

Bharat Heavy Electricals Limited
Ramachandrapuram : : Hyderabad – 502032
M&S – DIVISION
SCOPE OF WORK (ANNEXURE-I)

Tender No.: M&S/P&S/2022/35, Dt.: 19.08.2022

Name of Work: AMC for 258 Nos. Of Cranes (EOT, GANTRY, JIB etc) in various shops.

I. Maintenance of Cranes is mainly divided into two categories

- a) Breakdown Maintenance(BD maintenance)
- b) Preventive Maintenance (P Maintenance / PM)

Details of Cranes by capacity are as below

Type	By Capacity	No. of cranes	Total
EOT	≥250T	1	258
	≥150T and <250T	4	
	≥50T and <150T	28	
	≥20T and <50T	37	
	≥5T and <20T	83	
	<5T	21	
Gantry, S.Gantry	<40T	41	
Bracket	3T	1	
JIB	<5T	40	
Sand Grab Equipment		2	

A. BREAKDOWN MAINTENANCE

1. Breakdown Maintenance of all cranes (mentioned in the 'List of Cranes in Annexure-I') as per the call received (Telephone, Verbal, or thru Breakdown report). Attending to breakdown maintenance calls in such a way the crane is put back into operation in best possible minimal time.
2. For every activity (s)/ job (s) performed, a registration number (in the form of running serial number) shall be clearly mentioned in daily log-book or online system by the supervisor/ Contractor.
3. Critical cranes/ emergency requests shall be attended timely by redirecting manpower as per priority and instructions of the Engineer In-charge Crane Maintenance.
4. In case of urgent breakdown, the contractor shall have to retain his staff on working days, and call back on Sundays and holidays as per requirement and as and when instructed by the Engineer In-charge crane maintenance, for completion of urgent breakdowns. However any compensation on this account shall not be paid by BHEL outside the conditions specified in the payment terms.
5. When repair/ maintenance/ modification work gets completed, the actual time (in hours), material consumed, total down time and other information shall be reported to the Engineer In-charge crane maintenance in the daily report.
6. All complaints received shall be reported by the contractor to the Engineer In-charge crane maintenance and completed at the earliest.

B. PREVENTIVE MAINTENANCE:

Preventive maintenance of all cranes mentioned in the 'List of Cranes'.

B.1 MECHANICAL:

1. General checking of the Crane. Checking cranes for any loose fasteners/ bolts etc., vibration, oil leakage and missing parts/ guards during preventive maintenance and rectifying the same.
2. Topping oil in the gear boxes, EHT thrusters.
3. Checking lubrication of crane. Ensuring good lubrication using grease gun at points specified in manual / PM check sheet.
4. Lubrication of wire ropes (Eg. Dorsa or Vitalife spray etc.)
5. Checking of LT/CT wheels including bearings, wheel shafts, couplings, pedestals, gears, etc. for any abnormal sound.
6. Drive mechanisms - Checking of LT, CT and hoist motions, replacement of gear boxes, bearings, oil seals, gaskets, gears, input/output shafts, couplings, coupling bolts, drive shafts, pulleys, etc. for any play or abnormal sound.
7. Wire Ropes - Replacement of worn out/broken/crushed/damaged wire ropes, arranging for wire rope clamps.
8. Hook block of hoists - Replacement of damaged / worn out hooks. Replacement of damaged / defective pulleys and any other damaged components of the hook blocks.
9. Checking and replacement of crane end stoppers on LT and CT motion.
10. Restoration of trolleys at the time of derailment.
11. Checking and repairing bogie system on end carriages and repairing damages to structures.
12. Checking and replacement of brake units / brake liners, replacement of springs, adjustment of studs etc.
13. During Preventive Maintenance, a report of defects / condition requiring repairing/maintenance should be generated. Based on this, suitable action plan should be made for rectification in consultation with Engineer In-charge Crane Maintenance.
14. If the Crane is not spared for preventive Maintenance by the production as per schedule, contractor should intimate the same to the Engineer In-charge Crane maintenance and preventive will be done in next month / in that PM Cycle.
15. The contractor shall inform well in advance in writing the requirement of various items which are to be supplied by BHEL.
16. During lean period – take up works like repair of thrusters, Capacity painting on hook block with template etc.

B.2 ELECTRICAL:

1. Attending breakdown of electrical nature.
2. Replacement / minor repair of motors.
3. Replacement of fuses / fuse holders in electrical panels.
4. Cleaning of Contact points of contactors. Replacement of contactors or contact points, if necessary.
5. Replacement of cables.
6. Repair / replacement of incoming mains switches on panel.
7. Replacement / checking of brake units.
8. Maintenance of junction boxes of CT, LT, MH, AH, Pendent, etc.
9. Repair / Replacement of cable trolleys.
10. Repairs / Replacement of floor operation push button pendent including push buttons
11. Repair / Replacement of master control switches.

12. Topping / Replacement of oils in brake units.
13. Tightening loose connection on terminal boards.
14. Checking / Repair / Replacement of CT, LT rotary and counter weight limit switches.

B.3 ELECTRONICS:

1. Checking of Radio Remote Control System.
2. Minor repair / Replacement of remote control transmitter and receiver
3. Replacement of PCB or push buttons of RRC in case of faults.
4. Replacement / Adjustment / Tuning of variable frequency drives (VVVFD), Entering parameters when drive is changed.

B.4 CLEANING OF CRANES:

1. All cranes to be cleaned 2 times in a year at regular intervals to remove any kind of waste materials, dust, oils, grease, unused cables, etc.. Foreign materials need to be brought down.
2. While cleaning practise 5S techniques (Cleaning with meaning, check for any loose parts) and rectify them accordingly.

B.5 DSL MAINTENANCE:

1. Cleaning of DSL lines.
2. Tightening of Porcelain insulators and replacement.
3. Replacing / checking of current collectors.
4. Alignment of DSL lines and welding back, where ever L-angle is broken /bend, as part of maintenance.
5. Checking of power supply connections and DSL lines (Power feeding).
6. Repair / Replacement of power cables for DSL lines.
7. Repair / Replacement of Safetrack.

B.6 GANTRY MAINTENANCE:

1. Checking of end stoppers and welding / bolting rectification.
2. Cleaning of gantry walkways for removal of any unused / waste material.
3. Keeping handrails provided on walkway platforms in good condition.

B.7 EXECUTION OF WORK:

1. Contractor has to deploy manpower in such a way that breakdown percentage is maintained less than 2% always and meet all other requirements specified in the scope of work.
2. Contractor will receive breakdown through phone / in person/ online from Production Departments located across the plant. It should be attended promptly.
3. Efforts shall be made for promptly attending all types of breakdowns. However support related to major diagnostic related to VFD's & electronics shall be provided by dept. free of cost.

B.8 SKILL SET REQUIRED:

The job requires the following skills

1. Engineers: Engineering degree with 1 year work experience in Machine Tools / Cranes maintenance or Diploma with 5 Year work experience in Machine Tools / Cranes maintenance (or) ITI with 10 year experience in Cranes maintenance.
2. Supervisors: Diploma with 1 year work experience or ITI with 3year work experience in cranes maintenance or Machine tool maintenance.

3. Fitters & Electrician (Skilled Worker): ITI with work 1 year experience or with 3 year work experience in Cranes maintenance.
4. Unskilled Workers / Helpers: Able male person of 18 years and above who can read and write.

II. OTHERS:

1. A daily breakdown and monthly breakdown report (including downtime data of each crane) and report of major work shall be submitted to the In-charge of Cranes section after endorsement from concerned block maintenance In-charge. For every complaint received a registration number (in the form of running serial number) shall be clearly mentioned in daily log-book or online system by the supervisor of Vendor.
2. The contractor shall adhere to the priority fixed by the Block Maintenance / Cranes In-Charge for taking urgent repair work. Critical cranes/ emergency requests shall be attended timely by redirecting manpower as per priority and instructions of the Engineer In-charge Crane Maintenance.
3. Emergency breakdown during the third shift of all working days and second shift of Sundays shall also be attended, for which skeleton staff shall be available in the factory premises.
4. Total number of cranes (EOT, Gantry Semi-Gantry and Jib Cranes) is 258 Nos. the number of Cranes may vary by plus 2% and these should be covered automatically under the purview of this contract, without any increase in the price.
5. Preventive Maintenance work of the cranes shall be done twice in a year as per the Checklist provided by BHEL. PM Check sheets prepared by BHEL-Cranes incharge has to be followed and filled up while carrying out PM. Completed forms need to be submitted in-time to Supervisor in-charge.
6. When repair/ maintenance/ modification work gets completed, the actual time (in hours), material consumed, total down time and other information shall be reported to the Engineer In-charge crane maintenance in the daily report.
7. The Cranes, DSL/Safetrack and gantry shall be periodically cleaned as part of Preventive Maintenance and other works like Limit switch checking etc. should be carried out as and when assigned by Engineer / In-charge of Cranes Maintenance department.
8. As BHEL has been accorded with ISO-9001, ISO-14000, OHSAS 18001, ISO 50001 & API certifications, the Contractor shall carry out qualitative work to meet these standards. Necessary documentation / paper work shall also be maintained. Future standards acquired by BHEL (if any) need to be adhered.
9. Contractor shall arrange his own tools for removal, dismantling, assembling and re installation of hoist/motors/gearboxes, etc. However, all spares including consumables like gear oil, electrodes, grease, cotton waste, etc., and facilities like gas cutting, welding, machining facility, repair, rewinding of motors, coils etc., shall be provided by BHEL free of cost at ground level. However, to minimize the break-down time, the contractor, shall adopt vigilant action for better parts / methods voluntarily.
10. Contractor shall supply tools, tackles and necessary measuring instruments (Eg. Multimeter) to his employees for smooth working on day to day basis. However in special circumstances tools and other measuring instruments if available and if can be spared may be provided by us free of cost by BHEL on returnable basis.
11. Contractor should necessarily arrange one welder as part of his crew for carrying out minor welding works.
12. Contractor shall maintain all records like breakdown forms, spares list, all other records pertaining to his work, and should be shown to Cranes Engineer in charge.

13. For working at heights, Work Permit System as prescribed by BHEL-Safety dept. shall be followed and records maintained, to meet HSE audits / guidelines.
14. Medical fitness certificates of all workmen (fit to work at ground and heights) should be submitted as per HSE dept. guidelines before commencement of work and every year.
15. No foreign/used or unused/scrapped/broken parts shall be left on the crane/gantry / bridges so that likely accidents due to their falling are avoided.
16. All used/worn out/scrapped/ replaced spares/ parts shall remain the property of BHEL.
17. The contractor and their employees will observe all the laws/enactments, rules and regulations of BHEL and also the statutory and legal requirements of Central and State government.
18. Utmost care should be taken by the contractor to repair the cranes in a proper way and with quality workmanship so as to adhere to the safety requirements as per the latest revision of Factories Act and Telangana state rules.
19. All the contractor's personnel shall use PPEs (Personnel Protection Equipment).
20. The contractor shall engage experienced personnel for the maintenance of cranes as per the job requirement as indicated below.
21. Collection of spares/ material from various stores and blocks to work place/ site shall be carried out by contractor.
22. Cleaning, stacking, sorting, handling and upkeep of crane maintenance stores, work center stores (including 5S activities) shall be carried out by contractor.
23. Contractor has to carry out stock taking in all stores (Electrical store, Mechanical store and Bearings store, Drives and RRC store, ..etc) on a quarterly basis and submit the updated report to In-charge of Cranes section. To be updated into computer in Inventory report.
24. Salvaging/repair work of crane spares, shed on CT, & other crane items shall be carried out by contractor.
25. Drawing for major assemblies & component shall be prepared by the drawing section of BHEL or shall be arranged by Dept. However in case of emergency and for small jobs, hand sketch shall be prepared by the contractor.
26. Contractor shall carry out the work at his own risk, finance, human resources and supervision.
27. Payment of work shall be made to the contractor on the basis of work carried out on measurement basis.
28. Contractor shall have supervision on the conduct of his employees. Any violation of safety norms and misconduct by any of his employees/contractor may result in cancellation of Gate pass of that employee/contractor.
29. Parties may visit the site for actual site conditions, and all other relevant details related to Cranes.
30. Contractor should take feedback from supervisor on work performed, taking corrective/preventive measures and reporting status to Engineer/ In-charge crane maintenance.
31. All the information (About cranes, Check sheets, Data on cranes, ..etc) is the sole property of BHEL and no such information is taken out by contractor or his workmen.
32. Certification of Lifting Machines by third party is statutory requirement. During such certification and checking, Contractor and his workmen should assist (attend to problems reported by third party during protocol inspection) the third party competent person. A separate contract will be given for certification of Lifting machines by Competent Person.
33. Reasonable size room with telephone facility will be provided within the Factory premises to service staff for attending breakdowns/ complaints. The office space shall not be utilized for residential purpose by the Contractor's staff.
34. Check list need to be filled up at Crane itself while carrying out Preventive Maintenance and submit such filled in check list to Supervisor.
35. BHEL reserves the right to cancel the tender at any stage of tendering till signing of agreement without assigning any reason(s) thereof. The tender cost in that event shall not be refunded.

36. After performing PM on crane, A-schedule forms (Mechanical and Electrical) shall be filled in as per the work carried out and shall be submitted to supervisor/Engineer-in-Charge. PM cycle will be performed as per the SAP-PM module (as and when implemented) Contract supervisor shall take responsibility to use Tablet/ipad/Tough Pad/touch pad to fill A-schedule forms as per SAP system.
37. Safety of the workmen is the sole responsibility of the contractor. Safety requirement as prescribed by BHEL-Safety dept. need to be adhered to, while carrying out work.
38. The contractor and his/her workmen shall use the necessary safety equipment (like safety belts, helmets etc.) and shall comply with BHEL safety rules.
39. After major repair, load test will be carried out on cranes and Vendor need to assist during load test.
40. Contractor shall maintain sufficient maintenance staff for the said work, which will not be less than the nos. as mentioned below:
 - i. Site Engineer/ In-charge -
 - ii. Supervisors -
 - iii. Workmen –

III. DEFINITION OF ONE OPERATION:

BD Maintenance Operation: Carrying out Breakdown maintenance as and when necessary in such a way that BD is maintained less than 2% on monthly overall basis. There will be 12 such operations in a year.

P Maintenance Operation: Carrying out PM on all 258 no. of cranes once in 6 months, as per the schedule given by Cranes engineer. There will be 2 such operations in a year.

IV. DEFINITION OF CATEGORY OF BREAKDOWN:

1. Minor Repair
 - Eg. a) Cleaning and repair of contactors, over load relays, servicing of the unit, Resetting of overload relay, etc. b) Adjusting of Brake unit, etc
2. Medium Repair
 - Eg. a) Changing Half Gear coupling including, making necessary holes on PCD of flange. b) Changing wire rope, c) Drive parameter setting including changing new drive, etc.) Wheel bearing change, Wheel shaft changing (assuming spares are available readily)
3. Major Repair
 - Eg. a) Replacing new motor including drive tuning (ID run) and entering new parameters into new drive, assuming spare drive, DBR and Motor are available. b) Motor bed changing due to replacing with new motor of different frame size.

Note:

- Above is guideline and category need to be decided in consultation with engineer in charge of cranes section. Any other complex breakdowns will be treated separately and calculation of days for penalty will be decided by engineer in charge of Cranes section
- Cause of Breakdown is not assignable to contractor or his workmen in carrying out maintenance. (Eg. Time taken in procuring spare) is not counted in breakdown time.

V. PENALTY CLAUSE:

1. As this contract is Works Contract, Supplier's Performance is measured based on Break down percentage of Cranes.

Parameter	Criteria	Penalty
a) Breakdown percentage of all Cranes (Overall bd percentage) calculated on monthly basis	Should be less than 2%	5% of contract value as penalty will be applied. After 2% BD% - for every increase of BD percentage by 0.1%, Penalty of 0.1% will be increased. up to max of 10% of overall contract value
b) Max Number of days allowed for closing Break down. Note: Type of breakdown (Major or others) is decided by M&S executive in consultation with Contractor Engineer. Any other	Major Breakdown – ≥ 4 to ≤ 10 days Medium breakdown – 1 to ≤ 3 days Minor Breakdown – same day or less than 1 day.	BD Maintenance cost per day per crane * No of days delayed * No. of Cranes* 10 times.
c) Preventive Maintenance – Penalty: Carrying out PM in 6 months covering all 258 cranes = one operation.	Two such operations need to be completed in a year, as per the schedule given by Cranes engineer.	PM cost per crane*No. of Cranes* 2 times (Except 11 rarely used cranes)

11 nos. rarely used cranes are as under:

Sl.No.	Asset No. (SAP)	BLOCK	LOCATION	CAPACITY	TYPE OF CRANE	MAKE
1	4031920	03	CNC	2T	EOT	BHEL
2	4031921	03	CROSS BAY	2.5T	EOT	GARLICK
3	4031914	03	03 AB BAY	0.5T	JIB	-
4	4031915	03	03 AB BAY	0.5T	JIB	-
5	4031911	03	03 BC BAY	0.5T	JIB	-
6	4031912	03	03 BC BAY	0.5T	JIB	-
7	4031913	03	03 BC BAY	0.5T	JIB	-
8	4050197	05	05 DE Bay Pillar-11	2T	JIB	-
9	4052074	05	DE BAY	4T	Mono rail Hoist	SHIVPRA
10	4071812	07	07 DE BAY	0.5T	JIB	-
11	4511985	70	70 BLK BAY 4	2T	JIB	INDEF

2. Non completion of preventive Maintenance as per schedule for the reason attributable to contractor will attract non-refundable penalties. However the contractor has to complete the left out Preventive Maintenance in the next month or as directed by Engineer In-Charge Crane Maintenance. The left out crane shall automatically be kept as pending crane in the next month or in the month as per the direction of Engineer In-charge , Preventive Maintenance schedule and the afore said penalty clause shall be applicable on it.

3. Breakdown time for the reason not attributable to contractor (Eg. non availability of spare) will not be included while calculating break down time, break down percentage or Penalty.
4. Contractor should deploy manpower within 10 days(max) on receipt of work order/ PO. Otherwise EMD will be forfeited
5. Penalty will be calculated on
 - a. a monthly basis for BD maintenance
 - b. on half yearly for Preventive maintenance.

Example of Penalty Calculations: (As per PO:N020X00198)

Contract Value For two years	: ₹ 1,32,43,634 (Say)
Contract Value for 1 year	: (13243634)/2 = ₹ 6621817
Breakdown maintenance cost (80%)	: ₹ 5297454
Preventive maintenance cost (20%)	: ₹ 1324363
Total number of cranes as per contract	: 258
No. of working days in a year	: 302

Breakdown Maintenance cost per day per crane

$$\begin{aligned} &: \text{BD Contract value / (No. of Cranes * No. of days)} \\ &: 5297454 / (258 * 302) \\ &: ₹ 68/- \end{aligned}$$

Preventive Maintenance cost per crane

$$\begin{aligned} &: \text{PM Contract value / (No. of Cranes * 2 times in a year)} \\ &: 1324363 / (258 * 2) \\ &: ₹ 2566/- \end{aligned}$$

- a) If 'Breakdown percentage' is more than 2% in a particular month, Penalty will be 5% of value of one month.

$$\text{Value of one month} - (5297454)/12 = ₹ 441455$$

$$\text{Penalty will be} - 5\% \text{ of } ₹ 441455 = ₹ 22073/- \text{ (Base amount)}$$

- b) If 2 cranes are having medium breakdown and took 6 days to close the issue.

Exceeded by 3 days

$$\text{Penalty} = \text{BD Maintenance cost per day per crane} * \text{No of days delayed} * \text{No. of Cranes} * 10 \text{ times.}$$

$$= ₹ 68/- * 3 \text{ days delayed} * 2 \text{ (No. of cranes)} * 10 \text{ times}$$

$$= ₹ 4080/-$$

- c) If PM is not done for two cranes in specified time,

$$\text{Penalty} = \text{PM cost per crane} * \text{No. of Cranes} * 2 \text{ times}$$

$$\text{Penalty} = ₹ 2566 * 2 \text{ nos.} * 2 \text{ times} = ₹ 10264 /- \text{ penalty will be applied.}$$

- d) BD percentage is 2.5% in a month and one major breakdown has exceeded 5 days (total 15 days), penalty will be

After 2%, for every increase of BD by 0.1%, penalty of 0.1% will be increased, up to max of 10% of value of overall cost of Contract.

$$1) \text{ Penalty for BD} = 5\% \text{ of BD value per month} + \text{Increase accordingly}$$

$$= 5\% \text{ of } ₹ 441455 + 0.5\% \text{ of } ₹ 441455$$

$$= 22073 + 2207 = ₹ 24280/-$$