



**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**

**MAINTENANCE SCHEDULES MANUAL
FOR
POINT & CROSSING TAMPING MACHINE
(UNIMAT)**

REPORT NO. TM- 80

FEBRUARY- 2005

**RESEARCH DESIGNS AND STANDARDS ORGANISATION
LUCKNOW-226011**

PREFACE

Maintenance of On-Track Machine is a challenging task. Presently, about 345 On Track Machines are working over different zonal railways. Maintenance of these machines is being done by zonal railways with the assistance of local trade available, zonal track machine workshops, CPOH / Allahabad and RDSO/ Lucknow. With experience over the years, the railway engineers have developed adequate expertise in the maintenance of these machines. However, in absence of approved maintenance instructions, different maintenance practices have come into vogue. Therefore, it has become imperative to have a uniform maintenance standard throughout the Indian Railways. Provisional maintenance schedule manuals for Dynamic Track Stabilizer (DGS-62N), Ballast Regulating Machine (BRM), Points and Crossings Changing Machine (T-28), Plasser Quick Relaying System (PQRS), Multipurpose Tamping Machine (MP), Duomatic machine (DUO), Unomatic machine (UNO), Track relaying train (P811S), and final maintenance schedule manuals of Continuous Tamping Machine (CSM 09-32), Ballast Cleaning Machine (RM-80) and Shoulder Ballast Cleaning Machine (FRM- 80) have been issued by RDSO. Provisional maintenance schedule manual for Point and Crossing Tamping Machine (UNIMAT) was issued previously as report no. TM-21 vide letter no. TM/HM/15 dated 24-01-97. Present manual have been prepared after necessary amendment in provisional manual on the basis of experience and suggestions received from railways.

It is hoped that this manual will be quite useful for the staff maintaining the machines in field.

While every care has been taken to make the maintenance schedules quite exhaustive, there is always scope for further improvement. Suggestions from the railways in this regard will be welcome and may be sent to the undersigned.

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EXPLANATORY NOTES

While preparing text of schedules for maintenance of Point and Crossing Tamping Machine (UNIMAT), the terms used and their meanings are explained below:

CHECK - Ensure a specific condition does or does not exist.

INSPECT - Look for damage and defects including breakage, distortion, cracks, corrosion and wear, Check for leaks, security and that all items are completed.

CHANGE - Fit new or overhauled or reconditioned part in place of old parts and missing parts.

OVERHAUL - Dismantle, examine, recondition or renew parts as necessary against given specifications, reassemble, inspect and test.

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SCHEDULE - I
(TO BE DONE DAILY)
DURATION -- ONE HRS

1. ENGINE

- i) Check coolant level of radiator and top up.
- ii) Check level of lube oil & fill up, if required.
- iii) Check for fuel leakage from fuel pump, injectors, fuel supply and return pipes.
- iv) Check air filter indicator and do needful.
- v) Check lube oil pressure.
 - a) Low idle rpm 1-to 2-kg/sq. cm.
 - b) High idle rpm 3 to 7 kg/sq. cm.
- vi) Check fuel level and top up.
- vii) Check V-belt for tension adjust if any slackness is noticed.
- viii) Record max. engine temperature of the day.
- ix) Drain air reservoirs after the day's work.
- x) Check for water leakage from hoses, and water pump seal.
- xi) Clean engine and premises.
- xii) Check battery-charging Ammeter. It should be +ve.

2. MACHINE GENERAL

- i) Check in running condition (at 1000 rpm), the oil level of ZF gear box and top up if required, after stopping.
- ii) Check the tightness of carbon shaft bolts.
- iii) Check oil leakage and level of all gear boxes and do needful.
- iv) Check & top up oil in tank for lubrication of main pin bearing (55mm pin).
- v) Check & top up oil in wick lubricator for lubrication of guide columns.
- vi) Check and top up oil in tank for lubrication of vibration shaft main bearings
- vii) Lubricate the fork and eye end of squeezing cylinders with grease after every 2-3 hours of effective working.
- viii) Grease tamping arm bearings (35mm dia pin)
- ix) Grease tamping unit sliding arm bushes.
- x) Grease tamping tool adjusting cylinder pivot.
- xi) Check locking and unlocking of tamping units.
- xii) Change worn out tamping tools
- xiii) Check tightness of tamping tools.
- xiv) Check locking and unlocking of lifting and lining unit.
- xv) Check for oil leakage from hydraulic circuit and prevent if required.
- xvi) Check tightness of hook cylinder piston rod.
- xvii) Check hydraulic oil level in tank and top up if required.
- xviii) Record the max. hydraulic oil temperature during day's work.
- xix) Check for any rubbing of hoses and correct if necessary.
- xx) Top up air oiler.
- xxi) Check air brake pressure and brake application.

- xxii) Check the leakage from Pn. System and do the needful.
- xxiii) Check for any unusual sound from tamping units, gear boxes, engine & hydraulic pumps.
- xxiv) Clean the tamping bank.
- xxv) Check all functions of working mechanisms before block.

SCHEDULE II
(TO BE DONE 50 ENGINE HOURS)
(Duration 2 Hour)

1. ENGINE

- i) Clean air cleaner element outer with dry air (May be cleaned earlier, if red indicator lights up).
- ii) Clean battery terminals and apply petroleum jelly.
- iii) Check electrolyte level and specific gravity of battery.

2. MACHINE GENERAL

- i) Check and tighten shoe plate bolts of guide column.
- ii) Check and tighten squeezing cylinder cover plate bolts.
- iii) Check and tighten tamping unit cylinder holding bracket bolts.
- iv) Check and tighten clapper bracket distance piece allen bolts.
- v) Check and tighten the nuts of center pin (55 mm dia), top pin (35 mm dia).
- vi) Lubricate radial tilting guide plates and rollers.
- vii) Lubricate the carbon shafts with grease.
- viii) Lubricate the lining cylinder pivots with grease.
- ix) Lubricate the rail clamp pivot pins with grease.
- x) Lubricate the roller clamp housing with grease.
- xi) Lubricate the locking device pivots with grease.
- xii) Check and tighten clamp roller locking bracket bolts.
- xiii) Lubricate the track lifting cylinder pivots with oil.
- xiv) Lubricate the clamp carrier pivots with grease.

- xv) Examine for wear and free movement of clamp roller.

- xvi) Check clearance of lifting roller disc below the rail head in lowered closed condition.
- xvii) Grease the following points of the 3rd rail lifting unit:(UNIMAT- 3S)
 - a) Cylinder pivot pins
 - b) Rope pulley
 - c) Sliding plate
 - d) Rollers
 - e) Telescopic slide
- xviii) Grease all lining rollers.
- xix) Check for play in feeler rollers of middle trolley.
- xx) Clean water separator.
- xxi) Check function of air oiler.
- xxii) Grease king pin pivot of driving & idle bogies.
- xxiii) Grease axle gear box flange cover of driving bogie.
- xxiv) Grease torque arm pivots of driving bogie.
- xxv) Adjust the brake shoe clearance as per Annexure – III.
- xxvi) Apply lube oil on bush bearing of front and rear feeler rods.
- xxvii) Lubricate all ball & socket pivot joints.
- xxviii) Inspect cord wires of all transducers.

SCHEDULE III

**(TO BE DONE AFTER 100 ENGINE HOURS)
DURATION -- ONE DAY**

1. ENGINE

- i) Inspect the condition of V-belts. Worn out belts to be replaced.
- ii) Clean radiator fins by blowing air from opposite direction.
- iii) Clean alternator and check connections.
- iv) Check battery terminals & connections for tightness.
- v) Check engine safety circuit.

2. MACHINE GENERAL

- i) Check all lights, and do needful.
- ii) Check guide rod of transducers for bends and tightness of holding bolts.
- iii) Check foundation bolts of brake cylinders.
- iv) Grease pendulum bridge pivots.
- v) Change worn brake shoes on condition basis.
- vi) Check gap of carrier of versine transducers.

SCHEDULE IV

(TO BE DONE AFTER 200,400,600,800 ENGINE HOURS.)
DURATION – TWO DAYS

1. ENGINE

- i) Change engine oil.
- ii) Change lub oil filter element.
- iii) Change pre filter element.
- iv) Change secondary filter element.
- v) Check tappet clearance.
- vi) Clean cooling coil.
- vii) Clean crank case air breather.
- viii) Change engine air cleaner elements.

Note : i) Item no. (i),(ii),(iii),(iv), &(vii) will be done after 300 engine hours.
ii) Item no. (viii) will be done after 500 engine hours

2. MACHINE GENERAL

- i) Change gear oil of hydraulic drive reduction gear box.
- ii) Change oil of intermediate drive shaft.
- iii) Change oil of ZF gear box.
- iv) Change Z-F Gear Box filter.
- v) Change oil of axle gear boxes.
- vi) Change vibration shaft housing oil.
- vii) Change central bushes of tamping arms, which have developed excessive, play on condition basis.
- viii) Check all the measuring devices for working order.
- ix) Clean the fins of ZF Gear Box and System Oil Coolers, by blowing air from opposite direction.
- x) Check calibration of all pendulums.
- xi) Check calibration of lining.
- xii) Check calibration of tamping unit depth.
- xiii) Grease hand brake gear.
- xiv) Clean complete machine.

- xv) Check brake linkage and oil the pivots.
- xvi) Replace seals of tool tilting / Squeezing / tamping cylinder on condition basis.
- xvii) Replace all suction line filters.

- xviii) Replace all pressure line filter.
- xix) Replace return line filters.
- xx) Check all system pressure for rated settings and adjust if necessary.
- xxi) Check all limit switches and proximity limit switches.
- xxii) Change proportional valve filter element.
- xxiii) Change servo valve filter element.

Note: Item no. (iii),(vii) & (xviii) will be done after 500 engine hours.

SCHEDULE- V
(IOH)
(To be done after 1000,3000,5000 engine Hrs)
Duration –7 days

1. ENGINE

- i) Engine is to be top over hauled on condition basis.
- ii) Overhaul the fuel injectors.
- iii) Overhaul the fuel injection pump.
- iv) Check / Change worn out water hoses on condition basis.
- v) Overhaul air compressor on condition basis.
- vi) Check / Change bearings and shaft of radiator fan drive on condition basis.
- vii) Inspect compressor fan and pulley.
- viii) Clean the engine radiator.
- ix) Clean diesel tank.
- x) Overhaul / Replace air unloader.
- xi) Check RPM of engine radiator fan.

2. MACHINE GENERAL

- i) Replace the Hydraulic hoses which are damaged by external abrasion & corrosion.
- ii) Provide the missing clamps.
- iii) Overhaul water separator and air oiler.
- iv) Change pneumatic hoses on condition basis.
- v) Change the seals of pneumatic brake cylinders.
- v) Check bearings of all axles and grease them.
- vi) Check meggy springs and replace, if required.
- vii) Check wheel tyre defects and take necessary remedial action.
- viii) Check bearings of measuring trolley wheels and grease them.
- ix) Clean Hyd. oil reservoir with lint free cloth.
- x) Send sample of hydraulic oil for physical & chemical test.
- xi) Check play in the tool holding arms and change if necessary on condition basis.
- xii) Thoroughly clean all panel boxes.
- xiii) Provide missing thimbles.
- xiv) Replace defective switches and potentiometers on condition basis.
- xv) Replace defective indicative instruments.

- xvi) Overhaul all transducers and replace the chords.

- xvii) Replace the missing or defective light.
- xviii) Calibrate the machine for leveling & alignment.
- xix) Strengthen the machine frame, where cracks have developed on condition basis.
- xx) Overhaul / Replace the tamping units if required.
- xxi) Overhaul the lifting units if required.
- xxii) Grease the bogie king pin pivots.
- xxiii) Replace the missing and defective hand tools.
- xxiv) Check the function of all assemblies.
- xxv) Test the machine for one week before it is put for work in regular section.
- xxvi) Clean Hydraulic oil through portable filter of 10 Micron.

SCHEDULE VI
(IOH)
(To be done after 2000,4000, engine Hrs)
Duration – 45 days

1. ENGINE

- i) Overhaul the engine, if required.
- ii) Overhaul the air compressor.
- iii) Overhaul the alternator I & II.
- iv) Change bearing and shaft of radiator fan drive.
- v) Change the engine mounting pads on condition basis.
- vi) Overhaul self starter on condition basis.
- vii) Change batteries on condition basis.

2. MACHINE GENERAL

- i) Clean the hyd. Reservoir, paint with approved quality of paint and fill with new oil.
- ii) Overhaul all pneumatic valves and change the unserviceable valves on condition basis.
- iii) Change the seals of all pneumatic cylinders on condition basis.
- iv) Check hooks vertical/ horizontal guide bushes and replace if necessary.

SCHEDULE VII
To be done after 6000 engine Hrs
(POH)

1. ENGINE

- i) Overhaul or replace the engine.
- ii) Overhaul the injectors.
- iii) Overhaul the fuel injection pump.
- iv) Overhaul the air compressor.
- v) Overhaul the self starter.
- vi) Overhaul the alternator I & II.
- vii) Overhaul the radiator fan drive assembly.
- viii) Clean the engine radiator.
- ix) Change engine mounting pads.
- x) Change water hoses.
- xi) Overhaul water pump.
- xii) Change engine air cleaner elements.
- xiii) Change all engine filters along with lub oil.
- xiv) Inspect engine damper for any damage.
- xv) Check the RPM of Engine radiator fan, if found less than the rated RPM, take corrective measures.
- xvi) Clean the diesel tank.
- xvii) Replace cooling coil.
- xviii) Replace air unloader.
- xix) Test air tanks.

2. MACHINE GENERAL

- i) Change all Hydraulic pumps and motors.
- ii) Replace all Hydraulic cylinders.
- iii) Replace all hydraulic hoses.
- iv) Clean the Hydraulic tank, inside to be painted with approved quality of paint.
- v) Fill new oil after replacing return line and suction filters.
- vi) Replace all pressure filters, proportional valve, servo valve and return line filters.
- vii) Clean Hydraulic oil cooler. If it is blocked more than 20% during service or badly leaking, then replace it.
- viii) Check the Hydraulic accumulators and recharge.
- ix) Change all the direct acting and pilot operated directional valves.
- x) Proportional valves and servo valves may be got calibrated from the manufacturer. On their recommendation, these may be condemned and provide the new valves.
- xi) Change all the pressure control valves.
- xii) Replace all the stop cocks and flow control valves.
- xiii) Flush the complete system.

- xiv) Replace the seals of all hydraulic cylinders along with gland bushes /piston and hone the cylinder barrel, if required.
- xv) Replace water separator and air oiler.
- xvi) Change all pneumatic hoses.
- xvii) Change all pneumatic valves.
- xviii) Change all pneumatic cylinders on condition basis.
- xix) Change brake cylinders on condition basis.
- xx) Change clapper cylinders.
- xxi) Change all the brake shoes.
- xxii) Overhaul / Replace tamping units.
- xxiii) Overhaul / Replace the lifting units.
- xxiv) Overhaul / Replace the trollies, wheels & feeler rollers.
- xxv) Strengthen machine frame where cracks have developed.
- xxvi) Check the wheels for tyre defects, reprofile or change the assembly, if required.
- xxvii) Check the axle bearings and grease them.
- xxviii) Overhaul / Replace the cardon shafts.
- xxix) Complete machine may be painted as per approved paint scheme.
- xxx) Overhaul the driving and idling bogies and replace the defective parts.
- xxxi) Overhaul all gear boxes.
- xxxii) Replace the shock absorbers on condition basis.
- xxxiii) Replace the defective PCBs.
- xxxiv) Replace the limit switches.
- xxxv) Calibrate all the indicative instruments.
- xxxvi) Overhaul the pendulums.
- xxxvii) Overhaul all the transducers.
- xxxviii) Conduct insulation test of main cables and replace the defective ones.
- xxxix) Overhaul the panel boxes.
- xl) Defective switches and indicative lights may be replaced.
- xli) Check the LED of all the solenoids.
- xl ii) Check the calibration of digital potentiometers and replace the defective ones.
- xl iii) Calibrate the machine for lifting and alignment.
- xl iv) Recondition worn-out wheels of all trollies.

S.No.	Description	Qty
A.	ENGINE:	
1.	Fuel filter	2 No.
2.	Lub Oil Filter	2 No.
3.	Air Cleaner Filter	2 Set
4.	Radiator Hoses	1 Set
5.	Injector Pipes	1 Set
6.	`V' Belts	1 Set
7.	Fuel Flexible hoses	1 Set
B.	TAMPING UNIT:	
1.	Piston for Squeezing Cylinder	2 No.
2.	Gland Bush for Squeezing Cylinder	2 No.
3.	Seal Set for Squeezing Cylinder	2 Sets
4.	Piston Locking Screw	2 Nos.
5.	Buffer stop	2 Nos.
6.	Tamping Unit UP & DN Hydraulic Cylinder Seals	1 Set
7.	Tamping Unit UP & DN Hydraulic Cylinder Piston Rod (Complete).	1 No.
8.	Tamping Tool (2W .81.418)	8 Nos
9.	Tamping Tool (W .37 .1320)	8 Nos.
10.	Tamping Tool Bolts	8 Nos
11.	Tamping Tool Cap	8 Nos
12.	Tamping Tool Bolt (G30.42)	4 Nos.
13.	Tamping Depth Transducer Chord	8 Mtrs.
14.	Carrier Tamping Depth	1 No.
15.	35 mm Pin with Steel Bush, Nut & Washer	1 No.
16.	Squeezing Cylinder Piston Rod	1 No.
17.	Grub Screw	2 Nos.
18.	Gear Ring for Vibration Coupler	1 No.
19.	Tamping Tool Key	6 Nos.
20.	Tool Tilting Cylinder	1 No.
21.	Bolt (W.31.133A)	2 Nos.
22.	Bolt (CU.37.632	2 Nos.
23.	Rubber Ring (W.33.83)	6 Nos.

LIST OF SPARES & TOOLS FOR EMERGENCY

S.No.	Description	Qty
C.	HYDRAULIC:	
1.	Seal set for all hydraulic cylinders	1 Set
2.	Proportional filters	1 Nos.
3.	Servo Filters	2 Nos.
4.	ZF in line filter	1 No.
5.	Hydraulic Suction Filter	1 Set
6.	Hydraulic return filters	1 Set
7.	Hydraulic hoses 2781-4	5 Metres
8.	Hydraulic hoses 2781-6	5 Metres
9.	Hydraulic hoses 2781-8	5 Metres
10.	Hydraulic hoses 2781-10	5 Metres
11.	Hydraulic hoses 2781-12	5 Metres
12.	Hydraulic hoses 2755-16	5 Metres
13.	Hydraulic hoses 2781-20	5 Metres
14.	Hydraulic hoses 1503-24	6 Metres
D.	ELECTRICAL:	
1.	Relay 7002/S4	2 Nos
2.	Relay EL.T.663	2 Nos.
3.	Fuses 4A	4 Nos
4.	Head Light & working light bulbs	2 Nos. Each.
5.	Versine Transducer Carrier	1 No
6.	Versine Transducer Chord	8 Metres.
E.	MISCELLANEOUS:	
1.	Track lifting roller	1 No.
2.	Chord wire 2 mm	40 Metres
3.	Pneumatic Hose 6.3	15 Metres
4.	Pneumatic Hose 12.5 mm	10 Metres
5.	Cardon Shaft Engine to ZF Gear Box	1 No
6.	ZF Gear Box to Distribution Gear Box	1 No.
7.	Distribution Gear Box to Axle Gear Box	1 No.
8.	Brake Shoes	8 Nos
9.	Brake Seal	1 No.

GENERAL SAFETY NOTES.

1. The machine has to be operated according to existing Indian Railways Rules & Regulations.
2. The safety of yourself and other people is most important consideration in the operation and maintenance of the machine.
3. Remember, the machine is a working unit, carrying delicate instruments. Therefore, the machine should not be driven at excessive speed over bad track or crossing work.
4. Always keep your eyes open for other men working close to the machine.
5. Do not forget to look out for signals, switches and track obstructions.
6. Remember to make sure that all protection equipment and safety devices are in place on the machine and in working order especially when it is being driven from site to site.
7. Always keep the machine clean. Excessive oil or grease on the machine can cause you to slip and fall and is also a potential to fire hazard.
8. Always lock the machine before you leave. Make sure that the machine is protected in accordance with railway regulations.
9. Whenever you have the opportunity while waiting to get out on a job, do some of the smaller maintenance job, such as tightening loose nuts and bolts and cleaning the machine.
10. Do not permit unauthorized persons to operate the machine.
11. It is prohibited to use exposed light or fire on or near the machine.
12. When ever going out of the rear cab working on or near the tamping bank area, operate the emergency push button and ensure latching position.
13. Do not tow the machine if the final drive is engaged.
14. All wind screen glass should be protected with wire mesh.

IMPORTANT

- i) Tamping tools will be replaced after limiting wear of 20% on area basis.
- ii) Hydraulic tank will be top up after filtering the oil through portable filter of 10 Microns.
- iii) Clearance of lifting roller disc below the rail head in lowered closed condition will be 5 mm for rear and 12 mm for front roller.
- iv) Brake shoe clearance between shoes and wheels for all shoes will be between 3 to 5 mm.
- v) Worn out brake shoes will be changed after minimum thickness of 13 mm at any point.
- vi) Greasing of cardon shafts will be done after cleaning and grease by two shots of Grease Gun.
- vii) The gap between carrier of lining transducer and chord wire will be only 0.1 mm more than the dia of the chord wire.
- viii) Minimum Specific gravity of batteries will be 1.24.
- ix) While checking the tension of V-belts sag should not be more than 15 mm at mid point.

List of Safety Equipments

S.No.	Description	Quantity
1.	Detonators	1 box
2.	H.S. flag red	2 nos.
3.	H.S. flag green	1 nos.
4.	H.S. Tri colour lamps	2 nos.
5.	Chain & Pad lock	1 set
6.	25 t jack with traverser	1 no.
7.	Crow bars	4 nos.
8.	Beaters	4 nos.
9.	Wooden blocks off sizes	8 nos.
10.	Rail thermometer (dial type)	1 no.
11	Banner flag	2 nos.
12.	Portable Control Phone	1 no
13.	First Aid Box	1 no
14.	Skid	4 nos.
15.	Walkie-Talkie set	1 no.

Consumables To Be Used

S.N.	Section	Lubricant	Grade	Frequency
1.	Engine Crank Case	Lube oil	APICF4-15W40	300 Hrs
2.	Power shift gear box	Lube oil	APICF4-15W40	500 Hrs
3.	Distribution gear box	Gear oil	SAE-90	200 Hrs
4.	Hyd. Working drive reduction gear box	Gear oil	SAE- 90	200
5.	Drive intermediate shaft	Gear oil	SAE- 90	200
6.	Axle gear boxes	Gear oil	SAE- 90	500Hrs
7.	Lubrication of T/Unit component	Hyd. Oil and grease	HLP-68 and MP-2,RR3	As per schedule
8.	Working system	Hydraulic oil	HLP-68	6000Hrs
9.	King pin pivots	Grease	MP2 or RR3	1000 Hrs
10.	Axle bearing and other greasing points.	Grease	MP2 or RR3	As per schedules
11.	Radiator	Coolant	Premixed coolant or prepared coolant additive concentrate	Daily

ACKNOWLEDGEMENT

Following officers and staff have made their valuable contribution in preparation of Maintenance Schedule of Point & Crossing Tamping Machine (UNIMAT)

Railway

1. S/Shri Atul Shrivastva JE-II/TMC/NER/UNIMAT-8290
2. " Rajender Singh Section Engineer/TMC/N.Rly/UNIMAT-8250

RDSO

1. S/Shri A.K. Pandey DTM-V
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