kg |
| (ii) | Capacity of the spring to measure toe load | : 1400 Kg |
| (iii) | Material of the main spring | : Silico-manganese spring steel conforming to Grade 55 of IS : 3195 – 1992. |

5.2.3 Guidelines for using , handling , transporting and storing:

5.2.3.1 Using:

- (i) Place the device with one leg resting on the rail top and the other two legs resting on the sleeper surface.
- (ii) Adjust horizontally the base plate by means of the nut of levelling leg.
- (iii) Turn the handle continuously till air gap is created between rail flange/top of liner and toe of clip. Introduce a filler gauge of 0.1 mm thickness in the air gap created between the toe of the clip and the rail flange / top surface of liner .
- (iv) The handle is then turned anticlockwise so that the filler gauge comes under a normal pressure. Turn the handle again clockwise and simultaneously pull out the filler gauge. The filler gauge when moves indicates the lifting of toe of clip.
- (v) At this stage note down the reading on the graduated scale which when multiplied by the spring constant gives the toe load exerted by clip on the rail foot.

5.2.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) There shall be no oily substance on the surface of tongs so as to prevent slippage during operation.
- (ii) Steel grip shall be engaged firmly to the clip to avoid the slippage on the application of load.
- (iii) Longer portion of the steel grip shall be away from rail web.
- (iv) Base plate shall be horizontal.
- (v) Link hanger shall be vertical to the toe of the clip.
- (vi) Operator shall not lean over the device.

5.2.3.2 Handling:

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

5.2.3.3 Transportation:

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

5.2.3.4 Storage :

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

5.2.4 Maintenance Schedule:

Following instructions shall be followed as general maintenance practice:

- (i) Keep spare links /tongs ready for replacement.
- (ii) Lubricate/grease the threads inside the hole of the rotating handle as per requirement.
- (iii) In case the equipment is not used for more than a week, the inside of the spring box and the surface of the main spring shall be oiled before storing.
- (iv) Before use in the field, the oil, dirt and dust from the inside of the spring box and surface of main spring shall be thoroughly removed.
- (v) The device shall be calibrated at RDSO laboratory at the time of procurement and thereafter whenever results are doubtful.

5.2.4.1 Trouble Shooting:

Instructions regarding trouble shooting, contained in the operating and maintenance manual supplied with the device shall be followed.

5.2.5 Manpower requirement : One (skilled).

5.2.6 Consumables : Nil.

Chapter 5.3 - Electronic toe load measuring device

5.3.1 Use :

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

5.3.2 Description:

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



Salient Features:

- | | | |
|-------|-----------------------|--|
| (i) | Load cell capacity | : 2000 Kg. |
| (ii) | Operating temperature | : -5 to +70 ⁰ C |
| (iii) | Measurement accuracy | : $\pm 0.5\%$ of rated capacity |
| (iv) | Display | : 8 or 16 character alphanumeric display |
| (v) | Sensitivity | : Fast return to zero |
| (vi) | Operating Source | : Rechargeable battery Pack. |

5.3.3 Guidelines for using, handling, transporting and storing

5.3.3.1 Using:

- (i) Put the measuring unit of the electronic toe load device to 'ON' position for few minutes before measuring the toe load of an elastic rail clip.
- (ii) Place the device on its three supporting legs with one resting on the top of the rail head and the other two resting on the sleeper.
- (iii) Bring the base plate in horizontal position by means of the levelling leg provided for adjustment of the three legs.
- (iv) Engage the tong to the elastic rail clip keeping longer portion of the tong away from rail web.
- (v) Turn handle clock-wise to compress the load cell and pull the hanger. The toe of elastic rail clip will get pulled up.
- (vi) Continue to turn the handle until the toe leaves contact with the liner/ rail foot. Feeler gauge of gap sensing device having thickness of 0.05-0.1 mm is inserted below the toe of clip. The handle is then turned anti clock-wise so that the feeler gauge comes under normal pressure. Turn handle clock-

wise again and simultaneously the gap-sensing device is pulled out gently. When the feeler gauge moves out, it indicates the incipient point of lifting of toe of elastic rail clip and at the same time sensing device automatically freezes the toe load reading on LCD. At this stage, the reading displayed on LCD panel is the measured toe load of the elastic rail clip.

5.3.3.1 Precautions in operation:

Following precautions shall be observed during working:

- (i) The operator shall be fully conversant with the using, maintenance and trouble shooting of the device.
- (ii) The device shall be properly placed on its three legs and the base plate shall be kept horizontal before measuring the toe load.
- (iii) No extra effort shall be utilized on the gap sensing instrument during pulling out of the feeler gauge.
- (iv) Feeler gauge shall be correctly engaged to the clip to avoid slippage.
- (v) The operator shall not lean over the device.
- (vi) It shall be ensured that the longer portion of the steel grip shall be away from rail web.
- (vii) Link hanger shall be vertical to the toe of the clip.

5.3.3.2 Handling

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

5.3.3.3 Transportation :

The equipment can be carried by one man. It can be transported by mono rail trolley, any other rail vehicle or by any road vehicle.

5.3.3.4 Storage:

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

5.3.4 Maintenance schedule :

Following maintenance instructions shall be followed in general in addition to the instructions contained in the operating and maintenance manual supplied with the device.

- (i) Ensure that there is no oily substance on the surface of grips to prevent slippage during operation.
- (ii) Keep ready spare links/ grips for replacement.
- (iii) After daily work, battery shall be recharged by external battery charger (supplied with device).
- (iv) Rechargeable battery shall be recharged from time-to-time if device is not in use.
- (v) Lubricate the thrust bearing and link hanger threads.

5.3.4.1 Trouble Shooting:

Manufacturer's instructions for trouble-shooting shall be followed.

5.3.5 Manpower requirement: One (skilled).

5.3.6 Consumables:

(i) Grease (as recommended by the manufacturer).

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Chapter – 6.1 Mechanical Track Jack

6.1.1 Use:

It is used for lifting of track during track maintenance/construction work like spot attention, picking up slacks in isolated patches etc.

6.1.2 Description:



1 – Rack & Pinion

The mechanical track jack is a rack and pinion/rack and pawl assembly, housed in a robust frame having a base plate fitted at the bottom of the jack. In rack and pinion model, by moving the pinion through a gear train with



2 – Rack & Pawl

an external handle, the rack is lifted upward. In rack and pawl model, the rack is lifted by movement of the pawl. The jack is non-infringing type and it can be released instantaneously in face of an approaching train.

Salient features:

- | | | |
|-------|--|---|
| (i) | Minimum lifting capacity | : (a) with top – 8.0t
(b) with toe - 7.0t |
| (ii) | Height of top of jack in lowest position | : 250 mm (maximum.) |
| (iii) | Height of toe of jack in lowest position | : 120 mm (maximum) |
| (iv) | Area of base plate | : 155mmX 300 mm (approx.) |
| (v) | Length & size of operating handle | : 1250 mm long, 30 mm dia. (for rack and pawl model) 800 mm long, 20 mm dia.(approx.) (for rack and pinion model) |
| (vi) | Lift | : 100 mm (minimum) |
| (vii) | Weight (without handle) | : 20 Kg.(Max.) |

6.1.3 Guidelines for using, handling, transportation and storage:

6.1.3.1 Using:

For lifting of track, following steps shall be adopted:

- (i) The jack is placed under the rail to be lifted. Some ballast shall be removed for placement of the jack. The lifting can be done either with the top or the toe of the jack as found convenient at site.
- (ii) Engage the ratchet by pushing it forward, (in rack and pinion model).
- (iii) Insert the lifting handle in the ratchet bar assembly (in rack and pinion model) and in rack and pawl model insert the operating handle into the socket.

- (iv) Operate the handle up and down with a steady motion till the desired lift is attained.
- (v) Release of the jack is instantaneous and is done by pressing the lowering paddle with foot/further lowering of the operating handle.
- (vi) Remove the jack from the track after use.
- (vii) Instructions in supplier's booklets regarding safe operation of the jack shall be observed.

6.1.3.1.1 Precautions in operation:

Following precautions shall be observed during operation.

- (i) The operator shall be fully conversant with the operation, maintenance and trouble shooting of the jack.
- (ii) The jack shall not be lifted beyond its rated lift and capacity.

6.1.3.2 Handling:

The jack shall be handled with care to avoid any physical damage and when not in use, it shall be kept in a packing box to avoid moisture and dust.

6.1.3.3 Transportation :

It can be carried by one person. It can be transported by a road or rail vehicle.

6.1.3.4 Storage :

The jack shall be stored in a packing box and be kept under a covered shed.

6.1.4 Maintenance Schedule:

- (i) Lubricate the bushes , rack and pinion , ratchets and locks of the mechanical jack , using lubricating oil.
- (ii) All working surfaces of the jack shall be coated with rust preventive grease or oil and remaining surfaces shall be painted.

6.1.4.1 Trouble Shooting:

S.N.	Trouble	Probable Cause	Remedy
1.	Rack and Pinion Model		
	i) Rack doesn't lift up in spite of moving the handle up and down. ii) Jack doesn't released instantaneously after pushing down the lowering pedal.	i) Ratchet in not engaged. ii) Jam in pinion /gear train.	i) Engage the ratchet by pushing it forward. ii) Clean the jammed pinion/gear train.
2.	Rack and pawl Model:		

	i) Rack slips down at every stroke.	i) Locking pawl is not functioning properly.	i) Check the pawl and its connection pin for any damage. If so, renew the same.
	ii) Jack doesn't get released.	ii) Improper rack angle/tip angle of pawl.	ii) Manufacturing defect. Consult the manufacturer.

6.1.5 Man-power requirement :

Two (One skilled for operation + one unskilled for carrying and handling the jack) .

6.1.6 Consumable :

i) Lubricating oil (as specified by the manufacturer).

Chapter – 6.2: Hydraulic Track Jack

6.2.1 Use :

The hydraulic track jack (non-infringing type) is used for lifting of track in track maintenance/construction work.

6.2.2 Description :

The hydraulic track jack is a portable lifting device comprising of a hydraulic lifting ram integrated with a hydraulic hand pump. The jack is having a release key and a pre-set safety release valve.



Salient features :

Items	10 tonnes Jack	15 tonnes Jack
Capacity	10 tonnes	15 tonnes
Closed height	166 $\pm$ 3 mm	166 $\pm$ 3 mm
Maximum hydraulic lift	80 $\pm$ 3 mm	80 $\pm$ 3 mm
Weight (without handle)	10.5 $\pm$ 0.5 Kg	13.5 $\pm$ 0.5 Kg
Base Area	300 sq.cm. (approx)	300 sq.cm. (approx)
Length of operating handle	750 mm (approx)	750 mm (approx)

6.2.3 Guidelines for using, handling, transporting and storing :

6.2.3.1 Using:

- Check the hydraulic oil level in the pump reservoir.
- Loosen the oil filler plug cum air vent to act as an air-vent, for the entrapped air in the oil sump.
- At the location where the rail is to be lifted, remove some ballast and place the jack centrally underneath the rail foot.
- Loosen the release key of the pump and pump a few times to flush out the trapped air (if any) from the pump unit.
- Close the release key firmly.
- Pump till the required lift is achieved.
- When the jack is required to be lowered or removed from the track, unscrew the release key of the pump. The saddle of the jack below the rail foot gets slightly lowered. The jack can be pulled out by hand and thereafter its ram can be manually pushed down.

6.2.3.1.1 Precautions in operation:

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

6.2.3.2 Handling:

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

6.2.3.3 Transportation :

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

6.2.3.4 Storage :

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

- (i) The ram shall be in the fully retracted position.
- (ii) The pump plunger shall be in the retracted position.
- (iii) The oil filler plug cum air vent shall be in closed position.
- (iv) The jack shall always be stored in upright position.
- (v) The jack shall be free from dirt.
- (vi) The jack shall be stored in a covered and dry place.

6.2.4 Maintenance schedule:

Following maintenance instructions shall be followed as routine maintenance practice before commencement of day's work.

- (i) Check the hydraulic oil. Refill if necessary.
- (ii) Clean the jack with a piece of soft cloth.
- (iii) Check the working of jack by lifting and lowering under no load condition before putting on load.

The jack shall be overhauled once in a year or as per actual requirement following the procedure given in the manufacturer's manual .

6.2.4.1 Trouble Shooting :

S.No.	TROUBLE	PROBABLE CAUSE	REMEDY
(i)	Jack not closing completely	Air under ram	Open release valve and pump rapidly for several times. Close release valve. If still not successful open oil filler plug cum air vent.
(ii)	Pump handle stroke only partly effective	Air in pump chamber	Open release valve and pump rapidly for several times. Close release valve.
(iii)	Handle rises without efforts.	Sticky suction (intake) valve	Remove pump and clean valve unit.
		Leaky suction (intake) valve	Remove pump. Clean valve unit and re-seat valve.
(iv)	Handle snaps back	Sticky delivery (discharge) valve	Open release valve. Pump rapidly for several times. Close release valve.
(v)	Jack doesn't rise to full height.	Lack of oil	Refill oil & check for leaks.
		Sticky Suction (intake) valve.	Remove pump and clean valve unit.
(vi)	Jack rises and falls during each stroke	Leaky delivery (discharge) valve.	Tighten pump or replace steel ball in the valve or replace Brass seat and Copper washer if found worn out or damaged.

(vii)	Jack doesn't rise	(a) Release valve open (oil passing back into reservoir). Delivery (discharge) valve open (oil passing back into pump chamber) Suction (intake) valve open. (Oil passing back into reservoir). (b) Sticky suction (intake) valve (c) Lack of oil. Air under Ram (d) Leaky release valve or safety valve tampered with high pressure leaks (at pump or release valve).	Close the respective valve firmly Remove pump and clean valve unit. Refill oil. Check for leaks. Bleed air out by opening release valve. Pump rapidly a few times and close release valve. Clean valve unit and re-seat valve. Re-adjust safety valve to rated load carefully. Re-seat Valve
(viii)	Jack doesn't hold up load.	Leaky release valve. Defective ram seals	Re-seat valve. Replace ram seals.
(ix)	Jack doesn't get released.	Valve damaged/or Bent rams.	Remove and replace defective parts.

6.2.5 Requirement of manpower:

One (skilled).

6.2.6 Consumables:

Hydraulic oil (as recommended by the manufacturer).

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Chapter 6.3 – Portable Track Lifting and Slewing Device (TRALIS)

6.3.1 Use:

Portable track lifting and slewing device (hereinafter called TRALIS) is a hydraulic device used for lifting and slewing of Railway track and turnouts for maintenance/ laying purpose.

6.3.2 Description:

TRALIS consists of a pair of lifting cum slewing units (each comprising of one vertical and one horizontal jack) operated by a single hydraulic hand pump connected with pairs of high pressure rubber hose pipes.



Salient features:

- (i) Reaction Support plate size : Min 400 x 200 x50 mm (fabricated)
- (ii) Reaction Trough size : 140x 300 mm
- (iii) Close Height : 230mm (top of saddle to bottom of reaction support plate)
- (iv) (a) Vertical jack :-
 - (1)Capacity : 10 tonnes
 - (2)Hydraulic lift : 80 mm (approx.)(b) Horizontal jack :-
 - (1) Capacity : 5 tonnes
 - (2) Hydraulic stroke : 100 mm (50mm left/50 mm right)
- (v) Overall weight (including hydraulic jacks , hoses, hydraulic pumps, valves and reaction troughs): 60 Kg (maximum)
- (vi) It is capable of lifting and slewing a track / turnout laid with wooden / CST-9/ST/PRC sleepers with 52 Kg/60 Kg rails. It can be operated by a single man by using its hydraulic hand pump connected with hydraulic cylinder / jacks through rubber hoses.
- (vii) It is capable of giving differential lift for adjustment of cross levels of track
- (viii) The length of rubber hoses is such that TRALIS can be operated from cess easily.
- (ix) It is capable of working in track circuited and electrified areas.

6.3.3 Guidelines for using, handling, transportation and storage:

6.3.3.1 Using:

- (i) Loosen the ballast at the ends of sleepers towards the direction of slew for 7 to 8 sleepers on both sides of the slewing point prior to the insertion of TRALIS.
- (ii) Connect the Jack unit to the Pump Unit as per supplier's instruction manual if it is in dismantled condition.
- (iii) Open the Oil Filler Plug cum-Air-Breather partially and close the Release Valve for vertical as well as horizontal operation.
- (iv) Unlock the Directional Control Valve and set the Directional Control Lever for desired slewing (either to slew right or left)
- (v) Operate the Pump for lifting the Vertical Jack and stop pumping when the desired lift is achieved.
- (vi) It is advisable to bring the Vertical Jacks at the centre of the reaction trough before they are placed below the rails for slewing. If the required slew is excessive the Vertical Jack may be shifted to the extreme end before placing under the track.
- (vii) If slewing for other side is required, unlock the Directional Control Valve and shift the Valve Lever to the other position. Follow the operation procedure as directed above.
- (viii) Pack the sleeper ends as required.
- (ix) For lifting one rail of the track for correcting unevenness or super elevation, place both the loading units under the same rail at adjacent sleeper position and operate the vertical pump for lifting up to the desired level.

6.3.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The operator shall be well conversant with operation, maintenance and trouble shooting of the equipment.
- (ii) Both the horizontal and vertical jack shall never be loaded beyond rated capacity and the pistons shall not be extended beyond rated limit.
- (iii) Eccentric loading shall not be allowed.
- (iv) Factory pre-set overload safety valve shall not be disturbed.

6.3.3.2 Handling:

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

6.3.3.3 Transportation:

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

6.3.3.4 Storage:

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

6.3.4 Maintenance schedule:

DAILY

- (i) Check hydraulic oil level in the reservoir. Top up if necessary.
- (ii) Check all hoses for leakage. Replace if necessary.
- (iii) Check for any leakages. Replace valves if necessary.
- (iv) Clean the unit to keep it free from dust.

OTHERS:

- (i) It is advisable to open out the unit for servicing once a year or immediately after a period of heavy use. In case, the unit is to be disassembled for replacement of worn-out parts or any other reason, the instructions in Supplier's manual shall be followed.

6.3.4.1 Trouble Shooting :

S.N.	Trouble	Probable Cause	Remedy
1.	Pumping stroke is partially effective.	Air in pump chamber.	Open release valve, operate the pump rapidly for several times. Close the release valve.
2.	Jack doesn't close completely.	Air under Ram.	Bleed air out. Open Release valve and pump rapidly several times.
3.	Handle rises without effort.	Sticky suction (intake) valve.	Remove pump and clean valve unit.
4.	i) Jack doesn't raise to full height.	i) Lack of oil. ii) Sticky suction (intake) valve.	i) Refill oil. Check for leaks. ii) Remove pump from jack base. Remove valve unit with a matching screwdriver. Clean or replace ball valves. Retighten or repair.
5.	Jack rises and falls during each stroke	Leaky delivery (discharge) valve.	Tighten pump or replace steel ball in the valve or Brass seat and Copper washer.
6.	Jack doesn't hold up load.	Leaky release valve. Defective Ram seals.	Reseat valve. Remove ram and replace seals.

6.3.5 Manpower requirement : One skilled and one unskilled.

6.3.6 Consumable : Hydraulic oil (as recommended by the manufacturer).

Chapter – 7.1 Self propelled Light weight trolley

7.1.1 Use :

The self propelled light weight trolley is used by Railway officials for track inspection and to reach accident/work site quickly.

7.1.2 Description :

The trolley comprises of a light metallic tubular frame with two sets of axles powered by an I.C. engine mounted on the frame. The trolley has seating arrangement in front and rear.



Salient features :

i)	Track gauge (nominal)	: 1676 mm (BG) / 1000 mm (MG)
ii)	Pay load capacity	: 400 Kg (minimum)
iii)	Seating capacity	: 2 in front and 2 at the rear.
iv)	Self weight	: 90-95 Kg
v)	Speed	: Maximum 20 Km/h
vi)	Gear system	: 2 speed gear box or hand operated clutch device to increase / decrease the speed
vii)	Engine:	: Petrol / diesel / kerosene driven engine of minimum 2 HP rated capacity
viii)	Fuel tank capacity	: Adequate for a run of 60 km
ix)	Wheels	: Cold pressed steel , drop forged steel , cast steel or light alloy wheels with self adjusting ball bearings
x)	Insulation	: Wheels / trolley is insulated so that it does not activate switches & signals while moving in track circuited areas
xi)	Brakes	: Foot pedal operated brakes or mechanical hand brake. The trolley has also mechanical parking brakes.
xii)	Head lights and horn	: Head lights, tail lights and an electric horn to be provided
xiii)	The trolley has	: (a) Provision for showing a red flag by day and a red light by night . (b) Suitable detachable guards to remove stone ballast from rail top. (c) A light weight detachable hood.

		(d) A moulded plastic/G.I. sheet made tool kit of adequate size to keep detonators , search light ,diary , stationery, P. Way inspection kits etc.
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7.1.3 Guide-lines for using , handling , transportation and storage :

7.1.3.1 Using :

In addition to operating instructions given in the operating manual supplied with the machine, following instruction shall be followed in general:

- (i) Fill the fuel tank if required.
- (ii) Check the brakes.
- (iii) Start the engine by rope / self starter and run the engine for five minutes for circulation of oil.
- (iv) Engage the gear and drive the trolley.
- (v) For braking , bring the gear to neutral position and apply the brake.
- (vi) For movement of the trolley on running track, the GR / SR rules for that particular Zonal Railway shall be followed as applicable for a push trolley.

7.1.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The trolley shall not be over speeded.
- (ii) Operating instructions for the trolley and engine, supplied with the trolley shall be strictly followed.
- (iii) The trolley shall run under trolley protection rule as mentioned in GR/SR.
- (iv) The operator shall be fully conversant about working, maintenance and trouble shooting of the trolley
- (v) The trolley shall not be put on the track during foggy or bad weather when visibility is hampered.

7.1.3.2 Handling:

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

7.1.3.3 Transportation:

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

7.1.3.4 Storage:

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

7.1.4 Maintenance instructions:

In addition to the instructions for maintenance contained in the operating and maintenance manual supplied with the machine, following maintenance practices shall be followed in general:

DAILY:

- (i) Check fuel tank and top up if necessary.
- (ii) Clean the engine, axles and outside surfaces of the gear box.
- (iii) Check the tightness of V-belt / chain.
- (iv) Check the nut, pulley / sprocket and other rotating parts.

MONTHLY:

- (i) Control cable adjustment shall be done, if necessary.
- (ii) Tightening of all nuts and bolts shall be done.
- (iii) Oil changing of engine shall be done as per engine maker's instruction.
- (iv) Check bearing assembly and replace if find damaged.
- (v) Check clutch and gear shifting system.

Servicing of engine shall be done after 500 km for the first time, after 1000 km for the second time, after 2000 km for third time and there after at each 1000 km run or as specified by the engine manufacturer.

7.1.4.1 Trouble Shooting:

S.N.	Trouble	Probable cause	Remedy
1.	Engine fails to start	i) No fuel in Tank. ii) Cylinder head loose or worn cylinder & piston iii) Improper gap in spark plug	i) Fill the tank with fuel. ii) Tighten all nuts and use Over Size piston & rings , after re-boring if necessary. iii) Adjust spark plug or replace.
2.	Engine starts but runs irregularly and stops.	i) Faulty injector jet ii) Water in the fuel tank iii) Low idling speed	i) Clean the jets change if required. ii) Drain the tank and fill clean fuel. iii) Increase the idling speed.
3.	Poor Acceleration	Engine overloaded	Check and reduce the load

7.1.5 Manpower requirement :

Two men are required for lifting and lowering the trolley on/from the track. One trolley man with a valid competency certificate is needed to drive the trolley.

7.1.6 Consumables :

- (i) Fuel (Diesel/petrol/kerosene).
- (ii) Lubricating oil.

Chapter – 7.2 Powered Material Trolley

7.2.1 Use :

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

7.2.2 Description :

The powered material trolley consists of a platform, made of light steel / aluminium alloy structure and chequered plates, four wheels, seats, braking arrangement fitted on the wheels and an air cooled engine to run the trolley.



Salient features :

- | | | |
|--------|--|---|
| (i) | Track Gauge (Nominal) | : 1676 mm |
| (ii) | Pay load capacity | : 1 tonne (minimum) |
| (iii) | Design speed | : 30 kmph (minimum) . It is also capable of negotiating points and crossing, diamond crossings and single/double slips at a speed of 10 Kmph approx. |
| (iv) | Reverse speed | : 5 kmph |
| (v) | The trolley has two hooks for holding gauge cum level on two vertical posts of the hood. | |
| (vi) | Trolley platform | : Over - all dimensions :2000 mm x 2500 mm (approx). The height of platform above rail level is 30 cm. approx. |
| (vii) | Seating Arrangements | : A seat in the front to accommodate 1+ 2 persons. The seat may have a provisional arrangement for seating 3 or more persons at the back of front seat. |
| (viii) | Lighting arrangement | : Head and tail lamps shall be provided to both the front and rear side of the trolley. |
| (ix) | The seat should have a collapsible/folding type hood. | |
| (x) | Accessories | : Loud horn, flag-fixing arrangement, two pushing handles. |
| (xi) | Engine | : Petrol / diesel or light weight generator set of at least 4 HP. |
| (xii) | Self weight | : 350 Kg (maximum) |
| (xiii) | Gear system | : 3 speed (10 , 20 , 30 km/h) gear box hand operated , driving front / rear axles by means of gears |
| (xiv) | Wheel base | : 1500 mm |
| (xv) | Fuel tank | : Adequate capacity for a run of 100 km |
| (xvi) | Braking | : Braking system operated by foot pedal or mechanical hand brake. Trolley also has parking brakes. |

7.2.3 Guidelines for using, handling, transportation and storage:

7.2.3.1 Using: Following procedures shall be followed during operation:

- (i) Fill the tank with petrol / diesel.
 - (ii) Put the trolley on track
 - (iii) Check the brake.
 - (iv) Start the engine and run the engine for 5 minutes for proper oil circulation.
 - (v) Then put the gear in first and give acceleration when trolley is in movement. Engage the gear, give acceleration for required speed.
 - (vi) Always use clutch in shifting of gear.
 - (vii) For stop, bring the gear in neutral position and pull the brake lever.
- When trolley is stopped, switch off the key.

7.2.3.2 Handling:

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

7.2.3.3 Transportation :

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

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

7.2.4 Maintenance :

Following maintenance practices shall be observed in general. For maintenance of the engine, instruction contained in the operating and maintenance manual supplied with the engine shall be followed;

DAILY :

- (i) Check fuel tank and fill fuel if necessary.
- (ii) Clean the engine, axles and outside surfaces of the gear box.
- (iii) Check the tightening of V-belt / chain.
- (iv) Check the nuts and bolts, pulley / sprocket and other rotating parts.

MONTHLY:

- (i) Control cable adjustment
- (ii) Check and adjust drive chain / V – belt
- (iii) Tightening of all nuts and bolts
- (iv) Oil changing of engine
- (v) Check bearing assembly
- (vi) Check clutch and gear shifting.

7.2.5 Manpower requirement : 08 men (including at least one trolley man / supervisor).

7.2.6 Consumables : Fuel & lubricant of recommended grade.

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Chapter 7.3 - Light weight Rail (Mono) cum Road Trolley

7.3.1 Use:

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

7.3.2 Description :

Light weight mono Rail cum Road Trolley is light weight manually operated wheel trolley consisting of a fabricated rectangular frame. A set of two double flanged wheels for use on rails and four nylon wheels for use on ground /road are fitted to four separate axles in such a manner that the nylon wheels can be lifted up when not in use. The trolley is having a tubular pushing handle (detachable) to push/pull the trolley.



Salient features :

- | | |
|-------------------------------|-----------------------------|
| (i) Double flange wheel Tread | – 85 mm (approx.) |
| (ii) Flange depth | – 12 mm (approx.) |
| (iii) Flange thickness | – 5 mm (approx.) |
| (iv) Trolley frame size | – 650 mm x 400 mm (approx.) |
| (v) Weight of trolley | – 17 kg (max.) |
| (vi) Load carrying capacity | – 100 kg |
| (vii) Dia. of Nylon wheel | – 150 mm (approx) |

7.3.3 Guide-lines for using, handling, transportation and storage

7.3.3.1 Using :

- (i) For running on road - Bring the nylon wheels downward and lock in position by bolts and nuts. The trolley is ready for use and can be moved by pulling/ pushing its handle.
- (ii) For running on rail – The nylon wheels are lifted and locked in position. The trolley is moved on a single rail on its double flange wheels. For movement of the mono – rail trolley on rails, the safety rules for a push trolley should be followed as given in the GR/SR for that particular zonal railway.
- (iii) 1 to 3 persons are required for loading/unloading and movement of the trolley as necessary depending upon the load. On sighting any approaching rail vehicle like a train etc., the mono - rail trolley shall be quickly off-tracked for safety, in case of its movement on rails without a traffic block.

7.3.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The trolley shall not be overloaded.
- (ii) The operator shall remain cautious about any approaching train.
- (iii) The trolley shall not be run on the nose of crossing.
- (iv) The trolley shall be put on line only after assuring proper functioning of the double flanged wheels and nylon wheels.

7.3.3.2 Handling :

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

7.3.3.3 Transportation :

The trolley can be dismantled and put in a box and transported by rail or road. Over short distances it can be moved on its nylon wheels on the ground or on its double flanged wheels on rails as described in clause 7.3.3.1.

7.3.3.4 Storage :

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

7.3.4 Maintenance Schedule:

Following maintenance instructions shall be followed:

- (i) Keep the trolley neat and clean.
- (ii) Check the nuts-bolts and bushes. Tighten the nuts and bolts if required. Replace the bush if worn out or damaged.
- (iii) Lubricate the brass bush of nylon wheels once in a week.
- (iv) Keep the trolley away from rain when not in use.

7.3.5 Manpower requirement :

1 to 3 (1 person is required to move the trolley and 1-2 are required to load/unload the material carried).

7.3.6 Consumables : Nil.

Chapter 7.4 - Jib Crane Attachable to BFR/BRH for handling Concrete Sleepers

7.4.1 Use:

The jib crane (hand operated) is attached to BFR/BRH and used for loading/unloading of concrete sleepers from cess to BFR/BRH and vice-versa when the BFR/BRH is stationary.

7.4.2 Description :

The Jib crane is a hand operated winch type crane attachable to the side of a BFR/BRH. The crane consists of a base frame, boom, mast and a hand operated winch with self-locking devices. The mast is attached to the base frame. The base frame can be fitted to the side of a BFR/BRH. The boom is fitted to the vertical mast in such a way that it can rotate 360 degree around the mast. At the end of boom, lifting wire rope is passed over a pulley. The wire rope, which has a lifting hook, can be lifted vertically upward or downward by the winch. The lifting hook has a attachable chain



sling arrangement with two chain slings provided with scissor type clamps at their ends for gripping the inserts of a concrete sleeper. For unloading / loading a concrete sleeper from BFR/BRH to cess and vice versa , a single jib crane is used , but for handling concrete turn-out sleeper , two jib cranes are used simultaneously.

Salient features :

- | | | |
|-----|--|---------------------|
| (a) | Total weight of jib crane | : 275 Kg (maximum) |
| (b) | Maximum weight of an individual part/assembly | : 100 Kg |
| (c) | Safe working capacity of jib crane | : 500 Kg (maximum) |
| (d) | Swing | : 360 degree |
| (e) | Swing radius (minimum) | : 1350 mm. |
| (f) | Time required for assembly and erection of jib crane over BFR/BRH or for its removal | : 30 minutes (max.) |
| (g) | Loading / Unloading time for a concrete sleeper from BFR to cess and vice versa | : 5 minutes (max.) |

7.4.3 Guidelines for using, handling, transportation and storage :

7.4.3.1 Using :

- (i) The base frame (slew post body) is fastened firmly on to the side of the BFR/BRH at suitable location by means of anchoring hooks and bolts at the top and bottom of side plate of BFR/BRH.
- (ii) The working platform is pinned and locked with the slew post body.
- (iii) The winch frame is then lifted and seated on the slew post and bolted rigidly.
- (iv) The boom is fitted on the top of the winch column at a pin joint. Before fitting as stated above, the boom should be hooked and also the wire-rope is passed over the pulley to take the load at the end of the boom.
- (v) Then the boom is held by the tie bar. Now the structure is ready for operation.
- (vi) The cranking handle is fitted to the smaller gear of transmission. The wire rope can then be loosened by pressing and locking the brake release system to free the barrel. The loosened wire rope is taken over the pulley and near the sleeper to be lifted.
- (vii) The 'S' hook provided at the end of the wire coming from the winch barrel is hooked on to the slings.
- (viii) Once the sleeper is clamped, the operator starts rotating the handle to lift the sleeper
- (ix) After lifting the sleeper to the height of loading platform of BFR/BRH, it is slewed by operating the slewing mechanism to place the sleeper on to the loading platform.
- (x) During unloading of sleeper from BFR/BRH to cess, the sleeper is first lifted and then slewed to cess by rotating the boom and unloaded to cess by releasing the lifting rope from winch drum.
- (xi) For unloading / loading a concrete sleeper from BFR/BRH to cess and vice versa, a single jib crane is used. For lifting / lowering a concrete turn-out sleeper, two jib cranes are used simultaneously.

7.4.3.1.1 Precautions in operation :

Following precautions shall be observed during operations:

- (i) The jib crane boom shall always be within the BFR and not projecting outward during movement of the BFR.
- (ii) The jib crane shall be fixed on to the BFR/BRH in a station yard in advance of commencement of a traffic block.
- (iii) All anchoring bolts must be fitted and tightened properly.
- (iv) The brake release should be operated smoothly.
- (v) The slewing of sleeper by the jib crane should be smooth and steady.
- (vi) The unloading of the sleeper should be controlled to avoid any jerk or impact.

7.4.3.2 Handling

The jib crane shall be handled carefully to avoid any damage during fitting the same to the BFR/BRH, transportation and operation.

7.4.3.3 Transportation :

For transportation, the jib crane with its various assemblies/parts should be dismantled .The transportation can be then done by a road or rail vehicle.

7.4.3.4 Storage:

The crane when not in use shall be kept in dismantled condition and the bolts and nuts shall be oiled and kept in a bag in a covered.

7.4.4 Maintenance Schedule:

In addition to the maintenance instructions contained in the operating and maintenance manual (supplied with the crane, following instructions shall be observed in general:

DAILY :

- (i) All nuts and bolts are to be checked and tightened or replaced wherever required.
- (ii) The wire rope and functioning of the which shall be examined.

WEEKLY:

- (i) The brake assembly shall be checked for wear and tear and replacement shall be made wherever required.
- (ii) The moving components like shafts, gears and bearings are to be lubricated.

OVERHAULING:

- (i) The jib crane shall be overhauled once in a year if it is working regularly.

7.4.4.1 Trouble Shooting :

Instructions regarding trouble shooting, contained in the operating and maintenance manual supplied with the crane shall be followed:

7.4.5 Manpower required :

One skilled and one unskilled for each crane

7.4.6 Consumables :

Grease and gear oil (as recommended by the manufacturer).

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Chapter – 7.5 Attachment for Rail Dolly for PRC Sleepers

7.5.1 Use :

It is used with rail dolly for transportation of mono block concrete sleepers.

7.5.2 Description :

This attachment is made up of mild steel. There are two chain slings which are connected together at one end by a hook. The chain slings can be hung from a rail dolly by means of this hook and a ring. The other end of each chain sling has a scissor type clamping hook. One chain sling grips one insert and other one the second insert of the sleeper for transportation with single rail dolly. The chain sling assembly attachment can be suspended by means of a hook from one end of a rail dolly for transportation of the concrete sleeper. The clamp is such that it grips the insert of a concrete sleeper on being pulled and releases the insert instantaneously when the sleeper is laid on cess / ground..



Salient Features:

- | | | | |
|-------|--|---|-------------------|
| (i) | Loading capacity | : | Min. 0.5 t. |
| (ii) | Nominal dia. of chain sling | : | 8 mm (Min.) |
| (iii) | Nominal reach of chain sling and gripper | : | 1000 mm (approx.) |

7.5.3 Guide-lines for operation, using, handling and transportation:

7.5.3.1 Using:

- (i) This attachment is suspended by means of a hook from one end of a rail dolly. There are two chain slings, with each gripping clamp (eye hook / S- hook).
- (ii) The two gripping clamps (eye hook / S – hook) of the two chain slings are made to grip one insert each of the ordinary concrete sleeper (for plain track) to enable the sleeper to hang from one end of the rail dolly .
- (iii) The rail dolly is then moved on the track carefully to the point where the sleeper is required to be unloaded. During the movement of the rail dolly, the sleeper moves outside the track, hanging horizontally by the chain sling attachment at one end of the dolly. For unloading the sleeper, the sleeper is lowered on the cess/ground by carefully lowering the loaded end of the rail dolly. The gripping clamps of the chain slings are made to open and release the sleeper inserts once the sleeper rests on the cess / ground .

7.5.3.1.1 Precautions in operation:

Due care is to be taken during the transportation of the sleeper by the rail dolly. One person shall keep watch for any approaching rail vehicle on the same track so that the rail dolly can be removed and the sleeper unloaded safely in advance.

7.5.3.2 Handling:

The chain sling attachment shall be fixed properly with rail dolly and it shall be used for the specific purpose only.

7.5.3.3 Transportation :

The chain sling attachment is light in weight and can be carried by one man. It can be transported by a rail vehicle or a road vehicle.

7.5.3.4 Storage :

The chain sling attachment shall be stored in a box in a covered shed .

7.5.4 Maintenance Schedule :

- (i) The chain sling attachment shall be kept clean.
- (ii) The hinged points of the chain sling attachment shall be oiled before use.

7.5.4.1 Trouble Shooting :

If the chain or any component fails, replace the same.

7.5.5 Manpower requirement :

3 (unskilled) for each rail dolly and chain sling attachment.

7.5.6 Consumable : Nil.

Chapter 7.6 - Powered Rail Hauling System

7.6.1 Use :

Powered Rail Hauling System is used for :

- (i) Pairing and butting edges of long welded rails (10/20 rail panels),
- (ii) Stacking of long welded rails,
- (iii) Hauling heavy material, structures, equipment during construction, accidents, derailments etc. ,
- (iv) Hauling vehicles, BFR, BRH and such equipment on track ,
- (v) Hauling heavy cables for laying.

7.6.2 Description :

The Powered Rail Hauling system is basically a powered winch. It consists of a winch coupled with an engine through cone clutch for transmission of power from engine to the winch. Special foundations are not required, as the robust construction allows the machine to be seated on the rail (anchor) at its anchoring brackets and held firmly by bolts at the fish-plate holes of the rail and can also be retained by suitable slings or chains. The engine is mounted on detachable base with drive transmitted by means of cone clutch.



Salient features :

- | | | |
|-------|--|--------------------------------|
| (i) | Weight of complete unit
- 190 Kg (approx.) | |
| (ii) | Engine capacity | - 6 H.P. (minimum) at 1500 rpm |
| (iii) | Fuel Tank capacity of engine | - 4 litres (minimum) |
| (iv) | Mean rope hauling speed | - 2-3 metres per minute. |

7.6.3 Guide lines for using, handling, transporting and storing of machines

7.6.3.1 Using:

Instructions given in the operating manual of the machine shall be followed and following procedures shall be observed:

(i) Fastening of rail hauler to rail.

- a) Place the hauler on the rail to be fixed such that the rail (anchor) passes between the two brackets.

- b) The hinged brackets are aligned to fish plate holes of the rail and a stay is fastened in both the bolt holes of the brackets through the rail.
- c) The hauler shall be properly levelled.

(ii) Anchoring Hauler for support to structures other than rail

- a) Lugs provided on both sides of hauler chassis are fastened to firm and strong structure other than rail from both left and right sides through chains or slings.
- b) The holding slings/chains shall not be supported with hauler chassis at any point other than lugs.

(iii) Unwinding the steel wire rope from the barrel

- a) Tighten the spindle of the pull/push fixture and disengage the barrel. The barrel rotates about the shaft as the wire rope is pulled out for fastening to load.
- b) The drive to the barrel is provided through claw-coupling from the wheel of the worm gearing. The barrel can be engaged or disengaged from the wheels, by a pulling and pushing fixture on one side of the barrel.

(iv) Hauling the Rail Panel:

- a) Rail Hauler is fixed to anchoring rail or other strong structure as described above.
- b) Free-Pulley block is fixed to the 10/20 rail panel to be pulled with anchoring pins at the fish plate holes.
- c) Disengage claw coupling to free barrel drum to unwind steel wire rope.
- d) The wire rope from the barrel is pulled to the free pulley and passed about it. The wire rope is returned to the barrel from the pulley and tied by a shackle to the chassis of the hauler.
- e) Engage claw coupling
- f) Check, fuel, lubricating oil level and ensure correct levels as per manufacturer's recommendations.
- g) Start the engine.
- h) Set accelerator as per load requirement.
- i) Engage clutch as per load requirements and haul the 10/20 rail panel.
- j) This process shall be repeated for hauling of another panel. After completion of work the sling and brackets etc. are removed and the total hauling system is wound up.

7.6.3.1.1 Precautions in operation :

- (i) The operator shall be fully conversant with the working of the rail hauling system. He shall follow the operating instructions of the operating manual given by the manufacturer/supplier of the machine.
- (ii) Do not start the engine without following the operating manual.

- (iii) Do not start hauling before ensuring proper levelling of the engine.
- (iv) Do not allow any one to stand near the rope when in operation.
- (v) Do not start the engine without ensuring that the hauler is firmly anchored.
- (vi) Engine shall be checked at regular interval during working.

7.6.3.2 Handling:

The rail hauling system shall be handled carefully to avoid any physical damage to the engine or winch. The system shall not be dragged on cess rather it shall be shifted from one place to other by bodily lifting the same.

7.6.3.3 Transportation :

The unit is designed to be portable. It is also provided with double flange wheels mounted on bushings and nylon / rubber wheels on the same axle so that it can be rolled on rails as well as on ground surface, and the diameter/ thickness of wheels adopted are such that no infringement takes place at check rails .

7.6.3.4 Storage:

The components of the Hauling system shall be dismantled and thereafter kept in a covered and dry place.

7.6.4 Maintenance Schedule:

Instructions contained in the maintenance manual given by the supplier/manufacturer of the machine shall be followed. Following procedures shall be followed before commencement of day's work as general maintenance practice:

- (i) Check lubricating oil level and refill if oil level is low. For accurate readings, oil level shall be checked atleast 15 minutes after engine is shut down.
- (ii) Check fuel level in fuel tank and refill, if necessary.
- (iii) Check air cleaner and clean the element.
- (iv) Check the clutch assembly for proper functioning.
- (v) Check the wire rope condition. If found damaged, the wire rope shall be replaced.

For other periodical maintenance i.e., weekly, monthly etc., instructions contained in the maintenance and operating manual supplied with the engine shall be followed.

7.6.4.1 Trouble Shooting:

Trouble shooting instructions contained in the maintenance and operation manual, supplied with the engine shall be followed.

7.6.5 Manpower required:

Total 5 persons (two skilled and three unskilled).

7.6.6 Consumables : High speed diesel.

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Chapter 8.1 – Hand Held Off track tampers

8.1.1 Use :

Off track tampers are used for tamping of track for slack picking in concrete sleeper track as a means of intermediate attention in between the runs of On – track tampers..

8.1.2 Description :

One set of off track tampers includes four hand held tampers with two external / internal power source. Power source can be electrical, hydraulic or a mechanical engine fuelled suitably.



Salient features

(i) Tamper :

Weight of hand tamper : 12 Kg (Approx)
Weight of tamping tool : 2.5 Kg (Approx)
Power input : upto 1600 watts
Impact rate (Blow/min) : 900 to 2200 in adjustable mode

(ii) Power source :

Capacity : 3.6 Kw minimum at 230 V, AC at 7300 RPM
Current output : upto 8.5 Amp
Fuel : As specified by manufacturer
Starting mechanism : Rope start/self start.
Continuous operating time : Not less than 4 hours
The machine shall be electrically insulated as per IS: 1271-1985 (Re-affirmed-2001).

8.1.3 Guidelines for using, handling transportation and storage

8.1.3.1 USING :

The condition of the insulated covering shall be checked by the user before every use and by all inspecting officials as per inspection schedule mentioned in clause no. 1.5 of chapter-1.

Following procedure shall be adopted:

(i) SITE SELECTION

The stretch for tamping of track with Off-track tampers shall be selected on the basis of following information :

- Bad-riding reports from passenger train driver,
- Bad-riding spots noted by regular foot plate/Last Vehicle inspection by SE /SSE (P.Way) and other higher officials,
- OMS peaks,
- Ride Index,
- Peaks recorded during TRC runs.

(ii) PRE-TAMPING WORKS

- (a) Ballast deficiency is to be recouped
- (b) If the location has bad running due to some structural defects viz. rail surface, welding kink, fitting deficiencies, caked up ballast etc, the same shall be rectified before tamping work.
- (c) Broken sleepers/fittings shall be replaced.
- (d) Suitable numbers of non-infringing type track jack (Hydraulic/ Mechanical) shall be arranged.
- (e) Arrangement for transportation of the equipment to the site of work, shall be made. Fuel shall be arranged as per required consumption.
- (f) For alignment rectification, hydraulic Track Lifting cum slewing device (TRALIS) shall be arranged.
- (g) Gauging and squaring of sleepers shall be done. For squaring of sleepers hydraulic sleeper spacer may be used

(iii) TAMPING WORKS

- (a) The worksite shall be supervised by a competent site supervisor not below the rank of JE(P.Way) Gd. II and nominated by Assistant Divisional Engineer.
- (b) Suitable speed restriction as per site requirement shall be imposed by the site supervisor and track protected as per para 803 and 806 of Indian Railway Permanent Way Manual (IRPWM).
- (c) The generator and its accessories shall always be placed on a firm and level ground on the cess. They shall not cause any obstruction to any moving train or rolling stock.
- (d) The tamper shall be visually checked and before inserting the tool into the tamping unit, a little grease shall be applied on the shank portion of the tool.
- (e) Before starting the generator, the following shall be checked :-
 - (1) Fuel oil level,
 - (2) Lubricating oil level,
 - (3) Visual checking of air and oil filters,
 - (4) Electrical sockets, junction box and indicators etc of the alternator,
 - (5) Soundness of the fittings used in electrical connections.
- (f) As per laid down procedure, track shall be aligned/lifted using TRALIS/Jacks.
- (g) The tamping shall be performed at the same time underneath the two rail seats of a sleeper. For this two vibratory tampers shall be placed diagonally under each rail seat.
- (h) After tamping, the crib and shoulder portion of the sleepers shall be filled up with ballast.
- (i) Documentation of track parameters (before and after tamping attention) for each work-site is to be maintained in the form of log books.
- (j) Before allowing any train, the site supervisor shall ensure that track geometry viz. gauge, twist and unevenness is within permissible limits.
- (k) Effective communication system shall be available for the Site supervisor at the work site.

- (l) Supplier's Instruction manual shall be referred to for the operation and handling etc. of the equipment.

(iv) **POST TAMPING WORK**

- (a) Proper boxing shall be done at the location attended with the off-track tampers.
- (b) Loose fittings/fastenings shall be tightened.

8.1.3.1.1 Precautions in operation:

- (a) The operator shall be fully conversant about the working, maintenance and trouble shooting of the tamping system.
- (b) The operator shall wear protective clothes, goggles, hand gloves, shoes and ear- protectors during working with the tampers.
- (c) Broken electrical fittings/ cables etc. shall not be used.
- (d) During operation the operator shall not stand on a live cable.
- (e) The tamping system shall not be used when damp and not to be operated during rains.
- (f) During operation of the tamping system any part of the electrical cable, fittings, connection box etc. shall not fall/rest on any drain/wet area in the track/cess. Any part of the alternator shall not be touched during operation.
- (g) While working in yards or track circuited areas, S&T branch shall be informed and it shall be ensured that signalling cables, signalling gears, signalling rods and traction bond wires do not get damaged.
- (h) While working in LWR/CWR section, instructions laid down in ` Manual of Instructions on Long Welded Rails-1996 ` shall be followed.

8.1.3.2 Handling :

The tampers and power sources shall be handled carefully to avoid any damage. The tampers, after use shall be kept in the case/box supplied with the machine.

8.1.3.3 Transportation :

The tamping system can be transported to work site by powered material trolley / material trolley or by a road vehicle.

8.1.3.4 Storage :

The tamping system shall be cleaned and covered with polythene bags. This shall be stored in a covered shed to protect from rain, dust and heat.

8.1.4 Maintenance :

For maintenance, trouble shooting and safety precautions for using the Off track tamping system, the Supplier's Manual shall be followed. However, following guide-lines may be followed as general maintenance practice:

- (i) **Initial maintenance after 20 running hours :**
Carry out oil change.
- (ii) **Every 50 running hours:**
Check foam filter.

Check fuel filter.
Check nuts and bolts for tight fit.

(iii) Every 100 running hours:

Carry out oil change
Service or replace spark-plug as necessary.

(iv) Every 7.30 running hours or annually:

Have the engine-generator serviced by Customer Service.
If large amount of dust accumulates, clean the air filter and engine generator set at shorter intervals if required.

(v) Shutting Down:

When the unit is put into storage for long interruptions in operation (more than 7.3 days) completely empty the tank. For this allow the engine to run until it comes to a standstill because of lack of fuel. Soak up the small amount of fuel which remains at the bottom of the tank with a clean cloth.

8.1.4.1 Trouble shooting:

(i) Engine does not start

- (a) Check oil level and refill if necessary.
- (b) Check whether there is sufficient fuel in the fuel container. Fill up if necessary.
- (c) Check whether the fuel-cock is open.
- (d) When the engine is cold, check whether the choke lever is set to CHOKe.
- (e) When the engine is at operating temperature, check that the choke lever is not set to CHOKe.
- (f) Check spark-plugs. Replace if necessary.

(ii) Engine stops during operation

- (a) Check whether there is sufficient fuel in the fuel container. Fill up if necessary.
- (b) Check whether the fuel-cock is open.
- (c) Check oil level and refill if necessary.

(iii) Engine-generator set produces no power or stops after switching on

- (a) When the engine is cold, check whether the choke lever is set to choke
- (b) When the engine is at operating temperature, check that the choke lever is not set to CHOKe.
- (c) Check whether the engine-generator set is being overloaded by the consumer loads which are connected. The sum of the power of the connected loads must not exceed the power of the engine-generator set.

8.1.5 Manpower :

6 persons, all skilled for transporting and operating the equipment.

8.1.6 Consumable :

- (i) Petrol /kerosene/ or as specified by manufacturer.
- (ii) Lubricating oil as recommended by engine manufacturer.

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Chapter-8.2 : Portable ballast cleaner (semi- mechanized)

8.2.1 Use :

Portable ballast cleaner is used for cleaning the track ballast during track maintenance work like deep screening, overhauling etc.

8.2.2 Description :

The semi-mechanised portable ballast cleaner consists of a horizontally rotating trapezoidal drum casing whose sides are having fabricated square meshes. The drum casing is mounted on two detachable stands and provided with gear assembly and ball



bearings. The lid of the screener itself works as the sliding ramp for the screened ballast to slide directly to the track. The tray can be placed below the drum to collect the falling muck. The machine can also be easily dismantled into following four parts, if necessary, by removing the clamping and locking pins :

- | | | |
|-------|----------------------------------|---------|
| (i) | Rotating drum with driving shaft | : one , |
| (ii) | Muck tray | : one , |
| (iii) | Stands | : two. |

Salient features :

- | | | |
|-------|--|-----------------------|
| (i) | Maximum weight | : 75 Kg |
| (ii) | Size of square mesh provided in the drum | : 12 mm x 12 mm |
| (iii) | Operation | : Manually operated . |

8.2.3 Guidelines for using, handling, transportation and storage :

8.2.3.1 Using :

Following procedures shall be followed:

- (i) For the deep screening work under traffic, the machine will be kept at the cess with the lid of the drum opening towards the track. Unlock the drum and open the lid towards the track. Put the unscreened ballast in the drum. Close the lid with the latches provided at the side of the drum.
- (ii) Rotate the drum with the rotating handle. The ballast inside the drum will be vigorously turned and the muck will fall on the muck tray placed below it. With 2 to 3 rotations of the drum, the whole ballast will be screened. Take out the muck tray and open the lid and turn the drum upside down with its rotating handle in such a way that the screened ballast comes out

at the toe of the track ballast profile. Put back the screened ballast in the track.

- (iii) After screening the ballast for three sleeper locations, ballast screener is shifted ahead to sixth sleeper location to reduce re-handling of ballast.
- (iv) If screening is done under traffic block, the ballast screener can be directly placed inside the track. The muck collected in the muck tray can be taken off and thrown at the desired place on the cess. In this process the lifting and re-handling of ballast will be reduced.

8.2.3.1.1 Precautions in operations:

- (i) While the deep screening work is done under Traffic (without block) the ballast cleaner shall be placed at adequate distance so that none of its components infringes any running train.
- (ii) Care shall be taken to ensure proper mesh size to provide proper size of screened ballast to the track.

8.2.3.2 Handling :

The ballast cleaner shall be handled carefully to avoid physical damage. During transportation, the ballast cleaner shall be moved either on the nylon wheels (on cess) or on double flange wheel (on rail).

8.2.3.3 Transportation :

Two double flanged wheels, one each with detachable stand , are provided with the machine to facilitate its transportation to work site . It can also be moved on its rubber/nylon flanges over cess/ground. The diameter and thickness of the flanges are such that they do not infringe check rails . Few P.Way tools can also be carried along with machine by placing them on muck tray .

8.2.3.4 Storage :

The machine when not in use shall be kept in a covered and dry place.

8.2.4 Maintenance Schedule:

Following maintenance instructions shall be followed before day's work.

- (i) Clean the teeth of the gear wheels and apply grease coating to avoid rusting and wear of wheel teeth.
- (ii) Open the grease cap of the casing block containing ball bearings in the drum supports and fill it with grease when necessary.
- (iii) Check the bearings. Replace bearings if found damaged.

8.2.4.1 Trouble Shooting: For trouble shooting , instructions contained in the Operating and Maintenance Manual supplied with the machine shall be followed.

8.2.5 Requirement of manpower : 2 (unskilled) .

8.2.6 Consumables :

- (i) Grease (as per the recommendation of the manufacturer).

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Chapter-8.3 - Portable shoulder ballast compactor

8.3.1 Use :

The portable shoulder ballast compactor is used for compaction of track ballast in crib and shoulder portion of track. It can also be used for soil compaction having a depth of 15 – 20 cm and for compaction of ballast bed before track laying.

8.3.2 Description :

The equipment consists of a petrol/kerosene engine mounted on a steel base plate. The machine imparts vibrations through the base plate for compacting the track ballast/ground. The equipment is fitted with a steering handle for controlling the movement of the equipment during its operation. A separate mono-rail trolley is used for shifting of the compactor.



Salient features

- | | | |
|-------|---------------------------------------|---|
| (i) | Prime mover (engine) | : Petrol/Kerosene engine of 3 to 3.5 HP. |
| (ii) | Overall weight
(excluding trolley) | : 75 Kg (maximum) |
| (iii) | Size of compacting plate | : 11inches x 16 inches (minimum contact area) |
| (iv) | Climbing ability | : Gradients and undulations up to 20% slope. |

8.3.3 Guidelines for using, handling, transportation and storage :

8.3.3.1 Using:

Operating controls are mounted on a vibration-free steering handle. Easy starting is ensured by incorporation of a centrifugal clutch between engine and vibrating mechanism. The engine is started by rope and the equipment is placed on the ballast bed (or soil), to be compacted. The equipment is moved forward by the handle. After starting the engine, clutch is engaged and vibratory operation is started and continued as per site requirement.

8.3.3.1.1 Precautions in operation:

Following precautions shall be observed during operation:

- (i) The operator shall be fully conversant with the operation, maintenance and trouble shooting of the machine.
- (ii) Engine shall not be started when clutch is engaged.
- (iii) The compactor/engine shall not be tilted beyond the limit prescribed by the manufacturer.
- (iv) Vibration level shall be pre-fixed before operation is started.

- (v) Operating instructions of the engine shall be followed as mentioned in the operating manual provided by the manufacturer.

8.3.3.2 Handling:

The compactor shall be handled carefully to avoid any physical damage. During shifting, trolley shall be used and the compactor shall not be dragged on ground.

8.3.3.3 Transportation:

The machine is to be transported to the worksite by a mono-rail cum road/material trolley road vehicle. Care shall be taken while loading and unloading of the machine so that no jerks come either on the engine or on the base plate.

8.3.4 Maintenance Schedule:

Following maintenance schedule shall be observed:

Daily

- (i) Remove soil, gravel, dirt etc from the compactor and clean the base plate.
- (ii) Check all bolts and nuts and tighten them wherever required.
- (iii) Check fuel & lubrication level before starting the engine and follow maintenance schedule as per the manufacturer's instruction manual.

Weekly:

- (i) V-belt tension shall be checked and adjusted if required.
- (ii) Check propeller shaft and repair if required.

8.3.4.1 Trouble Shooting:

Instructions regarding trouble shooting contained in the operating and maintenance manual, supplied with the machine shall be followed.

8.3.5 Manpower requirement:

2-3 persons (3 persons required on initial pass on highly undulating surface otherwise 2 persons are sufficient) (1 skilled + 1 unskilled).

8.3.6 Consumables:

- (i) Petrol/kerosene
- (ii) Lubricating oil (as recommended by the manufacturer).

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CORRECTION SLIPS

S.No.	Correction slip no. and date	Reference
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CORRECTION SLIPS

S.No.	Correction slip no. and date	Reference
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