

NATURE OF SERVICING AND MAINTENANCE TO BE CARRIED OUT

**1. PREVENTIVE MAINTENANCE TO BE CARRIED OUT FOR EACH CRANE:
(Frequency: Once in six months)**

1.1 BRIDGE RAILS (L.T & C.T) WITH CLAMPING SYSTEM:

- 1.1.1 Check the fastening of crane rails and clamps and rectify, if required.
- 1.1.2 Check rail wear on top and sides and report any abnormality.

1.2. GANTRY GIRDERS ON BUILDING & CRANE

- 1.2.1 Check the foundation bolts, splices, loose bolts or missing bolts/rivets and for cracked welds and Splices and rectify wherever required.

1.3. END CARRIAGE (END TRUCKS):

- 1.3.1 Check the overall condition of end carriage and report any cracks in the welds or abnormal wear of rail and wheels. Rectify wherever required.
- 1.3.2 Rail sweeps to be checked and fixed properly, if needed.
- 1.3.3 WHEELS: Check for the non-uniform wear, correct the Wheel axle for proper alignment.
- 1.3.4 BUMPERS: To be checked and rectified if there is any defect.
- 1.3.5 End carriages and the bridge girder fasteners are to be checked and properly tightened
- 1.3.6 Attachment to end carriages – loose or missing rivets or bolts or broken/cracked welds to be Checked and rectified.

1.4. DRIVE SYSTEM (L.T & C.T):

- 1.4.1 Check the tightness of the bolts of the motor base, Plummer blocks, and its supports, brake unit Supports, gearbox supports, L.T & C.T. Shaft connecting the wheels etc., and rectify, if required.
- 1.4.2 Check the coupling condition and tightness of the key.
- 1.4.3 Check the Plummer block bearing condition.
- 1.4.4 Check the gearbox for leakage of oil, loose bolts or cracks in the gearbox, observe the noise level and report before rectification.

1.5. HOIST DRIVE SYSTEM MAIN/MICRO/AUXILIARY WHEREVER APPLICABLE:

- 1.5.1 Check the free rotation of the hook
- 1.5.2 Check the free movement of snatch block
- 1.5.3 Check for the wear and free rotation of pulleys.
- 1.5.4 Check tightness of fasteners at the end fixing of wire rope on rope drum and also rope drum fixing system.
- 1.5.5 Check the freeness of equalizer pulley system.
- 1.5.6 Check the tightness of Plummer block assembly.
- 1.5.7 Check all the fasteners for proper fixing of motor, gearboxes, Plummer blocks, brake units etc.
- 1.5.8 i) Check the coupling condition. ii) Check the tightness of the key.
- 1.5.9 Check the Plummer block bearing condition.
- 1.5.10 Check the gearbox for leakage of oil, loose bolts, or cracks in the box, observe the noise level and report before carrying out repair works.

1.6. BRAKE UNITS: (FOR L.T & C.T AND HOIST MOTIONS):

- 1.6.1 Brake shoe connecting linkages shall be checked and to be adjusted if required.
- 1.6.2 Adjust the spring tension for proper braking condition.
- 1.6.3 Check the condition for brake liner and replace, if require.
- 1.6.4 In electro-magnetic (E.M) type of brakes, ensure that the plunger inside the core shall be at least 1/3 of the core depth for proper operation.
- 1.6.5 Check the brake coil guide assembly (EM Brake) for proper plunger operation (for all motions).
- 1.6.6 In case of thruster brakes, check for oil condition and level and rectify, if required.
- 1.6.7 Brake currents are to be measured and recorded wherever the brakes are adjusted.
(Before and after the adjustments)



1.7. LUBRICATION

1.7.1 GEARBOXES (FOR L.T., C.T. AND HOIST MOTIONS): Check the condition of oil and replace if required.

1.7.2 CENTRALISED LUBRICATION SYSTEM: All grease nipple and oil points shall be packed with lubricant.

1.7.3 Lubrication of all mechanical components (viz., hook, pulleys, rope, brake, gears, gearboxes, Plummer blocks, wheels and axels, coupling, bushes etc.,) topping up or replacing lubrication oil wherever required. (Galvanised hard core wire ropes should not be lubricated).

1.7.4 If the pipelines of the centralized lubrication system are blocked, it shall be repaired before the application of lubricants.

1.8. LIMIT SWITCHES; (FOR L.T., C.T. AND HOIST MOTIONS):

1.8.1 Check all operation of all limit switches for L.T., C.T. and Hoist (upper & lower) and also for gravity limit switch and rotary limit switches.

1.8.2 Check the rotary limit switch cam system.

1.9. ELECTRICAL SYSTEMS

1.9.1 Check the free movement for guide, guide rail /rollers, push rod, connecting chains, clamping of all trailing cable units and rectify the defects, if any.

1.9.2. INSPECTION OF INCOMING PANEL AND CONTROL PANELS;

1.9.2.1 Tighten all terminals inside the panel.

1.9.2.2 Check the correct fuse ratings.

1.9.2.3 Check the over load relay settings (set over load relay to full load current of the motor)

1.9.2.4 Check the chattering and sluggish operation of power contactors and ISR relays.

1.9.2.5 Check the earthing of the motors for proper tightness and contact.

1.9.2.6 Ensure all panel door bolts are fixed.

1.9.2.7 Check and tighten all electrical connections in the motors.

1.9.2.8 Clean the terminal blocks of motors, brakes, junction boxes, limit switches etc.,

1.9.2.9 Check the limit switches functioning for all motions.

1.9.2.10 Check the brake coil operation for non-humming condition and proper closing.

1.9.2.11 Check the brake coil resistance.

1.9.2.12 Roller actuation of the limit switches shall be checked manually.

1.9.2.13 Check all electrical connections of the pendant.

1.9.2.14 Check all push button's actuation.

1.9.2.15 Check for proper operation for all motions of pendant push buttons.

1.10. CLEANING

1.10.1 After all the works are completed, remove tools, tackles, wastes, oil can, grease etc.,

1.10.2 Secure all covers after maintenance.

1.10.3 Clean the crane, L.T., Girder, walkways etc thoroughly.

1. ANNUAL SERVICING AND LOAD TESTING (Frequency: One in Year)

In addition to the work mentioned under periodical preventive maintenance (from point 1. to 1.10.3), the following works are also to be carried out for Annual Servicing and Load testing for each crane.

2.1. L.T. & C.T. DRIVE SYSTEMS

2.1.1 All couplings are to be removed, checked and refitted.

2.1.2 All Plummer blocks are to be opened and inspected thoroughly, oil seals / gaskets etc., shall be changed, if require.

2.1.3 All gearboxes have to be opened and inspected thoroughly, Oil seals/gaskets etc., shall be changed, if required.

2.1.4 Alignment of all drive chains shall be checked and corrected, if required.

2.2. HOIST DRIVE SYSTEMS (AUX. AND MAIN):

2.2.1 All couplings are to be removed, checked and refitted.

2.2.2 All Plummer block covers are to be removed, bearings are to be checked and refitted.

2.2.3 All gearboxes have to be opened and inspected thoroughly. Oil seals/gaskets etc., shall be changed if required.

2.2.4 Alignment of all drive chains including rope drum shall be checked and corrected, if required.

2.3. INSPECTION OF WIRE ROPES

2.3.1 Check the hoist rope reeving, rope wear, twist, kink, break, interference with any other member etc., while in operation. New rope is to be laid, if the old wire rope is required to be replaced.

2.3.2 Check the condition of hoist drum (rope drum) bolts tightness, bearing condition, grooves and ridges. Replace with new ones, if required.

2.3.3 Check the general condition of bull gear and connecting gear train. Replace with new ones, if required.

2.4. BRIDGE RAILS (L.T. & C.T.)

2.4.1 Check and align the rails, if required.

2.4.2 Check the end stoppers and rectify, if required.

2.5. BRIDGE GIRDERS

2.5.1 Check the welding condition, rivet or bolted joints throughout the length of the girder and rectify, if required.

2.5.2 Check the splice joints for any abnormality and rectify, if required.

2.5.3 Check walkway plates and hand rails and rectifies, if found defective.

2.6. ELECTRICAL SYSTEMS:

2.6.1 Inspection of Incoming panel and Control Panels:

2.6.2 Clean power contractors in the incoming panels and replace the contractors if required.

2.6.3 Clean the ISR relays and power contractors, magnetic core etc.,

2.6.4 Measure the insulation resistance of all power and control cable connected to motors and motor windings.

2.6.5 Measure the winding resistance of motors.

2.6.6 Check the electrical motor bearing condition and replace if required.

2.6.7 Check the condition of fan blades of motors and tighten all the fasteners.

2.6.8 Measure insulation resistance value of all cables including pendant cables.

2.6.9 Check the condition of electrical trailing cables, L.T.C.T., down shop leads etc., and rectify, if required.

2.6.10 Check the cable glands for proper condition and replace, if necessary.

2.6.11 Check loose connection inside the limit switches and tighten them, if necessary.

2.7 LOAD TESTING

2.7.1 After carrying out the annual servicing and maintenance of the crane and satisfactory completion of the written report, each crane shall be load tested in the presence of the respective Building In – Charge with written permission of Plant head. Any test which is to be repeated as per instruction of the Engineer-in-charge shall be carried out by the contractor. Mobilization of dead weights for load testing from facility to facility will be in contractor's scope. The department will provide the dead weights required for the load testing and Material Handling Equipment with driver for transporting dead weights from facility to facility. Coordination to mobilize dead weights for load testing from facility to facility to be done by supervisor of service provider. The Load Test Document specifying the procedure will need approval by Quality Control Department, Nagpur Work Centre.

2.7.2 The minimum tools and accessories required to carry out the load test as given in the following list have to be brought by the contractor at his own cost.

- a. Measuring tape, 50 meters
- b. Plumb-bob
- c. Piano wire
- d. Steel rule, 1 meter
- e. Stop watch - One No
- f. Try Square
- g. Multi meter
- h. Tong tester for current measurements
- i. Megger etc.

Note: All the instruments used should have been calibrated before use and the certificate to this effect should be shown to the building – In – Charge, Quality Control Representative, if demanded. If required re-calibration of any item, it has to be carried out immediately by the contractor at his own cost.



2.7.3 The contractor shall follow the procedure laid down by the approved document to carry out the load test & as per relevant ISO standards/ statutory norms.

2.7.4 The currents of all the motors and brakes as well as the speeds of LT, CT and Hoist motions are to be measured and recorded in the prescribed format.

2.7.5 The deflection measurements shall also be carried out and recorded.

2.7.6 **The vendor will be responsible for arranging the Load test certification from competent authority as per factory act if directed by BAPL. BAPL will reimburse the cost on production of bill and certification from competent authority.**

2.8 Maintenance schedule for Trolleys:

Maintenance Schedule of Magazine Trolleys			
Fortnightly:	Monthly	Quarterly / Half Yearly	Annually
i) Clean the exterior of the trolley. ii) check for any visible loose fasteners & tighten it if any. iii) Check the cable for any rodent damage.	i) Carry-out the fortnightly schedule. ii) Remove the wheel lock. Connect the manual hand wheel and move the trolley by 100 mm or 30-degree rotation of the wheel and re-fix the wheel Lock (to avoid the wheel in the same position for prolonged period due to load).	i) Carry out the monthly maintenance. ii) Check the oil level in the gearbox (top up with same grade of oil if required). iii) Tighten all fasteners and record. iv) Lubricate the floating shaft geared couplings. v). check the electrical cable for any slackness.	i) Transfer the load to an empty trolley. ii) Lift the trolley in the work shop. iii) check for free movement of all the wheels. iv) Open wheel bearings if wheels are found jammed due to hardened grease. Replace the hardened grease and replace with fresh grease.

Maintenance Schedule of Traverse Trolley			
Fortnightly:	Monthly	Quarterly / Half Yearly	Annually
i) Check the Motor; Gearbox and Brake for any loose fasteners. ii) check the Drives for any loose fasteners. iii) open and check control cabinet for any loose joints. iv) Check the cable drag chain path way before starting trolley.	i) Check fastening of traversal trolley, motors, brakes, gearboxes, shaft coupling, bearing and its housings. ii) Check condition of girder and end carriage joint bolts. iii) Brakes Junction box – check connections for looseness.	i) Check gear boxes for noise level, leakage of oil (topping up if necessary). ii) Check motors - terminal connections. iii) Alignment of motors, couplings, floating shaft, clutches, if any. iv) Check electrical - contactor tips /limit switch operating mechanism including electrical connections.	i) Visual inspection of all structural connections, joints and condition of welding. ii) Wheels flanges for wear & Brake drums. iii) Replacement of lubricants. iv) Check contacts of motors, contactors, isolators, circuit breakers, master controllers. 5. Check condition of cables and cable drag chain.

Note: The above check list is indicative and generic for all cranes; Detailed and crane specific check lists will have to be followed after award of Contract.