



VOLUME – IA
PART I & II

TECHNICAL CONDITIONS OF
CONTRACT (TCC)
FOR

OVERHAULING OF HP, IP, LP TURBINES,
TDBFP, MDBFP, GENERATOR, EXCITER,
CEP, HEATERS, CONDENSER AND
OTHER AUX EQUIPMENT'S, PIPING,
UNDER PACKAGE-A

AND

COMMISSIONING, STEAM BLOWING,
SYNCHRONIZATION & STABILIZATION
OF TG UNDER PACKAGE-B

AT 1X500 MWe PROTOTYPE FAST
BREEDER REACTOR (PFBR) BHAVINI
KALPAKKAM NUCLEAR POWER
PROJECT, TAMILNADU.



BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)

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VOLUME – IA - TECHNICAL CONDITIONS OF CONTRACT PART I - CONTRACT SPECIFIC DETAILS

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VOLUME-IA PART – I CHAPTER – I

PROJECT INFORMATION

1.1.1 INTRODUCTION

1 x 500 MWe PFBR Nuclear Power Project is being set up by BHARATIYA NABHIKIYA VIDYUT NIGAM LTD (BHAVINI) at Kalpakkam, Tamilnadu, India.

1.1.2 PROJECT INFORMATION

1	Name of the Project	1 X 500 MWe PFBR Nuclear Power Project, BHAVINI, Kalpakkam, Tamil Nadu
2	Station Capacity	500 MWe
3	Owner	BHARATIYA NABHIKIYA VIDYUT NIGAM LTD (BHAVINI)
4	Site Location	Kalpakkam about 68 KM South of Chennai on the coast of Bay of Bengal. District: Kanchipuram State: Tamilnadu
5	Nearest Railway Station	Nearest Railway Station Chengelpet about 32 KM from Kalpakkam.
6	Nearest Airport	Nearest Airport Chennai about 47 KM.
7	Nearest Road access	All weather road from Chennai to Puducherry – State Highway (ECR)
8	Ambient Air Temperature	
8a	Max. Dry Bulb Temperature	Absolute Max. 43.6 0C
8b	Min. Dry Bulb Temperature	Absolute Min. 17 0C
8c	Design temperature for electrical equipment / devices	+ 50 Deg.C
9	Relative Humidity	i. Maximum during monsoon: 100 % ii. Minimum: 15% iii. Average: 80%
10	Air Quality	Clean and free from chemical pollutants.
11	Rainfall	Max. 2112 mm / Average 1312 mm / Min 567mm.
12	Wind Pressures	Basic Wind Speed 67 mm/sec. (Max.)
13	Seismology	Defined as IS: 1893 - 2002

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1.1.3 INSTRUCTIONS TO BIDDER

- 1.1.3.1 The Bidder shall visit project site and acquire full knowledge and information about conditions prevailing at site and in & around the plant premises, together with site conditions, transportation routes, various distances, all the statutory, obligatory, mandatory requirements of various authorities and all information that may be necessary for preparing the bid and entering into the Contract. All costs for and associated with site visits shall be borne by the bidder.
- 1.1.3.2 The information given here in this chapter is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.
- 1.1.3.3 The contractor, in the event of this work awarded to him, shall establish an office at site and keep posted an authorized, responsible officer with valid Power of Attorney for the purpose of the contract. Any order or instructions of the `Engineer' or his duly authorized representative, communicated to the contractor's representative at site office will be deemed to have been communicated to the contractor at his legal address.
- 1.1.3.4 No claim will be entertained by BHEL on ground of lack of knowledge and the contractor's rates shall be deemed to have taken this into account.

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VOLUME-IA PART – I CHAPTER – II

SCOPE OF WORKS

THE SCOPE OF THE WORK WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works.

AND

PACKAGE-B: Commissioning, Steam blowing, Synchronization & Stabilization of TG

at

1X500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU.

2.1 SCOPE OF WORKS:

1. Works related to overhauling, steam blowing, pre-commissioning and commissioning of TG for turbine rolling with nuclear steam, synchronization and stabilized operation of TG for continuous 72 hours at the given steam conditions as given below.
 - a) Overhauling of the equipment as mentioned in BOQ.
 - b) Healthiness checking of equipment, Pre-commissioning, steam blowing and commissioning of individual equipment as per BOQ.
 - c) Commissioning of TG for synchronization after nuclear steam is made available by BHAVINI.
 - d) Stabilized operation of the TG for continuous 72 hrs at the steam conditions as provided by BHAVINI.

2.2 GENERAL SCOPE OF WORKS:

1. Statutory requirements like labour license from labour Inspector (form-III from customer is to be collected well before the start works to avoid delay in obtaining gate passes), workmen compensation insurance, third party liability insurance (as per customer requirement), PF registration and ESI registration certificates from statutory authority are to be submitted. **Power of attorney for Contractor 's representative to be submitted to BHEL Resident Manager.**
2. Preparation and Submission of detailed work schedule to meet the specific targets and agreed milestones as per contract. All work schedules and networks shall be prepared based on actual quantum of work indicating resources required by the contractor to achieve the agreed targets.
3. Contractor shall prepare and submit work procedures and QAP for approval before commencement of work. JHA for all works involving hazard shall be prepared with required precautions & actions required from the contractor.

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4. Contractor has to get safety clearance and work permit from customer before start of work.
5. The Contractor shall start the work only after instruction by EIC.
6. Major consumables like Argon, Acetylene, Oxygen gases, Nitrogen, required welding electrodes etc., shall be arranged by the Contractor.
7. All consumables like petrol, kerosene, grease etc., cleaning agents such as CRC electraclean, etc, adhesive like anabond loctite etc., and consumables for DP test such as cleaner, penetrant and developer etc. including silicon sealant RTV732 / RTV 736, hylomer are to be supplied by Contractor.
8. Arrangement of consumables like Kluber paste HEL 46-450 or Tiodize T8E_H, Stag -B, Hylomar blue and molykote (grade as per requirement) has to be arranged by Contractor.
9. Supply of material which do not go into the equipment being overhauled permanently is in Contractor's scope.
10. Consumables like welding rods, DP-Test kits, Rustolene spray, Kerosene, Gada cloth, emery sheets, 24V bulbs, oil stones, blue tube, Emery grinding wheels & stones, burr cutters, wire brush etc; required for the overhaul work shall be brought by the Contractor in sufficient quantities.
11. Oxygen & DA gas or induction heating coils for the Strainer work shall be brought by the Contractor in sufficient quantities.
12. Compressed air, water and power for the jobs as per requirement at specified locations shall be provided. Arrangements for further distribution shall be in the scope of the Contractor.
13. General consumables like petrol, diesel etc., marking cloth, cloths etc. for MOT basket filter required during oil flushing shall be in the scope of the Contractor.
14. Arrangement and removal of all platforms at all locations which are required for dismantling and re-assembly activities is in the scope of Contractor. Required Platform materials/scaffolding shall be arranged by the Contractor.
15. All scaffolding shall be securely supported or suspended and whenever necessary be properly braced to ensure stability.
16. Necessary scaffolding materials, wooden planks, sleepers, packers, tarpaulins etc., required for the work shall be brought by the Contractor.
17. Contractor has to mobilise all scaffolding materials, wooden planks, sleepers, packers, tarpaulins etc.
18. The Contractor shall erect approach platform as per requirement and dismantle the same after completion of works.
19. Transportation of the new materials from stores and returning of the removed materials to the notified area of the customer shall be arranged by the Contractor. The Contractor shall arrange necessary manpower, lifting, transportation arrangements required for drawing and returning spares/tools/other equipment required for execution of job.
20. Contractor has to arrange necessary Truck / Pick & carry crane/ trailer/tractor etc., for shifting of materials & T&Ps from customer store & back. Manpower required for shifting of materials shall be provided by the Contractor.
21. Contractor has to give necessary assistance for drawl of spares from stores & returning the damaged / surplus spares to store and scrap to the identified

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- location as per instructions of EIC.
22. The Contractor shall have to take utmost care of sparesparts/materials during dismantling, assembly, storage and handling of equipment's etc as applicable.
 23. Contractor shall arrange a temporary shed/closed area in TG floor with locking facility to safely store all important parts removed from Turbine/Generator etc., and also to keep the required tools & tackles for easy/quick access. Power supply shall be provided by customer on free of cost.
 24. All tools & tackles are to be arranged by Contractor except for special fixtures which are supplied along with original equipment.
 25. Calibrated instruments are to be arranged by Contractor for carrying out the tests in your scope.
 26. Any special fixtures required for successful generator rotor thread-out and thread-in activities are to be fabricated at site by Contractor. Any fixtures required during execution of scope of works not available at site shall be fabricated by the Contractor as per site requirement. Such fixtures fabricated at site shall be handed over to BHEL. Sufficient number of tarpaulins shall be arranged by the Contractor for covering, stator, rotor and other major components.
 27. Any testing equipment required during overhauling shall be arranged by the Contractor.
 28. Contractor has to arrange necessary T&Ps required for the overhauling jobs (like all standard sizes of spanners, Chain blocks, water jars for catenary if required, Dial gauges, bore gauges, slip gauges, Magnetic stand, Micrometers, Straight edges, Filler gauge, Spirit level, Hack saw frame, Tarpaulins, Grinding machines, Welding machines, Gas cutting machine, induction heating machine for bolts tightening, Measuring tape, SS Scale, lifting & pulling tools, hydraulic jacks & pumps, slings, portable tool/bench grinders, vice etc). Contractor shall also submit calibration certificate for all measuring instruments & load test certificate for slings / chain pulley blocks / D-shackles / eye bolts etc., before use. The above have to be recalibrated / load tested as per instruction of BHEL/customer EIC/safety department. If required, lifting tools & tackles to be load tested & certified by competent authority within the customer premises.
 29. Special T&Ps, if any, supplied by the respective equipment manufacturer shall be provided by customer on returnable basis (LPT Roller support, Generator Roller support, cast iron plate for coupling face correction, catenary block, jacks for TG deck springs, jacks for Generator alignment etc.,).
 30. Contractor has to arrange necessary water jars etc for measurement of catenary. T&Ps required for the overhauling jobs (like all standard sizes of spanners, Chain blocks, Dial gauges, bore gauges, slip gauges, Magnetic stand, Micrometers, Straight edges, Filler gauge, Spirit level, Hack saw frame, Tarpaulins, Grinding machines, Welding machines, Gas cutting machine, Measuring tape, SS Scale, lifting & pulling tools, hydraulic jacks & pumps, slings, portable tool/bench grinders, vice etc). Contractor shall also submit calibration certificate for all measuring instruments & load test certificate for slings / chain pulley blocks before start of work. The above have to be recalibrated / load tested as per instruction of BHEL/customer EIC/safety department. If required,
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- lifting tools & tackles to be load tested & certified by competent authority within the customer premises.
31. If any T&P not mobilised then deduction shall be made as per terms and conditions of the contract or as per the recommendation of BHEL resident manager.
 32. Portable cabin for safe custody of T&P near the work place to be arranged by the Contractor.
 33. Any Attachments that are required for the purpose of removal or assembly of components etc. are to be fabricated by the Contractor and it shall be handed over to customer after overhaul.
 34. Machining of small components shall be done by the Contractor without any additional cost.
 35. Any repair /modification work and minor works required for the successful commissioning shall be done by the Contractor without any additional cost.
 36. All NDT inspection including all accessories, consumables and manpower. (eg. DPT / MPI / NFT & ultrasonic testing) is in the scope of the Contractor. Water washable type chlorine free fluorescent type DP kit for DP testing (Magnaflux/Orion make). Suitable color paint to repaint the weld joint after DPT along with required accessories and consumables.
 37. For carrying out UT, DPT, MPI, NFT, testing etc, Contractor should engage competent certified personnel / vendors along with calibrated instruments / equipments /test pieces/ test certificates etc.
 38. For NDT purpose, Level-II supervisor, with valid credentials, shall be arranged by the Contractor for the evaluation of DPT, UT of bearings, retaining rings etc., and radiography of weld joints if required. Qualified NDT agency to be arranged by Contractor for conducting DP & UT as per scope of work.
 39. Contractor has to deploy IBR qualified welder for any pipelines welding as per requirement.
 40. **EOT crane operators** for round the clock operation is in Contractor's scope. Since the job involves handling of heavy components by special arrangement by EOT crane. **Experienced EOT crane operators and riggers must be deployed in all the shifts.**
 41. T&Ps required for reaming & honing of coupling holes shall be in the scope of the Contractor. Contractor has to carry out reaming & honing of coupling holes at site.
 42. Reaming & honing of coupling holes, if required, shall be carried out by the Contractor. Contractor has to mobilize necessary agency for the reaming & honing work as per requirement.
 43. Bearing replacement, if any required to be carried out by Contractor without any additional cost as it is already included in the generaloverhauling works.
 44. After completion of work, the area shall be cleared up to the satisfaction of EIC without any extra charge on daily basis. Scrap materials have to be disposed to the scrap yard before completion of work as per instruction of EIC.
 45. Designated group for housekeeping manpower on daily basis for maintaining clean working area.
 46. Contractor shall provide all necessary assistance while commissioning back the

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- unit including governing checking and setting and shall rectify any defects attributable to Contractor's workmanship.
47. Contractor shall carry out all the work in line with BHEL protocols regarding clearance, dimensional checks, blue matching, Alignment etc. All the reading/values/critical works to be witnessed by BHEL & customer executive.
 48. The Contractor has to carry out the work as per the details given in "Scope of work" in general. However, the Manufacturer's maintenance catalogue and standard Engineering practices also need to be adhered to.
 49. Progress review and next day plan/targets to be discussed on daily basis in meeting Contractor with BHEL & customer. Contractor has to meet daily and has to submit the works under progress and the works planned for the next day. This is mandatory. Contractor has to maintain the daily register for works being executed, plan & review and has to be shown to EIC on daily basis.
 50. As a safety regulation LPG should never be used in place of DA gas.
 51. Only 24V hand lamps should be used. Transformers (230V to 24V single phase) to be arranged by Contractor.
 52. Rolling of all compressed gas cylinders are not permitted. All cylinders are to be transported in upright position through hand trolley and must be stored away from open flames and other sources of heat.
 53. Gas cutting torches must be lighted by means of friction flames or similar other methods and not with matches. Flash back arrestor to be used while gas cutting.
 54. Use of jute or cotton waste at site is not permitted. Contractor shall strictly comply with the same.
 55. The Contractor is responsible for taking all precautionary measures, for ensuring safety, health and welfare of the workmen engaged on the specified work
 56. Contractor has to arrange for medical check-up as per the procedures of Customer prior to applying for gate passes.
 57. PF, ESI, Insurance, medical check-up documents, labour identity cards, Adhaar cards etc., should be submitted for availing gate pass.
 58. Contractor shall follow all the relevant practices implemented by Customer in respect of Safety, 5-S, ISO-14000, OHSAS etc. to the extent possible from proper cleanliness of site and records point of view.
 59. Contractor shall comply all statutory requirements such as PF, ESI etc., as applicable.
 60. The Contractor shall be fully responsible for maintenance of records of his employees including statutory requirements.
 61. If any person found not fit or not having suitable experience for the job, our Resident Manager has the discretion to remove or Contractor has to replace the person immediately with suitable experienced person.
 62. The Contractor shall owe complete responsibility for all the accidents to their workers taken place within and outside the premises and the consequences there from. BHEL and Customer will not pay any compensation.
 63. Contractor has to mobilize the site immediately and make necessary arrangements for getting gate passes and completion of Police Verification of workers.

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64. The Contractor and all persons engaged by him on the work shall conform in all respects with the provisions of all acts, orders, and regulations etc., made by the competent authority with regard to safety, health and welfare of the persons engaged.
 65. In case, BHEL/Customer becomes liable to pay any wages / dues/ penalties to any statutory authority/ Govt. Agency under any of the provisions of the factories act, Minimum wages act, workmen compensation act, employment of children act or any other loss, due to omission of the Contractor, BHEL/Customer may make such payment and shall recover the same from the Contractor's bills.
 66. The Contractor shall provide necessary first aid facilities for all his employees, representatives, workers, etc engaged at site. Enough number of his personnel shall be trained in administering first aid.
 67. The Contractor shall ensure that all persons deployed are thoroughly conversant with the Statutory requirements and safety rules governing the work and they have to undertake which may include, erection of barriers with identified danger marks around holes or openings, display of warning notices during day time and red lamps in the darkness, etc.
 68. Sufficient service personnel may be engaged day & night by the Contractor for exercising proper supervision of the above works in time.
 69. The Contractor shall be fully responsible for the safety of his personnel during the work at site, and shall ensure the use of safety appliances by his workmen.
 70. Contractor has to engage his manpower for 24-hour work in all working days/ holidays during overhaul as per site requirement. The teams are to be headed by responsible and experienced Engineers/Supervisors. The Contractor has to submit detailed manpower deployment program for round the clock work before commencing overhauling works.
 71. The Contractor has to engage competent / skilled manpower as per the requirement of the respective jobs. BHEL/customer reserve the right to disallow any worker to continue the work, if found unsuitable for the specific job. The Contractor shall submit list of proposed foreman / skilled / semi-skilled man power (Equal strength of work group in each shifts) for each schedule of jobs to be deployed indicating field experience and grade in the organization within two days of intimation of the date of commencement of overhauling. This list shall be approved by EIC before commencement of overhaul.
 72. Equal strength of work group shall be deployed in all the shifts.
 73. Independent group (Foreman / Supervisors / Mill-write fitters/skilled manpower etc) for schedule of work front for Generator, exciter & generator auxiliaries / Bearing revision, alignment, oil catcher shall be deployed separately in shift duty not extending beyond 12 hours round the clock for execution of the work.
 74. Following personnel shall be deployed round the clock basis by the Contractor:
 - a. Qualified safety officer
 - b. Certified NDT person for NDT inspections (DPT, MPI, NFT & ultrasonic testing, radiography, stress relieving etc.) based on requirement.
 - c. Certified IBR welders certified by FQA
 - d. Qualified and certified electrician on round the clock basis
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- e. General welder and gas-cutter on round the clock basis
 - f. Designated group for housekeeping manpower on daily basis for maintaining clean working area.
75. Bidder is advised to visit site for studying scope works and familiarize themselves thoroughly with the site conditions.
76. Contractor are advised to cover all contract labours engaged by them under Pradhan Mantri Jeevan Jyoti Bima Yojna (PMJJBY) and Pradhan Mantri Surakshya Bima Yojna (PMSBY).
77. Contractor shall fully indemnify BHEL against all claims of whatsoever nature arising during the course of erection / overhauling / performing work under the contract. Indemnity bond as per customer requirement has to be submitted by the Contractor.
78. **CONTRACTORS' RESPONSIBILITIES:**
It must be made clear to contractors when a contract is placed that they will be expected to provide clean conditions overalls, shoes, tread mats, bins etc. suitably marked with the name of their firm.
Foreign Bodies: To minimize the risk of a foreign body entering any system, the following should be ensured
1. The station staff shall attempt to instill into all men of supervisors and workmen the importance of keeping systems internally clean. The methods used should include lectures, written information and personal discussion.
 2. Station staff and Contractor's employees should be encouraged to inform their superiors of any tool or item that may have been dropped into the Generator, mislaid or not accounted for in the clean conditions area. It is better to identify, locate and remove the item even at the cost of extended outage.
 3. Special attention should be given to any magnetic material / powder taken inside the clean condition area to avoid its ingress into the Generator.
 4. Use of Covers, and blanks: Temporary end covers should be fitted to the Generator and only removed whilst work is being carried out.
 5. All disconnected pipe work should be fitted with purpose-made blanks or plugs which do not allow re-assembly whilst in position.
 6. All temporary covers, blanks and shrouds should be clearly labelled or distinctively identified, e.g., these items may be brightly painted so that they cannot be easily left in position during re-assembly.
 7. Precautions to be taken during work in the Clean Conditions Area
 8. No mechanical jobs like cutting, welding, chipping and filing etc. should be carried out in the clean conditions area unless most unavoidable for any major modification's jobs under close supervision of senior staff. In that case the following precautions must be undertaken: -
Cutting: When a pipe is cut care should be exercised to prevent swarf etc. entering the pipe. No pipe should be left open ended, all loose material should be removed and the end inspected before it is covered with the appropriate cover or blanking plug.

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Welding: The number of welding rods allowed into the clean conditions area should be counted, and the rod stubs retained to check they are all accounted for.

Work Supervision: All welding, burning and machining operations in the clean conditions area will be continuously supervised by BHEL staff. Availability of firefighting equipment's near the place of work to be ensured before any welding or burning work is under taken.

79. **DO'S AND DONT'S:**

Do's:

Do wear required PPE's while on job. Use proper gloves during work.

Do wear canvas shoes during winding assembly.

Do ensure that tools & instruments used are in good working condition & properly calibrated.

Do ensure that all tools used are back in tools box and no tools is forgotten inside the stator.

Do use protective creams before working with putties and wash hands with soap.

Do use vacuum cleaner for cleaning stator.

Do ensure covering of openings in stator body when not working to avoid accidental falling of foreign objects into the stator.

Don'ts:

Don't use any knives without handles for cutting braiding.

Don't enter the stator with loose objects like, coins, key bunch, metallic ball pen, pencils etc. in pockets.

Don't use items, the shelf-life of which has already expired.

80. **SPECIAL WARNING:**

Workers/technicians/ engineers entering inside the generator for inspection/repair/rehabilitation work use shoes with rubber soles as recommended. The synthetic rubber sole shoes should be worn only just before entering into the generator. In case these shoes are worn during their walking outside the generator clean area, these are likely to pick-up metallic chips or other small nails which will get embedded and unless discovered before entry can later get dislodged during walking inside the generator core. Hence, the shoes should be changed and fully inspected before entering into the generator and should not be worn other than for entry into the generator.

81. **STORAGE REQUIREMENTS:**

a. Components:

Components removed from the Generator should be stored in bins within the clean conditions area. All bins should be labelled stating their contents and purpose. Where larger components cannot be put in bins they should be held in a temporary secure storage area.

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Components like rotors which need protection against entry of dust, moisture, debris etc. in the ventilation ducts / clearances shall be properly wrapped with waterproof covers. (Wrapping Material is in Contractor Scope).

82. **WASTE MATERIAL:**

All waste material and refused material should be put in bins with correctly fitting lids or covers and labelled clearly 'WASTE'. They should not be located in the vicinity of the components.

83. **NEW COMPONENTS:**

All new replacement components should be cleaned before they enter the clean conditions area and shall be inspected before fitting.

84. **RECORDS:**

All materials, tools and special equipment's taken inside or outside of the personnel barrier of Generator shall be recorded in a Register, ensure that all tools/materials taken inside are brought back by checking the entries made in the Register.

85. If applicable, Contractor is required to take following insurance schemes (as per customer requirement) for the technicians or Engineers and submit the policy copies to BHEL before start of the work:

- a. Pradhan Mantri Suraksha Bima Yojana(PMSBY)
- b. Pradhan Mantri Jeevan Jyoti Bima Yojana(PMJJB)
- c. Any accident policy

Note: Contractor has to take any state government issued policies if any prevailing at the time of start of the work (if applicable as per customer requirement).

86. **Clauses of Deduction**

- d. Any job if carried out leads to safety regulation violation then the Contractor will be penalized appropriately by the management.
- e. Failure to comply with EHS guidelines.
- f. Any activity that leads to the disruption in the production activities that are being carried out without any written approval will be penalized.
- g. Damage to property will be recovered from the Contractor.
- h. Non-compliance of statutory requirements.

87. **LABOUR LAWS:**

The Governing Acts as applicable and as amended shall be strictly followed. Some of such acts are given below. List of Labour legislation under which compliance, maintenance of registers and sending of returns shall be ensured by Contractor. While complying with the Act complying with relevant rules issued under the said Acts and administrative circulars there on shall also be ensured by the Contractor.

- i. The Factories Act, 1948
 - j. The Contract Labour (R&A) Act, 1970
 - k. The Employees Provident Fund and Misc. Provision Act, 1952
 - l. The Employees' Compensation Act, 1923
 - m. The Minimum Wages Act, 1948
 - n. The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996
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- o. The Building and Other Construction Workers Welfare Cess Act, 1996
- p. The Inter State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979
- q. The Payment of Wages Act, 1936
- r. The Payment of Bonus Act, 1965
- s. Maternity Benefit Act, 1971
- t. The Child Labour (Prohibition And Regulation) Act, 1986
- u. The Employees' State Insurance Act, 1948
- v. Equal Remuneration Act, 1976
- w. The Industrial Disputes Act, 1947
- x. The Payment of Gratuity Act, 1972
- y. The Trade Union Act, 1926
- z. The Apprentices Act, 1961
- aa. Industrial Employment (Standing Orders) Act, 1946
- bb. The Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959.
- cc. Any other acts/rules as may be applicable from time to time.

88. **MANPOWER REQUIREMENT**

1. Customer has insisted to provide experienced diploma holders, engineers, highly skilled and skilled manpower etc., This should be strictly adhered. It may strictly be noted that if experienced engineers, diploma holders, highly skilled and skilled manpower etc., are not deployed as per site requirement, accordingly recovery shall be made from your bill based on recommendation by Resident Manager.
 2. Resident Engineer-1 no with 10 to 15 years of experience, must be an Engineering Graduate. Supervisors must be diploma holders with sufficient experience in Turbine & Generator area.
 3. Qualified safety supervisors shall be deployed in all shifts having diploma in safety, should be arranged by the Contractor mandatorily for supervising the safety activities. If not deployed, accordingly recovery shall be made from your bill based on recommendation by Resident Manager.
 4. The Contractors man power deployed shall hand over the gate passes to the security through the Resident Manager / BHEL.
 5. Safety of the equipment to be given utmost attention.
 6. Contractor should make sufficient man power available for taking up this work with accent on quality.
89. Contractor shall follow HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS (Doc. No. HSEP:14 (Rev.01) Dtd.20.01.2020) attached with tender.

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2.2 DETAILED SCOPE OF WORKS:

- a. The scope under this specification is only indicative and not exhaustive. However, any activity covered under the normal course of overhauling, Pre-commissioning, commissioning, synchronization & stabilization works, but not mentioned in the scope, shall be deemed to be within the scope. Based on the condition and requirement at site, any of the activities or part thereof mentioned in the scope are to be repeated without any extra cost to BHEL.
- b. Time is the essence of this contract. Hence, contractor must mobilize site with adequate manpower for round the clock work, during the entire duration.
- c. Also, adequate T&P, consumables and inspection/measuring and monitoring devices are to be mobilized at site for at least 2-shift/24 Hrs operations to avoid any hold up during execution of the work. Load test / calibration certificates of lifting tools/measuring instruments to be submitted to RE/RM available at site for verification and in case of any deficiencies, BHEL reserves the right to reject the usage of the particular tools/instruments. In such case vendor needs to replace the defective tools/instruments immediately to avoid any delay in execution of works.
- d. Hydraulic torque wrench shall be arranged by contractor for dismantling and assembly of all couplings.
- e. Post overhaul and synchronization of the unit, observation for 72 hrs at stable load and attending all defects, if any, is included within the scope of work.
- f. Necessary scaffolding material to be arranged by the vendor.
- g. Alumina (size 80 grit), blasting nozzles/ other arrangements, enclosure including covering by tarpaulins and proper illumination of enclosure to be arranged by the vendor.
- h. Induction heating machine to be arranged for loosening and tightening of Turbine casings parting plane studs.
- i. Experienced agency to be mobilised by the vendor for conducting MPI with Level-II certified engineers for testing.
- j. Prior to mobilization, shift wise list of workmen along with the concerned work area supervisor shall be submitted to BHEL.

PACKAGE-A SCOPE OF WORKS:

2.3 GENERAL WORKS FOR TURBINE OVERHAULING:

Pre-overhaul activity.

- i. Install blast-cleaning shed. Adequate cleaning apparatus including standby to be arranged.
- ii. All tools, special fixtures, spares to be drawn from storage and kept ready. Return of drawn materials, items, tools are in contractor scope.

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2.4 ITEM NO 1: OVERHAULING OF HP TURBINE:

This Scope Includes Complete Dismantling of HP Module, Repair and Replacement of Any Part as required.

1. Securing of valve supports, opening of breach nuts (02 nos.) Of steam inlet.
2. Heating of breech nut using electrical heating. The required heating coils to be available on time.
3. Dismantling exhaust steam, gland-sealing steam, leak off and drain lines as required.
4. Supporting of turbine shaft to inner casing.
5. Lifting of complete hp module from pedestal and placing on fixture.
6. Tilting of complete module and placing in vertical position.
7. Opening of thrust ring, locking segments, taking out fitted keys between inner and outer casing.
8. Removal of rotor with inner casing from barrel with the help of attachments etc. And placing on the same on fixture in horizontal position and inspection of barrel threaded ring "U" ring, and "I" ring also repair / replacement as required.
9. Removal of top half of inner casing after removing the seals and after adjustment of casing and rotor on fixture so that the rotor becomes free of casing, inspection of blades, fins etc. And repair replacement etc. As required.
10. Removal of rotor from bottom half casing and inspection of fins and repair / replacement as necessary.
11. Blast cleaning of the rotor taking care to protect the journal areas by covering with requisite cling wrap type material.
12. Blast-clean both the inner casing halves. Visually inspect the stationary blades, fins etc.
13. HPT inner casing steam inlet side DPT to be carried out to detect cracks if any.
14. Inspection / fact finding of turbine internals and carrying out rectification as required.
15. Testing of spring support on sealing segment, sealing strips etc. And repair replacement as required. Revisioning of the seal segment to be carried out if required.
16. Measurement of parting plane studs and replacement if required.
17. Casing "U" seal ring, "I" seal ring & breech nut "U" seal ring DPT & MPI to be done.
18. Perform the NDT checks MPI / UTI on the blast-cleaned rotor, rotor blades and fins etc.
19. Placement of top half on bottom half and checking of parting plane gap & ovality before and after heat tightening the stud. Correction of parting plane gap if required.
20. Place the HPT rotor over the inverted upper half casing and record all axial & radial clearance.
21. Checking of axial and radial clearances for sealing segment after insertion of the same and placement of rotor.
22. Turbine shaft removal from inner casing and final cleaning etc. To be done.

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23. Centering check of HPT inner casing w.r.t. Barrel casing and corrections as required.
The details of procedure for centering as below:
24. Turbine shaft insertion in the bottom half for final assembly and measure flow path readings (both axial and radial). And top is to be placed on position and tightening of the halves with the heating device.
25. After final assembly of the rotor with inner-casing roll check values are to be ensured before insertion into barrel casing.
26. Locking of inner casing with rotor for insertion in casing inlet section.
27. Inner casing to be inserted in to the inlet section after fitting of the internals, and tightening of the threaded ring etc.
28. Final axial and radial clearance check.
29. Fitting of seals etc. And lock of the inner casing to rotor.
30. Assembled module to be put on pedestal.
31. HPT horn drop checking and correction.
32. HPT roll check, casing centering & bump check in position at bearing pedestal.
33. After conducting roll check, bump check etc, inlet breech nuts must be tightened and 0.05 mm feeler proof joint must be ensured.
34. Note: inlet insert face & corresponding mating face of outer casing must be perfectly parallel & necessary blue matching to be done by circular surface plate.
35. Final connections exhaust steam, gland-sealing steam, leak off and drain lines disconnected during dismantling.
36. Final assembly of inlet pipes including seal rings & breech nut.
37. Removal of securing devices from valve supports.
38. NDT testing schedule of HP module:
 - a. Outer casing: - Visual, MPI & UT.
 - b. Inner casing (L/H & U/H): - Visual, MPI & UT.
 - c. Guide blades (L/H & U/H): - Visual & MPI.
 - d. I- seal rings: - Visual, MPI & DPT.
 - e. HP rotor including blades: - Visual, MPI & UT.
 - f. Parting plane fasteners (>m64): - Visual, MPI & UT on sample specimen.
 - g. HP inlet inserts & breech nut: - Visual, MPI & UT.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

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2.5 ITEM NO 02: OVERHAULING OF IP TURBINE:

This Scope Includes Complete Dismantling of IP Module, Repair And Replacement Of Any Part As Required.

1. Dismantling of the piping required for module dismantling. Recording of pre-dismantling readings like total axial and radial clearances and control, reference dimensions.
2. Roll and centering check of the IP assembly
3. Unbolt the outer casing parting plane bolts. Remove the top half of the outer casing.
4. Roll and bump check of IP with inner casing with and without seals.
5. Unbolt the inner casing parting plane bolts after necessary locking. Remove the top half of the inner casing.
6. Record the axial, radial running clearances and reference dimensions.
7. Remove the rotor from the casing. Carry out visual inspection. Collect samples of deposits on the rotor and casing if any.
8. Blast cleaning of the rotor taking care to protect the journal areas.
9. Blast-clean both the inner casing halves. Visually inspect the stationary blades, fins etc. Carry out the MPI of rotor & casing blades for seal segment grooves. MPI of all steam entry/exit grooves & slots to be done. MPI of outer casing inner surface including various ports.
10. Record the lengths of the studs and identify any overextended studs / bolts for replacement.
11. Blast-clean the casing bolts and studs to be re-used
12. Perform NDT checks like UTI / MPI on the studs. Identify the studs / bolts requiring replacement based on NDT checks.
13. Re-assemble the inner casings. Check for parting plane for gap, ovality with parting bolts hand tightened. Repeat measurements with parting plane bolts heat stretched. Deviation in parting plane gap to be corrected and checked till desired parting plane gap / contact is achieved. Dismantle the casings after the above checks.
14. Clean the outer casings and inspect the seal strips. Revisioning of seal segments is to be carried out if required.
15. Perform the NDT checks MPI / UTI on the blast-cleaned rotor. Rotor blades, fins etc.
16. Carry out comprehensive fact finding on healthiness of inner casing and rotor blades.
17. Re-install the bottom half inner casing in the outer bottom half casing. Insert the rotor and position it in the running position. Check the running clearances. Adjust the keys, packers etc as required to get the control dimensions / running clearances recommended by the manufacturers. Record the final clearances at the blades and the fins. Minor rework for bent fins to be done for straightening.
18. Final boxing up of the inner casing halves after thorough cleaning. Parting plane bolts shall be heat stretched after heat tightening, horn drop of IP inner casing to be carried out.

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19. Inner casing roll check is to be done and ensure the control dimensions recommended by the OEM. Removal of front seal segments and rear gland rings to be done to get actual values.
20. Check and adjust as required (by grinding) the axial and radial clearances of the seal strips of the outer casings, in both the top and bottom halves.
21. Box up inner case and heat stretch parting plane bolts.
22. Roll, bump check and adjust keys and packers.
23. Final boxing up of outer casing and heat stretching of parting plane bolts.
24. Final roll and bump check.
25. Refit the piping disconnected for the dismantling of the module.
26. NDT Testing Schedule of IP Module:
 - a. Outer Casing (U/H & L/H): - Visual, MPI & UT.
 - b. Inner Casing (U/H & L/H): - Visual, MPI & UT.
 - c. Guide Blades (U/H & L/H), Front & Rear Seal Housing: - Visual & MPI.
 - d. IP Inlet and Extractions Inserts & Angle Rings: - Visual & MPI.
 - e. IP Rotor: - Visual & MPI.
 - f. Moving blades Stages: - Visual & MPI.
 - g. Parting Plane Fasteners(>M64): - Visual, MPI & UT on Sample Specimen.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.6 ITEM NO 3: OVREHAULING OF LP TURBINE MODULE:

LPT OH & extraction bellow inspection, this scope includes complete dismantling of LP module, repair and replacement of any part as required.

1. Removal of LP turbine outer casing parting plane bolts and removal of outer casing.
2. Erection of LP parting plane joint covering, fabrication of grill / chequered plates as per requirement.
3. Condenser tube bundles shall be covered properly with wooden planks /scaffolding boards, tarpaulins etc. At the top of tube bundle to prevent falling of foreign material on condenser tubes from top of condenser / LP turbine
4. Carry out roll check of LP turbine.
5. Jacking of LP inner outer casing bottom half. Removal of LP turbine inner outer casing parting plane bolts & eccentric bolt. Removal of inner outer casing.
6. Removal of LP turbine inner-inner casing parting plane bolts & removal of inner casing.
7. Checking of flow path clearance of LP turbine (both axial & radial) etc.

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8. Removal of front & rear gland box top half. Removal of gland segments. Repair & replacements of gland fins etc.
9. Removal of LP rotor & placing on the stand.
10. Alumina blasting of LP rotor and casing. Cleaning of rotor, inner- outer casing, inner-inner casing and all other components as per requirement.
11. Alumina blast cleaning of rotor and top halves of inner-inner and inner-outer casing. Alumina blasting machine and the required shed arrangement etc shall be arranged by the agency. Scaffolding material shall be arranged by agency.
12. Alumina required is to be supplied by the agency as per the specified technical requirement.
13. Agency has to strictly adhere to the specification and required material test certificate is to be submitted to BHEL/BHAVINI before start of the work.
14. Cleaning of inner-inner & inner-outer bottom casing and casing blades in position. Placing top half of inner-inner casing in position and trial boxing up. Ovality checking and measuring of parting plane gaps.
15. Re-visioning of front and rear shaft gland box seal segments. Minor repair of seal fins of gland seal segments. Minor repairs of rotor and casing inter-stage and gland area seal fins. Replacing of gland seal ring segments if required.
16. Visual inspection & DPT of steam inlet pipe bellows / all LP extraction bellows / LP turbine front & rear bellows and carry out necessary repair / replacement as per requirement.
17. Inspection of expansion joints (compensators) in LPT extraction piping, LPT steam inlet, cross around pipe (cap) and LPT glands: cleaning the bellows surfaces, DPT of the bellows and joints welds.
18. DPT to be Carried out by qualified and competent personnel. Equipment's, tools & tackles and consumables for carrying out DPT are in the scope of agency. Making necessary temporary approaches and working platforms and removal of the same after the inspection works.
19. Replacement of inlet/extraction/other compensators of LPT (if required)
 - a. Making necessary scaffolding & approach platform for the replacement of compensators whenever required
 - b. Locking of piping and cutting the damaged compensator.
 - c. Cleaning and edge preparation for the welding joint.
 - d. Positioning of compensator as per drawing and tig welding the pipe joint.
 - e. Carry out DPT / NDT of welding joint and compensators. For bellow repair / replacement necessary field welding schedule of OEM and inspection shall be carried out as per relevant field welding schedule is to be followed.
 - f. Unlocking of compensators and temporary piping support.

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20. Carry out DPT of welding joints in the condenser dome wall stiffening structure / grid structure & spray trays etc. Necessary rectifications by grinding / welding etc to be done as per requirement.
21. Carry out necessary cleaning of LP exhaust hood spray nozzles. Carry out DPT of LP exhaust spray line weld joints & rectification of same by welding.
22. Necessary cutting of inter stage rotor & casing fins as per requirement to achieve the required radial clearances / roll check values.
23. Inspection of root welding of LPT guide blades in both top & bottom half of LPT inner-outer casing. Build up the root welding of guide blades by micro-82welding electrode as per approved field welding schedule. Micro- 82 welding electrodes will be provided by BHEL/BHAVINI free of cost. Carry out DPT of root weld joints of guide blades and repairing of defects if any.
24. Placement of rotor in position and checking radial and axial clearances. Note: if min clearances are not obtained during final flow path checking, rotor is to be removed from position and the same are to be corrected.
25. Box up of inner-inner & outer casing by hot tightening etc. As per requirement.
26. Carry out roll check of LP turbine & necessary correction in keys, packers & eccentric bolts etc. As per requirement.
27. Set casing radial and axial keys. Setting thermal expansion clearances.
28. Replace parting plane O-ring and box up of LP turbine outer casing.
29. Placement / fitment of LP front & rear gland box top half and carrying out necessary adjustments. Set LP front and rear shaft seal gland box clearances.
30. Replacement of lead diaphragms from both atmospheric relief diaphragms of LPT and make suitable adjustments in arrangement for ease of maintenance.

MPI & NFT TEST OF FREE-STANDING BLADE OF LPT

Natural frequency test (NFT) and magnetic particle inspection (MPI) of last two stages blades (2L, 3L, 2R & 3R) of LP rotor blades & blades root area.

- i. MPI & NFT of LP turbine rotor / blades to be carried out with overhauling of LP turbine. MPI & NFT kit along with accessories etc. shall be brought by the agency/ sub-contractor.
- ii. Remove all free-standing blades with fir root (only last two stage blades-both side) from LP turbine rotor.
- iii. Last two stages of LP rotor (5th & 6th stage-both side) DPT, MPI & NFT to be done.
- iv. Cleaning of old blade roots and rotor grooves thoroughly.
- v. Carrying out DPT on blades and roots & clits of fixed blades of last two stages.
- vi. Cleaning of blade roots and rotor grooves thoroughly.
- vii. Carry out necessary MPI test for both rotor grooves and blades.

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- viii. Fixing of blades with technological pieces as per requirement (technological pieces to be brought by the agency/ sub-contractor).
- ix. Conducting NFT test on the existing / detuned blades.
- x. Measurement of natural frequency of individual blades. Recording of values. Removal of technological pieces. (equipment's and consumables required for carrying out MPI and NFT are in the scope of the agency. Agency to engage competent certified personnel to carry out MPI & NFT works.)
- xi. Carry out necessary minor repair in rotor grooves and blades if required.
- xii. Fitment of blades on the rotor with new clamping pieces and locking strips. Welding of locking plates.
- xiii. NDT Testing Schedule of LP Turbine:
 - a. LP Rotor: - Visual, MPI & UT.
 - b. Blading's: - Visual & MPI.
 - c. LP Front & Rear Seal Housing and Compensator: - Visual, DPT & MPI.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.7 ITEM NO 04: OVERHAULING OF TURBINE & GENERATOR BEARING PEDESTALS, BEARINGS & ASSOCIATED WORKS:

1. Inspection and measurement of bearing clearances for turbine bearings 1 to 7.
2. Checking of pedestal elevations (1-7) and catenary measurement.
3. Provide assistance for removal and re-fixing of instruments.
4. Removal of pedestal covers and bearing halves (1-7).
5. Measurement of oil guard clearances for turbine bearing pedestals and removal of pedestal covers and bearing halves of HP, IP & LP turbine.
6. Oil clearances to be recorded including yoke key and side pads clearances. Oil inlet pocket to be covered immediately after removal of yoke.
7. Bearing no.2 thrust float to be checked separately in full bearing assembled condition & with bottom half bearing only. Necessary corrections to be done as per requirement during repair/assembly.
8. Remove top & bottom halves of bearing. Carry out DP test & ultrasound test for all bearing halves and thrust pads. (ultrasound test kit / DP test kit along with accessories to be brought by agency). Measure bore & journals for all bearings. Carry out necessary lapping /polishing on bearings / supports / journals etc. As per requirement. Carry out necessary scrapping / grinding etc. On the bases of cylindrical / spherical
9. Checking and correction of bearing skewness.

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10. In case desired contact of supports and bedding is not achieved replace bearing. Steam turbine bearing replacement: the following activities to be carried out for replacement.
 - a. Removal of old bearing from position.
 - b. Shifting of new bearing from store to the work area and cleaning of the protective painting.
 - c. Checking new bearing for dimension and fitment.
 - d. Ut and DP test of new bearing.
 - e. Matching of bottom support/side pads of bearing with pedestal as per requirement.
 - f. Measurement of bearing height for both old & new bearing. Carry out necessary shim corrections in torus /support as required.
11. Setting bearing clearances as per requirement. Checking and correction of bearing skewness.
12. Carry out necessary scrapping / lapping / polishing on bearings / supports /journals etc. As per requirement. Carry out necessary scrapping / grinding etc. On the bases of cylindrical / spherical supports of the bearings to correct the taperness etc. As per requirement. Matching of bearing side Pads, keys, supports, journal etc.8. Other checking required as per OEM guidelines.
13. Replacement of jacking oil hoses for all turbine bearings.
14. Carrying out repair / replacement of keys, oil guard ring strips, and oil catcher ring strips etc. As per requirement. Any taperness /abnormality in the keyways (all bearing yoke keyways, all bearing side packers area, turbine casing radial and axial keyways etc.) To be checked during dismantling and rectification/ blue check to be done well before final box-up. This taperness/blue check works to be witnessed by BHEL & BHAVINI.
15. Thrust pad checking of bearing # 2 and repair / replacement if necessary.
16. Through cleaning of bearing halves. Box up bearings, yokes, bearing pads, oil catchers etc. For all bearings 1 to 4. Maintaining necessary bearing clearances. Fixing the rotor in zero position for C&I instrument calibration.
17. Agency should also make necessary scaffolding in each column around deck springs to carry out above jobs in safe manner. Scaffolding material (preferable quick erect type, MOC should be aluminum) should be brought by the party. Party has to arrange necessary water jars pipes etc. For measurement of catenary.
18. Record bearing yoke / yoke key clearance and remove yoke.
19. Measurement of oil catcher clearance, bearing top half removal & measurement of bearing oil clearances.
20. Note: all precautions to be taken by the agency to avoid any oil spillage from TG bearing 1 to 7. If any oil spillage occurs outside the pedestal and insulation is soaked with oil, all the oil-soaked insulation is to be removed by the party and re-insulation to be carried out by the agency free of cost.

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21. Inspection and measurement of bearing clearances for all bearings 1 to 7. Removal of top & bottom halves of bearings.
22. Carrying out DP test / ultrasound test for all bearing halves. Measurement of bore for all bearings.
23. Note: experienced & level – 2 certified manpower to be arranged by the agency for all the NDT test. Calibrated NDT equipment to be arranged by the agency. Fulfillment of requirement of BHEL & BHAVINI FQA shall be binding on the agency.
24. Thrust pad checking of bearing # 2 and repair / replacement if necessary.
25. Rectification / replacement of pedestal packers and leveling.
26. Through cleaning of bearing halves. Box up bearings, yokes, bearing pads, oil catchers etc. For all bearings 1 to 7. Maintaining necessary bearing clearances. Fixing the rotor in zero position for C&I instrument calibration.
27. Loosening and ensuring tightness of foundation bolts of TG pedestals, generators and exciter components.

BEARING REVISIONING

1. Checking of pedestal elevations (1-7) and catenary measurement.
2. Provide assistance for removal and re-fixing of instruments.
3. Removal of pedestal covers and bearing halves (1-7).
4. Check bearing / journal dimensions and clearance. Rectification of top oil clearances.
5. Non-destructive testing of bearing babbitt metal for checking surface defects, bonding, etc. By dye penetrant test & ultrasonic testing.
6. Thrust pad checking of bearing # 2 and repair / replacement if necessary.
7. Replacement of bearings as per requirement.
8. Check bearing supports, saddle supports, bedding of bearings and correct if necessary. In case desired contact of supports and bedding is not achieved replace bearing.
9. Rectification / replacement of pedestal packers and leveling.
10. Resetting of all bearings, keys, bearing oil guard and pedestal oil catcher clearances and carry out rectification if necessary.
11. Check labyrinth rings and seals. (replacement if required & matching of the spherical contact with load and w/o load) to be specified. Final assembly of all bearings.
12. Note: Technical assistance / supervision to be provided by agency during repair machining of components.

ALIGNMENT AND COUPLING

Includes HP-IP, IP-LP, LP-GEN alignment & coupling including swing check value at HPT front.

1. Coupled run out checks of all rotors and couplings. Swing check at hp front.

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2. Run-out of emergency governor stub shaft and barring gear wheel to be checked and corrected as required.
3. Recording of all axial references and measurement of axial & radial clearances of mop, overspeed bolts etc.
4. De-coupling of HP-IP, IP-LP, LP-GEN and carry out disassembly alignment checks.
5. Carry out free run out check of the rotors and check and record spigot clearances.
6. Check coupling faces for convexity / concavity / face runout and correction to be done if required so as to obtain coupled runouts and swing check values. Agency shall correct faces either by manual scrapping or with the help of machine.
7. Coupled run-out and swing check correction required to be finalized and done in the following methodology:
8. HP, IP, LP rotors alone (without casings) shall be placed on bearings and rough alignment done
9. HP, IP, LP rotors coupled with fitted / loose bolts.
10. Coupled runout and swing will be measured and necessary correction shall be done on the coupling faces / spigot as per requirement.
11. This activity may require placement and removal of rotor on bearings more than once.
12. Check and record seal bore readings and journal levels and carry out rotor catenary check at all journals. Compare existing height of individual deck spring elements with erection value. Adjust deck spring height to achieve design / erection / best achievable catenary values
13. Carry out alignment checks, swing check of hp rotor. Carry out necessary corrections / adjustments, realign all the rotors. Adjust packers, bearings and their blue matching. Lubricate the packers as required.
14. Carry out alignment of HP-IP, IP-LP, and LP-Generator coupling within the allowable limits. This would include adjustment in deck level, packers, bearing supports, bearing keys etc. And their matching, lubrication etc.
15. Partial - replacement of coupling bolts and reaming of coupling bolt holes as required.
16. Carrying out non-destructive testing of coupling bolts and weight balancing of bolt nut combination.
17. Carry out roll check, bump check and horn drop check of HP & IP modules (with the system in normal operating conditions). Carry out centering of HP & IP turbine modules including adjustment of casing keys, packers and their blue matching as required. Lubricate keys, packers etc.
18. After charging the CW system, carry out final alignment of all the rotors, roll checks and key packer's corrections if required.
19. Couple HP-IP, HP-MOP, IP-LP, LP-Gen, Generator-exciter and final CRO'S and swing checks.
20. Through cleaning of bearing pedestals and box up of all bearing pedestals.

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21. Inspection of MS, HRH, CRH and other turbine integral piping hangers and rectification/replacement of defects/hangers.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.8 ITEM NO 05: OVREHAULING OF GOVERNING SYSTEM:

Main Governing and LPBP Governing Racks System Overhauling Under Supervision Of BHEL Experts

1. This scope includes complete servicing of components present on governing racks, protection rack and supply racks, replacement of parts as required, checking of valve characteristics & corrections
2. The agency has to depute skilled and sufficient manpower for overhauling the governing system components
3. The agency shall arrange expert manpower at own cost as well as the additional support manpower for cleaning, servicing of governing components
4. The following jobs are to be executed for 500 MW KWU turbine governing system:
 - a. Servicing of governing rack assemblies:
 - b. Electro-hydraulic governor,
 - c. Hydraulic governor
 - d. Low vacuum trip device
 - e. Over-speed trip testing device
 - f. Protection rack assemblies:
 - g. Main trip valve
 - h. ATT changeover valve
 - i. CRH NRV slide valves
 - j. Extractions valve relay
 - k. HPCV & IPCV - 1&2 valve control rack: valve block assembly.
 - l. Servicing of vacuum breaker control valve servomotor.
5. All the above equipment after servicing and clearance, to be adjusted as per the OEM assembly drawings, set as per the operating curves for control system.
6. Checking and setting of governing characteristics including valve openings and required remedial correction.
7. Adjustment of governing component provided in governing & protection rack including valves.
8. Any special type tools & tackles required for adjustment work shall be brought agency.

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Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.9 ITEM NO 06,07,12,13: HP/IP/LPBP/HPBP OVERHAULING OF VALVES AND SERVOMOTORS OH, OF HPT/IPT/LPBP/HPBP STOP, CV, SPRAY VALVES & WATER INJECTION VALVES -OVERHAULING OF HPT/IPT/LPBP/HPBP STOP VALVES AND CONTROL VALVES:

Detailed scope of work for overhauling of HPT/IPT/LPBP/HPBP stop valve & control valve:

1. Making necessary scaffolding & approach platform for stop & control valve wherever required.
2. Removal of grills and canopy wherever required, removal of oil piping from servomotor, decoupling of servomotor from valve and removal of servomotor from position.
3. Removal of insulation for opening of cap nuts and valve to be done.
4. Loosening of threaded ring / cap nuts (by using heating device wherever required) of valve cover and removal of valve cover from valve casing.
5. Dismantling of valve internals and cleaning of all internals.
6. Carry out DPT of the valve internals.
7. Measurement of critical clearances/dimensions of all components of valve and compression of "u" seal ring (in case of hp stop & control valves).
8. Repairing / replacing the defective components and assembly of all internals after lapping etc.
9. Blue match checking of the valve seating area is to be checked.
10. Putting the valve internals in position. Tightening of threaded ring / tightening
11. Of cap nuts (heat tightening wherever required) of valve cover.
12. Fitting of servomotors and oil piping and coupling of servomotors with valve.
Thoroughness of drain to be checked and drain line to be fixed.
13. Charging of system and attending of defects if any.
14. Hot tightening of fasteners after charging wherever required.
15. Commissioning of the system and attending of defects if any.
16. Removal of temporary platform & scaffolding and placing of grills & canopy.
17. Inspection and servicing of oil units, tanks, pumps, accumulators etc.

HP / IP / LPBP / HPBP OVERHAULING OF SERVOMOTOR:

1. OH of HPT/IPT /LPBP / HPBP Stop & CV servomotors - overhauling of HPT/IPT / LPBP / HPBP stop valve and control valve servomotors:

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2. Detailed scope of work for overhauling of HPT/IPT stop valve and control valve servomotor:
3. Removal of grills and canopy wherever required.
4. Making necessary scaffolding & approach platform for stop valve servomotor whenever required.
5. Removal of oil piping from servomotor, decoupling of servomotor from valve and removal of servomotor from position.
6. Dismantling of servomotors shall be done as per the instruction of EIC.
7. Oil from HP & IP stop valve servo motor is to be collected in identified oil barrel as instructed by EIC representative
8. Dismantling of servomotor internals and cleaning of all internals. Carry out DPT on servomotor internals as per requirement. Carry out necessary matching/lapping etc. As per requirement.
9. DPT of all disc springs to find out any discontinuity.
10. Repairing / replacing the defective components and assembly of all internals and box up of servomotor.
11. Cup & disc blue matching is to be done and correction if any is to be carried out
12. Replace servo motor gland packing in the coupling area
13. Fitting of servomotors and oil piping in position and coupling of servomotors with Valve.
14. Charging of system and attending of defects if any.
15. Commissioning of the system and attending of defects if any.
16. Removal of temporary platform & scaffolding and placing of grills & canopy.

NDT TESTING SCHEDULE OF ESV & CV, IV, CONTROL VALVE, SPRAY VALVE & WATER

INJECTION VALVES: -

- i. ESV & CV chest internal & external surface: - visual & DPT.
- ii. ESV & CV stem and cone: - visual, MPI & DPT.
- iii. Stem chest cover of ESV & CV: - visual & MPI.
- iv. ESV & CV fasteners (>m64): - visual & MPI on sample specimen.
- v. IV & CV stem & cone: - visual, MPI & DPT.
- vi. Stem chest cover for IV & CV: - visual & MPI.
- vii. IV & CV fasteners (> m64): - visual & MPI on sample specimen.
- viii. Spray & water injection valves: visual, MPI & DPT

BOROSCOPIC INSPECTION OF PIPELINES: -

- i. Inspection of inlet and outlet areas of pipelines of HPBP.
- ii. Inspection of inlet and outlet areas of pipelines of LPBP.

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Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.10 ITEM NO 08: OVREHAULING OF CONTROL OIL SYSTEM:

1. COT oil draining
2. COT and strainers cleaning
3. COT strainer cover gasket replacement
4. Inspection of temperature control valve and reassembly with new gasket
5. Control oil coolers inspection, cleaning and reassembly with new o rings
6. Control oil cooler and 3-way valve servicing.
7. Necessary loop arrangement for flushing purpose
8. All the oil lines flanges gasket and o rings replacement with new one
9. All the accumulator's bladder inspection and replacement with new one
10. All accumulator nitrogen charging
11. Control oil filters replacement
12. Servicing of all the pumps, fans, filtration unit valves, NRV's and reassembly with new gasket
13. Any other commissioning associated works

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.11 ITEM NO 09: OVERHAULING OF LUBE OIL SYSTEM:

1. PUMPS

- i. Dismantling of AOP'S, EOP'S, JOP'S, OVEF
- ii. Inspection and NDT of dismantled components.
- iii. Replacement of "O" rings and consumables.
- iv. Re-assembly of AOP'S, EOP'S, JOP'S.
- v. Mot strainer cover gasket replacement.
- vi. Inspection and healthiness checking of oil centrifuges.

2. OIL TANKS, THROTTLES AND VALVES

- i. MOT oil draining & mot and strainers cleaning.
- ii. MOT strainer cover gasket replacement

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- iii. Injector nozzles inspection and gasket replacement in oil canal and mot
- iv. MOP suction float inspection, testing and reassembly with new gasket.
- v. Inspection of temperature control valve and reassembly with new gasket
- vi. Lube oil coolers inspection, cleaning and reassembly with new o rings
- vii. Lube oil cooler and 3-way valve servicing.
- viii. Necessary loop arrangement for flushing purpose
- ix. Replacement of oil lines flanges gasket with new one
- x. Replacement of o rings of oil throttles.
- xi. Cleaning of line filters and fixing.
- xii. Servicing of pressure relief valve in jacking oil line
- xiii. Lube oil filters replacement.
- xiv. Jacking oil filters replacement.
- xv. Servicing of all the pumps, fans centrifuges, valves, NRV's and reassembly with new gasket
- xvi. Any other commissioning associated works
- xvii. If any additional work required during inspection and commissioning work to be carried out.

3. CLEANING OF LUB-OIL COOLERS, INSPECTION OF FLASH TANK BELLOWS:

- i. Lube oil flushing/commissioning
- ii. Preparatory works for carrying out the oil flushing of the lube oil system. All temporary loop lines as required be fabricating and making ready shall be agency responsibility.
- iii. Remove all oil throttles from lube oil supply line to each bearing pedestal, fix line filters/ blocking oil flow in individual lube oil supply line shall be agency responsibility.
- iv. Extend full support and carry out oil flushing with intermediate cleaning of line filters, lube oil duplex filter and mot basket strainers etc as per requirement (mot basket strainers to be provided with cloth filter of correct size and fit.)
- v. Reset / refit oil throttles after completion of oil flushing (achieving oil purity values).
- vi. Adjust the pressures as required in the jacking oil & lube oil systems. DPT of JOP line welding joints to be done. JOP hoses replacement, JOP pressure regulating valve repair / replacement, JOP relief valve repair / replacement.
- vii. Checking of shaft lift at individual journals and carry out necessary adjustments.
- viii. Putting the machine on barring gear, steam rolling and trial run.
- ix. Inspection of Lube Oil Coolers: 02 Nos
 - a. Removal of required oil pipeline flanges
 - b. Removal of required water pipeline flanges

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- c. Removal of required cooler covers
- d. Dismantling of cooler tube bundle
- e. Lifting of cooler tube bundle from shell
- f. Thorough cleaning of coolers
- g. Replacement of gaskets with new
- h. Re-assembly coolers
- i. Connection of oil and water pipelines
- x. Inspection of compensators of all flash tanks
- xi. Making scaffolding up to the bellow
- xii. Removal of bellow covers (if any)
- xiii. Cleaning of bellows
- xiv. Assistance during commissioning for cleaning of oil filters on main turbine lube oil filters; control fluid filters on HP, IP and LP bypass control racks. For this purpose, groups with supervisor has to be stationed round the clock at site for a period of 2 days after synchronization of the unit.
- xv. Note: sufficient quantity of cleaning media (petrol) to be made available by agency for proper cleaning of filters).

4. BOROSCOPIC INSPECTION OF PIPELINES: Inspection of oil pipelines of various areas of lube oil system to be carried out.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.12 ITEM NO 10: OVREHAULING OF SEAL STEAM SYSTEM:

- 1. Servicing of seal steam supply and leak off control valve and reassembly
- 2. Servicing of seal steam supply and leak off CV isolation valves
- 3. Steam blowing of supply line
- 4. Steam blowing of individual seal steam supply to turbine
- 5. Supply header drain pot cleaning and gasket replacement
- 6. MAL 81-line cleaning/air blowing
- 7. Inspection of MAL 81 orifice and gasket replacement.
- 8. Gland steam lines butterfly valve inspection, seal replacement and gasket replacement
- 9. GSC fan inspection and replacement of impeller if required
- 10. GSC fans inlet valves inspection
- 11. GSC drain line valves operation check and servicing of steam trap
- 12. Gland steam inlet and bypass to GSC valve operation check and gland replacement

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13. Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.13 ITEM NO 11: OVREHAULING OF TURBINE DRAINAGE SYSTEM

1. Servicing of all MAL drain angle valves and its isolation valves
2. Air blowing of all MAL drain lines
3. Air blowing of LPBP drain line, inspection of orifice and replacement of gasket.
4. Flushing of turbine flash box spray line, cleaning of nozzle and replacement of gasket.
5. Cleaning of flash box spray line orifices and replacement of gaskets
6. Flushing of LP exhaust spray line and replacement of gasket.
7. Cleaning of exhaust hood spray nozzle and fixing.
8. If any additional work required during inspection and commissioning work to be carried out.

2.14 ITEM NO 14: OVERHAULING OF CONDENSER & ITS AUXILIARIES:

1. Inspection of steam side for fouling, scaling, corrosion, erosion, cracks, and foreign materials.
2. Inspection of water boxes for any corrosion, coating damage, divider plate leakage, and gasket seating condition.
3. cleaning of condenser tube using recommended method
4. Random tube thickness measurement using ultrasonic testing.
5. Inspection of bellows for cracks, deformation, corrosion, and leakage marks.
6. Inspection of supports and anchors.
7. Inspection of all nozzles available in the steam space and rectification if required.
8. Inspection of Hotwell for any sludge accumulation, corrosion, coating damage and level tapping cleanliness and cleaning
9. Inspection of supports, foundation bolts, springs, vibration marks, and structural cracks.
10. Manhole doors and other flanges- replacement with new gaskets.
11. Necessary arrangement/preparation for condenser flood test like locking of flash tanks vent bellows, additional support below the condenser, etc.
12. Random inspection and testing of condenser welding by suitable NDT method and rectification if required.
13. Inspection and servicing of condenser air relief valve and re assembly with new gasket.
14. Inspection and servicing of auxiliaries like vacuum pumps, Priming pumps, RC pumps, heat exchangers, and flushing of water lines etc.
15. Replacement with new gasket for all the condenser associated lines.

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Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

Note: If required contractor has to perform mechanical or chemical cleaning if biofouling, scaling, or debris is detected. Additional cost towards this shall be reimbursed extra on mutually agreed rates.

2.15 ITEM NO 15: OVERHAULING OF GENERATOR, EXCITER, PRIMARY WATER SYSTEM & AUXILIARIES

1. GENERAL WORKS:

- i. Conducting Air Tightness Test of Generator Stator checking for any leakages in the Bushing area.
- ii. Generator is to be isolated from bus duct side by removing flexible links.
- iii. Removal of Exciter dome after removing all Electrical and C&I connections. Removal of Diode wheel cover.
- iv. Taking CRO of LP-Gen. & Decoupling of LP-Gen- Exciter rotors.
- v. Note down Alignment Reading of LP-Gen as per Protocol
- vi. Removal of Gen/Exciter Bearing no 5,6 &7. and Visual inspection. Insulation checking & correction if required. DPT/UT of bearings and replacement of bearings if required
- vii. All pipeline (PW, seal oil, gas and cooling water lines) hangers to be checked and adjusted if required.
- viii. Inspection of generator foundation sole plate grouting and condition of foundation bolts.
- ix. End shield and stool piece blue matching to be done.
- x. Anchor bolts re stretching to be done.
- xi. LP-GEN, GEN-Exciter alignment and coupling.
- xii. Alignment of Generator Couplings, CRO & Exciter end Swing check.
- xiii. Check oil catcher clearances and replace fins as per requirement.
- xiv. Checking of coupling face run out, face blue matching with master plate.
- xv. Measurement of radial/ axial measurement of Spigot/ recess of couplings.

2. INSPECTION OF STATOR:

- i. Dismantle Stator End Shields and replace all Gaskets.
- ii. Check condition of Stator Core and Winding. Complete cleaning of stator end shields
- iii. Baroscopic inspection and recording of core end pockets, ventilation duct, and overhang portion will be carried out. Device for Boroscopic inspection shall be arranged by agency
- iv. Checking winding support structure and all other Stator Bolts and rectify defects.

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- v. Inspection of stator core for any looseness in core laminations, finger at core end packets. Repair of hot spots and other defects of minor nature. Inspection of core clamping ring locking and inspection of core back side. Any defect observed is to be rectified.
- vi. Inspection of partial discharge occurrences at under wedge/packers and rectification of the same. Rectification of any looseness observed in slot wedging.
- vii. DP Test of Air gap seal ring clamp welding joints DP testing. DP test of welding joints and pneumatic & hydraulic test of seal oil pipe lines mounted in both end shields.
- viii. Replacement of stator inspection man hole 'O' rings
- ix. Tightness check of Overhang Clamp Nuts (M30). Torque tightness of bar end clamps bolts.
- x. Carry out the fluorescent DP test of baffle ring segment blades. Check the IR of the compressor segments and rectify if found less.
- xi. Replace all necessary Generator Flange, manhole gaskets.
- xii. Carrying out winding Hydraulic Test and attending any leakage in water and nitrogen circuits.
- xiii. Cleaning of stator, thorough inspection of stator, stator core, stator cooling gas circuit and Hydrogen cooler water pipes, stator overhang bracket bolts, core bar bolts and other fasteners inside the stator are to be inspected for tightening and proper locking of nuts and bolts.
- xiv. Checking of all electrical connections of stator like bushing connection (phase connectors), bar to bar to connection and rectification of defects.
- xv. Conducting Air Tightness Test of Generator casing and attending leakages if any.
- xvi. Cleaning of Primary water filters along with conical filters.
- xvii. Thorough cleaning of stator bore, back side core, Teflon hoses, end shields, bus bar connections and bushing chamber. Physical inspection & cleaning of bushing for any kind fine crack and any mark of heating.
- xviii. Varnishing on stator core. Spray painting of stator external surface.

3. ROTOR INSPECTION:

- i. Perform Runout checks and Rotor thread out and check the Rotor visually
- ii. Check rotor wedge and retaining rings.
- iii. Inspect the winding and Gas duct.
- iv. Dismantle Compressor Assembly. Carry out Fluorescent DP test of rotor compressor blades and both end retaining rings after removal of paint.
- v. UT of both end retaining rings.
- vi. Check MULTICONTACT system and replacement of multicontact bands, if required
- vii. Boroscopic Inspection & Recording of Rotor Winding under Retaining rings. Device for boroscopic inspection shall be arranged by agency

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- viii. Perform Gas Tightness Test of Rotor and replace current carrying bolt and sealing washers,
- ix. Clean all dismantled parts thoroughly before box up. Varnishing on rotor.
- x. Rotor thread- in and Box up.
- xi. Boxing up of all dismantled parts and all internals of Generator as per procedure, seal body IR measurement and bring the IR value to the recommended value.

4. EXCITER INSPECTION:

- i. Dismantle Exciter and Cleaning of Main exciter & Diode wheels
- ii. Check STATOR & ROTOR windings. Check condition of rectifier wheels
- iii. Check MULTICONTACT system at both rotor & exciter sides & replacement of Multicontact bands, if required.
- iv. Check bearing and pipe insulation
- v. Check air filters and clean
- vi. Checking condition of ground fault detection system and replace brushes if required
- vii. Applying insulating varnish for stator and rotor windings
- viii. Complete cleaning of diode wheels. Replacement of diode wheel fuses with new fuses, if required. Replacement of faulty diodes of the rectifier wheels
- ix. Rectification/modification of exciter hood glass door locking mechanism, if required.
- x. Checking of stroboscope and associated works
- xi. Perform gas leak test of Exciter CC bolt Assy. (N2 leak Test).
- xii. Complete assembly of the Exciter and alignment & Coupling with Generator. Replacement of all gaskets and providing proper sealing of exciter dome.
- xiii. Varnishing on Exciter & PMG Components.

GAS SYSTEM:

- i. Checking H2 pressure reducers
- ii. Checking all valves of the Gas system for tight closing
- iii. Servicing of any defective valves/replacement of valves as applicable
- iv. Functional checks of H2 gas drier
- v. DP test on welding joints of all gas pipelines including supply of standard DP material.
- vi. Air tightness of Generator with complete gas system

HYDROGEN & EXCITER COOLERS

- i. Dismantling of the hydrogen and air coolers
- ii. Cleaning of coolers on air and waterside
- iii. Replacement of old gaskets with new gaskets

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- iv. Painting of water boxes with water resistant paint
- v. Check condition of cooling water inlet & outlet pipes, vent pipes, and drain pipes
- vi. Pre-assembly of all coolers
- vii. Conducting hydraulic test on coolers
- viii. Re-Assembly of all coolers in position

GENERATOR TERMINAL BUSHINGS

- i. Inspection of terminal bushings & replacement of old 'O' rings with new ones.
- ii. Complete cleaning of bushings & bushing compartment
- iii. Replacement of bushings, defective flexible with new ones, if any
- iv. Tightness test of bushing connections.

SHAFT SEALS ASSEMBLY

- i. Dismantling of shaft seals and checking insulation and IR test
- ii. Replace seal insulation and gaskets
- iii. Check contact faces of the seal rings
- iv. Check seal ring clearances
- v. Check seal body and Teflon bushes
- vi. Blue matching of parting plane of seal body top and bottom halves
- vii. DP and UT test of seal rings
- viii. Replacement of old seal rings with new seal rings, if required
- ix. Check Inner & Outer labyrinth rings and if required replace seal strips.

PRIMARY WATER SYSTEM

- i. Perform functional checks on primary water pumps.
- ii. Replace the resin of Ion exchanger & Top-up alkaliser tank
- iii. Check all valves of primary water system for tight closing. Servicing of defective valves in PW System
- iv. Filters cleaning & Replacement of old 'O' rings in the primary water system with new ones including conical filters in Generator Primary water circuit and filters at PW Station.
- v. Conducting Hydraulic test of primary water system.
- vi. Leak test of nitrogen gas system including identification of leakage points, testing and Rectification.
- vii. DP test on welding joints of all pipelines including supply of standard DP material.
- viii. Check all Teflon hoses for healthiness
- ix. Replacement of water box O-rings with new one.
- x. Cleaning & Servicing of primary water filter & coolers

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Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

Note: Assistance to electrical agency shall be provided for Electrical Tests on Stator, Rotor, Exciter, Diodes and PMG etc without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.16 ITEM NO 16: OVERHAULING OF CONDENSATE EXTRACTION PUMPS (CEP) – 3 NOS

Complete Dismantling, Inspection and Assembly of Condensate Extraction Pumps (CEP) – 3 Nos including all bearings and Mechanical Seals, Sleeves, Impellers etc involving dismantling of pumps, replacement of damaged parts and Reassembly including CEP Motors and Its alignment. NDT OF dismantled components and replacements. Inspection of CEP Cannisters, removal if required and replacement of bushes below cannisters. Tentative scope is as follows

- a. Removal of all interconnected pipe lines and Lifting of Motor from the position
- b. Inspection of Mechanical Seal and if necessary replacement of seal
- c. Inspection of all bearings of Condensate Extraction Pump (i.e. Visual, DP & UT Test).
- d. Recording of bearing clearances & interferences and if necessary replacement.
- e. Inspection and servicing of motors, replacement of bearings if required and assembly.
- f. Pump Alignment with Motor.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.17 ITEM NO 17: LIVE STEAM REHEATER:

1. Opening of manhole doors
2. Shell side hydrotest and tube side hydrotest at prescribed pressures in GA drawing.
3. Closure of manhole door with new manhole door gasket
4. Servicing of relief valves and reassembly.
5. Inspection of all supporting structures, hangers and brackets in position
6. Inspection of steam inlet valves for proper functioning and rectification if required.
7. If any additional work required during inspection and commissioning need to be carried out.

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Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.18 ITEM NO 18: HP HEATERS (04 NOS), LP HEATERS (03 NOS), DEAERATOR, DRAIN COOLER, GLAND STEAM CONDENSER:

1. HP HEATERS:

- i. Inspection of heater tubes internal with opening of manway cover
- ii. Thickness measurement of shell and dished end with d meter
- iii. Heater tube sheet cover opening and internal cleaning of tube and reassembly
- iv. Manway cover gasket replacement with new one
- v. Hydrotests of tube side and shell side at working pressure
- vi. Safety valves remove, servicing and reassembly with new gasket (shell side)
- vii. Removal of water expansion relief water, servicing and rewelding of relief valve
- viii. Inspection of stand pipe isolation valves and level gauges, servicing and reassembly
- ix. Local gauges removal, re calibration and re-fixing.
- x. If any additional work required during inspection work to be carried out.
- xi. Inspection and hydrotest of impulse line, if required impulse lines, isolation valves are to be replaced.
- xii. Removal of level transmitters, calibration and re-fixing
- xiii. Removal of pressure transmitters and temperature sensor, recalibration and re fixing works.
- xiv. Note: During Inspection BHEL specialist from Hyderabad Shall Be Deployed by BHEL For Final Assessment and Conclusion.

2. LP HEATERS:

- i. Inspection of heater tubes internal with opening of manway cover
- ii. Thickness measurement of shell and dished end with d meter
- iii. Heater tube sheet cover opening and internal cleaning of tube and reassembly
- iv. Manway cover gasket replacement with new one
- v. Hydrotests of tube side and shell side at working pressure
- vi. Safety valves remove, servicing and reassembly with new gasket (shell side)
- vii. Removal of water expansion relief water, servicing and rewelding of relief valve
- viii. Inspection of stand pipe isolation valves and level gauges, servicing and reassembly
- ix. Local gauges removal, re calibration and re-fixing.
- x. If any additional work required during inspection work to be carried out.
- xi. Inspection and hydrotest of impulse line, if required impulse lines, isolation valves are to be replaced.
- xii. Removal of level transmitters, calibration and re-fixing

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- xiii. Removal of pressure transmitters and temperature sensor, recalibration and re fixing works

3. DRAIN COOLER:

- i. Inspection of heater tubes internal with opening of end cover
- ii. Thickness measurement of shell and dished end with d meter
- iii. End covers gasket/o ring replacement with new one
- iv. Hydrotests of tube side and shell side at working pressure
- v. Local gauges removal, re calibration and re-fixing.
- vi. If any additional work required during inspection work to be carried out.

4. GLAND STEAM CONDENSER

- i. Inspection of heater tubes internal with suitable opening
- ii. Thickness measurement of shell and dished end with d meter
- iii. Hydrotests of tube side and shell side at working pressure
- iv. Local gauges removal, re calibration and re-fixing.
- v. If any additional work required during inspection work to be carried out.

5. DEAERATOR

- i. Manhole door opening of deaerator & FST and inspection for any corrosion
- ii. Inspection of trays and nozzles, cleaning and reassembly
- iii. Thickness measurement of shell and dished end with d meter
- iv. Cleaning of inside FST.
- v. Manhole doors fixing with new gasket
- vi. Other dummy flanges gaskets removal and replacement with new
- vii. Local gauges removal, re calibration and re-fixing.
- viii. Safety valves removal, servicing and reassembly with new gasket (shell side)
- ix. Inspection of stand pipe isolation valves and level gauges, servicing and reassembly
- x. Local gauges removal, re calibration and re-fixing.
- xi. If any additional work required during inspection work to be carried out.
- xii. Removal of level transmitters, calibration and re-fixing
- xiii. Removal of pressure transmitters and temperature sensor, recalibration and re fixing works.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

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2.19 ITEM NO 19: OVERHAULING OF MS & HRH STEAM STRAINERS, EXTRACTION NRV'S, CRH NRV & ITS SERVOMOTOR:

1. Scaffolding & approach platform erection whenever required as necessary for CRH NRV servicing.
2. Removal of existing insulation cladding sheet and insulation in the top cover area of NRV.
3. Removal of oil pipeline from NRV servomotor, decoupling of servomotor from valve spindle and removal of servomotor from position.
4. Opening the top cover of CRH NRV by making proper lifting arrangement and removal of all internals like flap, spindle etc.
5. Cleaning of all internals including pressure seal area and checking for any erosion mark in gasket seating areas. Carry out DPT as per requirement.
6. Repair and replacement of defective component. Carryout necessary matching/lapping etc.
7. Build up and repair of eroded portion by grinding and matching/lapping.
8. Box up of NRV with new pressure seal gasket/ components etc.
9. Tightening of the cover to the required torque and hot tightening of the same after charging.
10. Dismantling and servicing of CRH NRV servomotor. Replacement of O-rings and automatic gasket of servomotor.
11. Fixing the servomotor in position, coupling the servomotor with NRV spindle, and fixing of oil pipes of servomotor after servicing of servomotor.
12. Attending to leakages if any after charging.
13. Removal of temporary platforms and scaffoldings.

OVERHAULING OF MS STRAINERS (2 nos)

1. Providing temporary platform for strainers servicing wherever required.
2. Dismantling of strainer assembly and removal of strainers from strainer housing.
3. Cleaning & checking of strainer inside housing for any foreign body & damage and measurement of the housing bore, seal ring seating surface, protection ring etc.
4. Re-visioning of all components of the strainer.
5. Proper cleaning of strainer element and checking of any defects like welding crack by NDT, foreign object damage etc. Rectification of any welding defects on strainer element and replacement of strainer element as per requirement by carrying out welding as per standard procedure by qualified welder.
6. Making necessary fixtures for dismantling the strainers if required, shall be in the scope of contractor.
7. Re-assembly with new gaskets, rectification after radiography, if required.
8. Hot-tightening & attending to any defect after steam charging

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OVERHAULING OF HRH STRAINERS- 02Nos

1. Providing temporary platform for strainers servicing wherever required.
2. Dismantling of strainer assembly and removal of strainers from strainer housing.
3. Cleaning & checking of strainer inside housing for any foreign body & damage and measurement of the housing bore, seal ring seating surface, protection ring etc.
4. Re-visioning of all components of the strainer.
5. Proper cleaning of strainer element and checking of any defects like welding crack by NDT, foreign object damage etc. Rectification of any welding defects on strainer element and replacement of strainer element as per requirement by carrying out welding as per standard procedure by qualified welder.
6. Making necessary fixtures for dismantling the strainers if required, shall be in the scope of contractor.
7. Re-assembly with new gaskets, rectification after radiography, if required.
8. Hot-tightening & attending to any defect after steam charging

OVERHAULING OF EXTRACTION VALVE & ITS SERVOMOTOR:

1. Making necessary scaffolding & approach platform for extraction valves if required.
2. Removal of existing insulation cladding sheet and insulation in the top cover area of valves.
3. Removal of oil pipeline from servomotor, decoupling of servomotor from valve spindle and removal of servomotor from position.
4. Re-positioning of servomotor.
5. Opening the top cover of valves by making proper lifting arrangement and removal of all internals like flap, spindle etc.
6. Cleaning of all internals including pressure seal area and checking for any erosion make in gasket sealing areas, carry out DPT as per requirement.
7. Repair and replacement of defective component, carryout necessary matching / lapping etc.
8. Build up and repair of eroded portion by grinding and matching / lapping.
9. Box up of extraction valve with new pressure seal gasket/ components etc.
10. Tightening of the cover to the required torque and hot tightening of the same after charging.
11. Fixing the servomotor in position, coupling the servomotor with valve spindle and fixing of oil pipes of servomotor.
12. Replacement of gland packing on both sides.
13. Attending to leakages if any after charging.
14. Removal of temporary platforms and scaffoldings.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.20 ITEM NO 20: OVERHAULING OF BOILER FEED PUMP DRIVE TURBINE AND AUXILIARIES: TDBFP DRIVE TURBINE- 02 NO

1. Overhauling of TDBFP drive turbine details of TDBFP drive turbine: model: K1401-2, make: BHEL, hyderabad
2. Overhauling of TDBFP drive turbine involves complete dismantling of BFP drive turbine, valves, bearings etc. Carry out necessary repair & replacement. Alignment & centering as per detail scope of work given below:
3. Removal of covers and insulations of drive turbines as per requirement & through cleaning of the same.
4. Removal of integral piping (lube oil, control oil piping, and steam piping etc) connected to turbine.
5. Providing manpower assistance in removal of C&I probes/ connections etc as per requirement.
6. Dismantling of coupling between turbine to main pump, turbine to gearbox and between gear box to booster pump.
7. Checking the alignment and coupling distance of turbine - main pump, turbine - gearbox & booster pump gearbox.
8. Checking of float of thrust bearing of drive turbine, main pump & booster pump.
9. Opening of bearing housings and lifting of bearing top half.
10. Measurement of rotor position relative to outer casing of bearing housing,
11. Alignment checks of rotor to casing.
12. Measurements of radial and axial run out at various points of turbine rotor as per requirement.
13. Disconnection of emergency stop valve (ESV), main control valve (MCV) servomotor, nozzle control valve, aux control valve (acv) & its servomotor and integral oil piping.
14. Dismantling of emergency stop valve (ESV), main control valve (MCV) servomotor. Inspection of valve cone, bush, disc etc. Inspection of valve internals such as valve disc & seat etc. Lapping and blue matching of valve disc with seat if required. Box up of valves with new / repaired spares as per requirement. Inspection of steam inlet strainers. DPT of strainer element. Replace / repair of strainer element as per requirement.
15. Removal of nozzle control valves from turbine upper half. Placing of control valve on suitable support. Inspection of valve disc, lapping and blue matching with seat if required. Adjustment of steam admission valves if required. Replacement of bush & lantern ring if required

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16. Dismantling of aux control valve (acv) & its servomotor. Inspection of valve disc, lapping and blue matching with seat if required. Carry out minor repair etc as per requirement. Box up of valves with new / repaired parts etc as applicable.
17. Removal of turbine casing parting plane studs & taper pins. Check the turbine casing parting plane gaps before loosening the parting plane studs & after loosening the parting plane studs. Carry out necessary scrapping & matching in parting plane to remove high spots. Fitting of guide pins and raising of casing top half along with guide blade carriers, shaft glands and labyrinth seal.
18. Placing the top half on a suitable support in inverted position. Cleaning / alumina blasting of casings. Alumina & sand blasting machines shall be brought by the party
19. Measurement of clearances of gland labyrinth seals and inter stage seals.
Measurement of clearances of non-spring-loaded seals. Measurement of turbine flow path clearance (both radial & axial). Checking the thrust-bearing float before removing the thrust bearings. Making of necessary protocols.
20. Removal of bearing bottom halves, DPT / ultrasonic test (UT) and dimensional checks of bearings. Necessary repair and replacement of bearings as per requirement. DPT / ultrasonic test (UT) kits shall be arranged by the party.
21. Check the seating contact of the rotor journal on the bearings and ensure minimum 80% of seating contact is achieved and 0.02 filler should not enter. Check and record bearing oil clearances and yoke to bearing clearances and set the valves as per drawing. Replacement of journal / thrust bearing/ thrust bearing pads if required.
22. Lifting of rotor and placing on suitable support, checking of rotor and blading.
Integrity check of rotor. Inspection of rotor blades for erosion and deposits. Cleaning / alumina blasting of rotor. Alumina & sand blasting machines shall be brought by the party.
23. Shifting of turbine rotor to balancing machine and taking radial / facial run out readings.
24. If rotor need to be replaced same to be done with measurement of fresh flow path and other required clearances.
25. Thorough cleaning of bottom half of the casing in-situ.
26. Clean and examine all measuring, sealing surfaces etc of casing. Measure / examine joint faces of casings (parting plane faces) and correct as necessary by scrapping etc. Examine and free all nuts & bolts. Examine & refit pins if required.
27. Sealing strips (gland / inter stage / balancing drum sealing strips etc) if necessary, will be carried out by the agency at site. This is an optional item and if carried out agency shall be paid extra.
28. Check precision holes i.e. Taper pins, parallel pins etc, examine pins and refit both if necessary & re-ream if required. Examine support and guide surfaces, smoothen or renew as necessary. Assembly of both casings together and measure casing bore horizontal and vertical & recoding of casing ovality.

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29. Carry out parting plane feeler check. Carry out necessary scrapping & matching in parting plane to remove high spots.
30. Check and examine seal steam glands. Examine and clean joint faces and bolts. Examine and free all nuts, bolts and pins. Examine sealing strips and renew, if necessary, as per requirement.
31. Removal of casing & bearing pedestal keys for carrying out centering / roll check of turbine. Carry out necessary corrections & adjustments as per requirement.
32. Remove and inspect over speed trip device. Inspect & measure front & rear bearing journals, thrust bearing section and sealing ring section of rotor. Examine bearing sealing strips. Renew sealing strips, if necessary, as per requirement.
33. Clean and examine front / rear journal bearings and bearing housings. Examine joints & holes.
34. Examine & free all nuts & bolts, adjusting devices & guides. Dismantle hand trip valve, clean, free inspect and reassemble. Clean bearing sealing rings, inspect and fit new strips if required. Clean & refit journal bearings. Clean & refit thrust bearing. Visual inspection of bearing pedestal etc.
35. Placing of rotor in bottom half after placing bottom half of both front and rear journal bearings. Mounting of trust bearing. Check axial float of rotor and adjust thrust-bearing position. Check flow path clearance of turbine and make protocol. Matching of thrust pads if required.
36. Checking of concentricity of rotor with casing and with front and rear pedestals. Check and record reference readings. Checking & recording of clearances and condition of sole plate packers at front & rear pedestals. Check and record clearances between longitudinal fitted keys at front & rear pedestals. Setting of packers and keys clearances to the design value by replacing or machining of the existing keys and packers. Skew and parallelality check of bearing pedestals and corrections as required.
37. Placement of top half of casing along with guide blade carrier and seal steam glands. Check position of casing to rotor. Tighten joint bolts (torque tightening) of outer casing, seal steam glands, and exhaust hood flanges as per requirement & measurement of elongation of studs. Making of necessary
38. Protocols.
39. Measurement & recording of elongation of each stud. This should be within the specified tolerance as mentioned in the drawing.
40. Checking of rotor to casing alignment for axial and radial and positioning of bearing housings. Carry out centering / roll check of turbine. Carry out necessary corrections & adjustments as per requirement.
41. Replacement of TDBFP drive turbine rotor with new rotor if old rotor is found with more run out / damages or as per requirement.
42. Cleaning & dimensional check of spare rotor.

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43. Removal of emergency governor & coupling halves from old rotor and fixing on the same on new rotor as per requirement.
44. Flow path clearance checking (axial & radial) etc. With new rotor.
45. Cutting of inter stage fins / balancing drum / gland seal fins as per requirement to get the desired clearances.
46. Measurement of axial, radial run outs of new rotor.
47. Mounting of emergency stop valve (ESV), main control valve (MCV) servomotor, nozzle control valve etc.
48. Measurement of clearances at palm packers. Carry out necessary corrections & adjustments as per requirement.
49. Checking the alignment turbine - main pump, turbine - gearbox and gearbox to booster pump and adjustment as per requirement.
50. Checking of total float for drive turbine, main pump & booster pump and adjust accordingly.
51. Inspection of gear box between drive turbine and booster pump. Dismantling the gear box. Measurement & recording of gear clearances, bearing clearances, axial float etc. DPT of gear components/ bearing etc. Assembly of gear box with old/ new spares as per requirement. Inspection & DPT of gear coupling components.
52. Overhauling pilot valves of main control valve and aux control valve if required, fitting of all oil, water & steam piping etc. normalization of lube oil and control oil system.
53. Servicing of emergency speed governor including fly bolts: repair and replacement of emergency speed governor as per requirement after proper matching with rotor. Adjust over speed device if required.
54. Inspection of turning gear: carry out DPT and repair & replacement as per requirement.
55. Removal damaged seal fins from rotor / casing as per requirement.
56. Mounting of new seal fins in rotor / casing as per requirement
57. Final box up front/ rear bearing pedestals, turning gear and overhauling and box up of hand barring gear.
58. Providing manpower assistance for mounting of C&I instrument.
59. Carry out oil flushing of lube oil and control oil system until values are achieved and attending of defects if any. Setting of turbines JOP shaft lift.
60. Checking & setting of turbine governing characteristics. Governing system devices servicing if required.
61. De-coupled trial run of drive turbine and over speed of drive turbine. Attending of defects if any.
62. Installation of coupling between drive turbine-BFP, coupling between turbine gearbox and gear box- booster pump.
63. Removal, cleaning and assembly of seal steam associated pipe lines.
64. Arrangement for steam flushing of seal steam lines and normalization.

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65. Inspection and servicing of seal steam supply and leak off control valves.
66. Trial run of TDBFP with pump and attending of defects if any

OVERHAULING OF GEARBOXES OF TDBFP-A&B

1. Thorough inspection & cleaning of internals of Gear boxes
2. Inspection of tooth, journals of pinion & gear wheels (visual DP, check & measurement of journals) and checking of backlash of pinion & gear wheels
3. Inspection of all bearings (i.e. Visual, DP & UT Test). Recording of bearing clearances & interferences and replace the same if required.
4. Blue matching of bearings, placement of bottom half bearings pinion & gear wheel
5. Inspection of high speed & low speed couplings

COMPLETE OVERHAUL OF BOOSTER PUMP OF TDBFP-A & B.

1. Removal of top casing & rotor assembly
2. Inspection of DE & NDE sides Mechanical Seals & Cooling water jackets and Replacement of same if necessary
3. Inspection of Journal Bearing for both DE & NDE sides and Thrust Bearing (Visual, DP & UT Test). Recording of bearing clearances & interferences and replace the same if required.
4. Cleaning & Inspection of pump parts like pump shaft, impeller & coupling halves, dimensional checks & recording
5. Thorough inspection, cleaning & replacement of damaged gaskets at parting plane & cooling water jackets.
6. Replacement of Strainers and Gaskets of BFP and Booster pumps. Flushing of Booster pump and BFP lines.
7. BP and BFP jacket cooling water lines flushing and new gasket replacement.
8. BP and BFP seal cooling water lines flushing and new gasket replacement.
9. BP and BFP jacket cooling water lines, seal water lines valves replacement if required.
10. Exhaust butterfly valve inspection and seal replacement.
11. Erection of additional bypass valve to Exhaust butterfly valve.
12. Inspection and replacement of exhaust diaphragm with new gasket.
13. Inspection of seal steam system supply and leak off control valves and reassembly with new gasket.
14. Steam blowing and normalization of seal steam supply line.
15. Inspection of gland steam line butterfly valve and seal and gasket replacement.
16. If any additional work required during inspection work to be carried out.

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OVERHAUL WORKS RELATED TO LUBE OIL SYSTEM OF TDBFP-A&B

1. Checking the healthiness of Accumulators of TDBFP-A&B and Replacement if necessary
2. Overhauling of AOP of TDBFP-A & TDBFP-B
3. Overhauling of Upstream & Downstream Pressure Control Valves in Lube Oil System of TDBFP-A&B
4. Overhauling of DCEOPs & JOPs of TDBFP-A&B.
5. Overhauling of Transfer oil pumps.
6. OVEF Dismantling, Overhauling and Assembly.
7. Overhauling/Cleaning/Replacement of Filters, 3 Way Valves, Lubrication Oil pressure control valves, PRV's.
8. Cleaning of MOTs (2 Nos.) & Lube Oil Coolers (4 Nos.) of TDBFP-A&B
 - a. Draining of oil from the Tanks to spare tanks/oil barrels
 - b. Cleaning of the Tanks & thorough inspection of Tank internals & welding joints
 - c. Refilling of tanks with new oil
 - d. Draining of oil from coolers & Cleaning of pipes with suitable methods
 - e. Assembly & Hydraulic Test of coolers
 - f. Oil Flushing of both TDBFP-A&B and Commissioning.
9. Cleaning of MOTs (2 Nos.) & Lube Oil Coolers (4 Nos.) of TDBFP-A&B. Boxup & Hydraulic Testing of Lube oil coolers.

INSPECTION, TESTING & REVISIONING OF GOVERNING ELEMENTS OF TDBFP-A&B

1. Inspection & Testing of all the components in the Governing rack along with tripping device on front bearing pedestal of both TDBFP-A&B.
2. Rectification of oil leaks in the Governing racks of both TDBFP-A&B.
3. Governing calibration and fine tuning of Governing System for smooth operation of ESVs, ACVs & MCVs.

VALVES

Dismantling, Inspection, Rectification of Feed Water Discharge and Suction Valves of BFP's, APRDS Isolation and Pressure reducing valves, BFP Recirculation Valves, cooling water valves. Tentative scope is as follows

- a. Lifting of actuator along with motor
- b. Removal of bonnet cover
- c. Removal of split rings, pressure seal ring & bonnet
- d. Removal of stem & wedge
- e. Inspection of valve internals
- f. Cleaning & Replacement of damaged parts with available new parts

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- g. Reconditioning of valve by lapping valve gate/globe using lapping surface plate & valve seat using In-situ valve lapping machine to achieve perfect seating
- h. Checking the valve seating with blue matching the valve gate/globe seating position
- i. Assembling of dismantled components.
- j. Replacing with new gaskets & gland packings
- k. Assisting for commissioning of valve
- l. Adjusting the setting of valve operation.
- m. Cleaning the area after completion of work

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.21 ITEM NO 21: TURBINE DRIVEN BOILER FEED PUMP AND AUXILIARIES - 2 NOS:

- 1. Decoupling of Complete Train and Removal of Bearings Covers, Bearings etc recording necessary measurements.
- 2. Inspection of all bearings of Boiler Feed Pump (i.e. Visual, DP & UT Test). Recording of bearing clearances & interferences and replace the same if required.
- 3. Inspection of Mechanical Seals of Boiler Feed Pump, replacement if necessary.
- 4. Complete Dismantling of Turbine Driven BFP and inspection of internals. NDT and Dimensional measurement of dismantled components. Replacement of Dismantled components and Re-Assembly of TDBFP. Replacement of Cartridge if Required.
- 5. Checking, Recording & Correction of DBCF of all couplings of TDBFPs and Alignment of Complete Train (BFP-DT, DT -GB & GB-BP) of TDBFPs.

VALVES

Dismantling, Inspection, Rectification of Feed Water Discharge and Suction Valves of BFP's, APRDS Isolation and Pressure reducing valves, BFP Recirculation Valves.

Tentative scope is as follows

- a. Lifting of actuator along with motor
- b. Removal of bonnet cover
- c. Removal of split rings, pressure seal ring & bonnet
- d. Removal of stem & wedge
- e. Inspection of valve internals
- f. Cleaning & Replacement of damaged parts with available new parts
- g. Reconditioning of valve by lapping valve gate/globe using lapping surface plate & valve seat using In-situ valve lapping machine to achieve perfect seating
- h. Checking the valve seating with blue matching the valve gate/globe seating position
- i. Assembling of dismantled components.

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- j. Replacing with new gaskets & gland packings
- k. Assisting for commissioning of valve
- l. Adjusting the setting of valve operation.
- m. Cleaning the area after completion of work

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.22 ITEM NO 22: MOTOR DRIVEN BOILER FEED PUMP AND AUXILIARIES (01 NO):

1. Decoupling of Complete Train and Removal of Bearings Covers, Bearings etc recording necessary measurements.
2. Inspection of all bearings of Boiler Feed Pump (i.e. Visual, DP & UT Test). Recording of bearing clearances & interferences and replace the same if required.
3. Inspection of Mechanical Seals of Boiler Feed Pump, replacement if necessary.
4. Complete Dismantling of MDBFP and inspection of internals. NDT and Dimensional measurement of dismantled components. Replacement of Dismantled components and Re-Assembly of MDBFP. Replacement of Cartridge if Required.
5. Checking, Recording & Correction of DBCF of all couplings of MDBFP-C and Alignment of Complete Train (BFP-HC, HC-Motor & Motor-BP) of MDBFP.
6. Overhauling of AOP of MDBFP
7. Cleaning of working oil cooler & Lube Oil Coolers (4 Nos.) of MDBFP
 - a. Draining of oil from the Voith coupling Tanks to spare tanks/oil barrels
 - b. Cleaning of the Tanks & thorough inspection of Tank internals & welding joints
 - c. Refilling of tanks with oil
 - d. Draining of oil from coolers & Cleaning of pipes with suitable methods
 - e. Assembly & Hydraulic Test of coolers
 - f. Oil Flushing and Commissioning.
8. Cleaning of Voith tank, Working Oil Coolers, Lube Oil Coolers (4 Nos.) of MDBFP, Boxup & Hydraulic Testing of oil coolers.

OVERHAULING OF VOITH COUPLING OF MDBFP

1. Thorough inspection & cleaning of internals of Voith coupling
2. Inspection of all bearings (i.e. Visual, DP & UT Test). Recording of bearing clearances & interferences and replace the same if required.
3. Blue matching of bearings, placement of bottom half bearings pinion & gear wheel
4. Inspection of AOP and MOP
5. Inspection of high speed & low speed couplings.

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6. Vendor needs to be called during inspection and all the works need to be carried along with them.

COMPLETE OVERHAUL OF BOOSTER PUMP OF MDBFP

1. Removal of top casing & rotor assembly
2. Inspection of DE & NDE sides Mechanical Seals & Cooling water jackets and Replacement of same if necessary
3. Inspection of Journal Bearing for both DE & NDE sides and Thrust Bearing (Visual, DP & UT Test). Recording of bearing clearances & interferences and replace the same if required.
4. Cleaning & Inspection of pump parts like pump shaft, impeller & coupling halves, dimensional checks & recording
5. Thorough inspection, cleaning & replacement of damaged gaskets at parting plane & cooling water jackets.
6. Replacement of Strainers and Gaskets of BFP and Booster pumps. Flushing of Booster pump and BFP lines.
7. BP and BFP jacket cooling water lines flushing and new gasket replacement.
8. BP and BFP seal cooling water lines flushing and new gasket replacement.
9. BP and BFP jacket cooling water lines, seal water lines valves replacement if required.
10. If any additional work required during inspection work to be carried out.

VALVES

1. Dismantling, Inspection, Rectification of Feed Water Discharge and Suction Valves of BFP's, BFP Recirculation Valves, cooling water valves.
2. Tentative scope is as follows
 - a. Lifting of actuator along with motor
 - b. Removal of bonnet cover
 - c. Removal of split rings, pressure seal ring & bonnet
 - d. Removal of stem & wedge
 - e. Inspection of valve internals
 - f. Cleaning & Replacement of damaged parts with available new parts
 - g. Reconditioning of valve by lapping valve gate/globe using lapping surface plate & valve seat using In-situ valve lapping machine to achieve perfect seating
 - h. Checking the valve seating with blue matching the valve gate/globe seating position
 - i. Assembling of dismantled components.
 - j. Replacing with new gaskets & gland packings
 - k. Assisting for commissioning of valve
 - l. Adjusting the setting of valve operation.

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m. Cleaning the area after completion of work

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.23 ITEM NO 23,24,25: OVERHAULING OF ELECTROMATIC RELIEF VALVES (ERV-7 NO'S), OVERHAULING OF STEAM GENERATOR OUTLET MANUAL SAFETY RELIEF VALVES (SRV-16 NO'S), OVERHAULING OF SRV'S OF HP/LP HEATERS, LSR STEAM DRUM, ETC (12 NO'S):

1. Inspection, servicing and testing of valves
2. Replacement of the required spares
3. Reassembly of valves and hydro test
4. Pressure setting during commissioning
5. If any additional work required during inspection work to be carried out.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.24 ITEM NO 26: OVERHAULING OF SEAL OIL SYSTEM

1. Functional check of all seal oil pumps and Motors.
2. Inspection and servicing of all the seal oil pumps, Bearing chamber exhaust fans and relief valves.
3. Cleaning of Seal oil tanks and seal oil storage tank.
4. Servicing of check valves,
5. Servicing of DPR valves, Equalizing Valves and reassembly with new gaskets
6. Servicing of SOT float valves
7. Flushing of seal oil system and impulse lines
8. DP test on welding joints of all seal oil pipelines including supply of standard DP material.
9. Cleaning of H2 & Air side seal oil coolers (Tube & Shell side) and Filters.
10. Normalization of seal oil system.
11. Replacement of all flange gaskets with new oil gaskets.
12. Servicing of all seal oil coolers, hydrotest and re assembly.
13. Inspection of air side and H2 side seal oil filter and replacement with new one if required.
14. Servicing of all flow meters and gasket replacement.
15. Servicing/checking for proper operation of remaining valves in valve rake and seal oil skid in 0 meter.

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16. Flushing of cooling water lines of seal oil cooler and normalization with new gasket.
17. Inspection and servicing of cooling water valves if required
18. Modification of Hydrogen impulse line to downstream of pre-chamber drain syphon.
19. Cleaning and re assembly of air side and H2 side seal oil impulse line.
20. Inspection motors bearing and replacement if required (Air side seal oil pump1, 2, H2 Side SOP and air side DC SOP).

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.25 ITEM NO 27: MECHANICAL PIPING SYSTEM & MISC EQUIPMENTS

Inspection of various piping system & misc equipment, joints, flanges, hangers & supports, insulation, etc & submission of report on healthiness of the system to EIC. The scope under this item includes comprehensive inspection, assessment, and reporting of the healthiness and operational condition of all mechanical piping systems and associated components installed. The work shall broadly cover the following activities:

Detailed visual inspection of all accessible process and utility piping systems for:

1. Leakage, seepage, sweating, or signs of failure
2. Corrosion, erosion, pitting, scaling, denting, deformation, and mechanical damage
3. Vibration marks, misalignment, excessive stresses, and abnormal conditions
4. Condition of pipe surface coating/painting and anti-corrosion protection
5. Identification of unsupported or improperly supported piping sections
6. Verification of pipe routing and accessibility
7. Examination of welded joints, threaded joints, socket welds, expansion joints, and couplings.
8. Verification of joint integrity and condition of gaskets/sealing arrangements wherever accessible.
9. Detailed inspection of all pipe supports, hangers, clamps, guides, anchors, spring supports, and structural attachments.
10. Preparation and submission of detailed inspection reports indicating:
 11. System-wise observations
 12. Defects/anomalies identified
 13. Recommendations for repair, replacement, strengthening, re-insulation, or corrective actions.
14. Submission of healthiness assessment report of the piping system to the Engineer-in-Charge (EIC).

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15. Marking of unsafe/critical locations requiring immediate attention.
16. Necessary access arrangements, tools, measuring instruments, ladders/scaffolding coordination, and manpower required for inspection shall be included in the scope unless specifically excluded.
17. Visual Inspection
 - Piping Condition:
 - To inspect all pipes for visible signs of corrosion, cracks, wear, or any external damage (e.g., dents, gouges).
 - To check for any signs of leakage around joints, flanges, valves, or welded areas.
 - To ensure that all supports, hangers, and brackets are properly installed, tightened, and in good condition.
 - Flanges and Bolted Connections:
 - To verify that all flanges and bolted connections are torqued to the correct specifications and there is no leakage.
 - To ensure gaskets are in place and not damaged.
 - Expansion Joints and Flexible Hoses:
 - To check the condition of expansion joints and flexible hoses for wear, cracks, or bulges.
 - To ensure there is sufficient clearance around expansion joints to accommodate thermal expansion and movement.
 - Valves:
 - To ensure all valves are properly installed, labelled, and in good working order.
 - To verify that manual and automatic valve actuators (pneumatic, electric, hydraulic) are functioning.
 - To check valve seats for leakage and ensure correct operation during tests (e.g., opening and closing).
 - Insulation:
 - To inspect thermal insulation for damage, wear, or missing sections, ensuring it is properly fitted around piping and equipment.
 - To check for signs of moisture or condensation under the insulation, which can indicate leaks or poor insulation integrity.
18. Pressure and Leak Testing
 - Hydrostatic Pressure Test:
 - To perform a hydrostatic test by filling the piping system with water and pressurizing it to the design pressure.
 - To inspect for any signs of leakage, deformation, or swelling in the pipes.
 - Pneumatic Pressure Test:
 - In certain applications, pneumatic testing with compressed air (at a lower pressure than hydraulic tests) may be conducted to check for leaks.
 - To ensure safety precautions are in place when performing pneumatic tests due to the higher risk of rupture.
 - Leak Detection (if required):
 - Use of ultrasonic, dye penetrant, or gas leak detection methods to find hidden leaks in the piping and equipment.
19. Component Testing
 - Pumps and Compressors:

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- To perform functional testing of all pumps and compressors, including checking for proper alignment, vibration levels, and noise.
 - To verify that seals and bearings are intact and lubricated, and that pumps are primed and ready for operation.
 - To check for smooth start-up, adequate flow rates, and correct pressures.
 - Heat Exchangers:
 - To inspect heat exchangers for proper sealing of gaskets, clean tubes, and correct installation of baffles.
 - Verify pressure ratings and perform tests to ensure that the heat exchange process (e.g., steam to water, air to fluid) is functioning properly.
 - Turbines:
 - To check that turbines are properly aligned and that all bearings and seals are intact and lubricated.
 - Perform rotation checks (by hand or motor) to ensure there is no obstruction or excessive resistance.
 - To verify that turbine blades and vanes are free of cracks or corrosion.
20. Alignment and Fitment
- Mechanical Alignment: Perform alignment checks for pumps, compressors, and motors. Misalignment can lead to increased wear, vibration, and eventual failure. To ensure proper alignment of rotating equipment.
 - Couplings:
 - To check for correct installation of couplings between rotating machinery. Ensure that they are free of wear, cracks, or other damage.
21. Thermal Expansion and Movement
- Thermal Expansion:
 - To check the piping system's ability to accommodate thermal expansion by ensuring there is sufficient clearance for pipes to expand without causing damage to supports or other components.
 - To inspect expansion loops or bellows, ensuring they are free from deformation or cracks.
 - Movement Monitoring:
 - Test and monitor movement of flexible connections, expansion joints, and pipes under different temperature conditions.
 - Confirm that no piping sections are restricted or unduly stressed during thermal expansion.
22. Safety and Compliance Checks
- Safety Valves and Relief Devices:
 - Ensure safety valves, rupture discs, and other protective devices are installed and operating according to design specifications.
 - Verify that these devices are properly calibrated and ready to respond to overpressure or thermal conditions.
 - Pressure Test Documentation:
 - Ensure that all pressure tests (hydrostatic, pneumatic) are documented and comply with plant and regulatory standards.
23. Vibration and Noise Monitoring

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- Vibration Monitoring:
 - Perform vibration checks on rotating equipment (pumps, motors, compressors) to ensure they are operating within specified limits.
 - Ensure there are no unusual vibrations indicating imbalance or misalignment.
- Noise Levels:
 - To check for excessive noise levels from mechanical equipment, which could indicate issues such as cavitation in pumps or faulty bearings in motors.

24. Operational and Functional Testing

- System Start-up:
 - Perform a system start-up and run all equipment in various operational modes (start, idle, load, and shutdown) to ensure everything operates as expected.
 - Monitor system pressures, flow rates, temperatures, and vibration levels during the test.
- System Shutdown:
 - Verify that the system can safely shut down in a controlled manner, including checking for any abnormal temperature or pressure conditions during shutdown.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.26 ITEM NO 28: FD FAN, GATES & DAMPERS:

1. Inspection and servicing of fan internal, bearings and replacement if required.
2. NDT testing of fan internals and reassembly.
3. Inspection motor and replacement of bearing if required
4. Inspection and servicing of dampers, replacement of bearing and commissioning of dampers
5. Inspection and servicing of inlet guide vane.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.27 ITEM NO 29: DE-HUMIDIFICATION AND DRY AIR PRESERVATION SYSTEM:

1. Inspection, servicing of the unit
2. Erection of the unit in position
3. Arrangement of connection from unit to turbine
4. Commissioning of the unit and testing.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

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2.28 ITEM NO 30: TURBINE ACOUSTIC NOISE ENCLOSURE:

1. The scope under this item includes complete material handling, erection, installation, fitting, alignment, fastening, and associated works for Turbine Cladding/Acoustic Enclosure system as per approved drawings, technical specifications, and site requirements.
2. Shifting, stacking, and safe handling of turbine cladding/acoustic enclosure materials from designated storage area to installation location.
3. Ensuring protection of materials against damage, denting, moisture ingress, and deformation during handling and storage.
4. Inspection Prior to Installation:
 - i. Verification of materials against approved drawings and BOM.
 - ii. Inspection of panels and structural members.
 - iii. Identification and reporting of shortages/damages to Engineer-in-Charge (EIC).
5. Installation of Turbine Cladding / Acoustic Enclosure
 - i. Erection and installation of acoustic enclosure/cladding support structures, frames, brackets, and mounting arrangements as per approved drawings.
 - ii. Alignment, positioning, and fixing of acoustic enclosure panels around turbine equipment.
 - iii. Installation of removable panels, inspection covers, and maintenance access doors.
 - iv. Ensuring proper clearances around turbine components, piping, valves, instruments, and rotating parts.
6. Touch-up of damaged paint/coating during installation wherever required.
7. Removal of temporary supports, debris, packing materials, and unused items after completion of work.
8. Cleaning of installed cladding/enclosure surfaces.
9. Joint inspection with Engineer-in-Charge (EIC) after completion of installation.
10. All required manpower, tools & tackles, lifting equipment, scaffolding coordination, consumables, fasteners, safety PPE, and supervision necessary for execution of the work shall be included in the scope unless specifically excluded.
11. All activities shall be carried out in accordance with approved drawings, technical specifications, OEM recommendations, and site safety procedures.

Note: Any minor job, not specifically included in the scope of work but essential for the completion of work, shall be executed by the agency without any extra cost to BHEL as per the instruction of engineer-in-charge.

2.29 ITEM NO 32: INSULATION REMOVAL/DISMANTLING:

Removal/dismantling of existing insulation from equipment, piping, valves, ducts, and associated components including arrangement of required access/scaffolding coordination, tools & tackles, careful dismantling of insulation material and cladding, handling, collection, transportation, shifting, stacking, and storage at designated

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location as directed by Engineer-in-Charge (EIC), including cleaning of work area and disposal of damaged/unusable materials wherever required, complete with all labour, supervision, consumables, PPEs, and safety precautions as per approved procedures and site requirements.

2.30 ITEM NO 33: INSULATION APPLICATION WORKS:

Application of insulation on equipment, piping, valves, ducts, and associated components including arrangement of required access/scaffolding coordination, tools & tackles, handling, transportation, shifting, cutting, fitting, fixing, and installation of insulation material and cladding as per approved specifications and instructions of Engineer-in-Charge (EIC), including fastening, sealing of joints, finishing, cleaning of work area, and completion of work with all labour, consumables, supervision, PPEs, and safety precautions required for proper installation and satisfactory performance of the insulation system.

Note: Required Insulation materials will be supplied by BHAVINI.

2.31 ITEM NO 34: CS PIPING DISMANTLING WORKS:

Cutting, grinding, dismantling, removal, handling, transportation, shifting, and storage of erected carbon steel (CS) piping materials including pipes, fittings, flanges, valves, supports, and associated components at designated location as identified by Engineer-in-Charge (EIC), including arrangement of required tools & tackles, access arrangements, consumables, debris clearance, and safe handling of materials without damage, complete with all labour, supervision, PPEs, and safety precautions, and completion of work to the satisfaction and acceptance of EIC.

2.32 ITEM NO 35: CS PIPING ERECTION WORKS:

Handling, shifting, erection, alignment, cutting, edge preparation, fit-up, welding, testing, and completion of carbon steel (CS) piping works including pipes, fittings, flanges, valves, supports, and associated components as per approved drawings and specifications, including joint preparation, root run, filling and capping, grinding, correction of weld defects, arrangement of consumables, tools & tackles, and execution of required Non-Destructive Testing (NDT) such as DP/RT/UT/MT as applicable, complete with all labour, supervision, scaffolding coordination, PPEs, and safety requirements, including rectification of defects and acceptance of work by Engineer-in-Charge (EIC).

2.33 ITEM NO 36: STRUCTURE & SUPPORTS DISMANTLING WORKS:

Cutting, grinding, dismantling, removal, handling, transportation, shifting, and storage of erected structural steel members, pipe supports, brackets, frames, platforms, hangers, clamps, and associated components at designated location as identified by Engineer-in-Charge (EIC), including arrangement of required tools & tackles, access arrangements, cleaning of dismantled materials, segregation of reusable and scrap materials, preparation and submission of dismantling/material reconciliation reports,

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debris clearance, and completion of work with all labour, supervision, consumables, PPEs, and safety precautions to the satisfaction and acceptance of EIC.

2.34 ITEM NO 37: STRUCTURE & SUPPORTS ERECTION WORKS:

Handling, shifting, erection, alignment, cutting, edge preparation, fit-up, fabrication, welding, installation, and completion of structural steel works including supports, platforms, brackets, frames, hangers, clamps, and associated structural components as per approved drawings and specifications, including grinding, drilling, fastening, correction of weld defects, arrangement of consumables, tools & tackles, and execution of required Non-Destructive Testing (NDT) such as DP/UT/MT as applicable, complete with all labour, supervision, scaffolding coordination, PPEs, and safety requirements, including cleaning, touch-up, rectification of defects, and acceptance of work by Engineer-in-Charge (EIC).

2.35 ITEM NO 38, 39, 40: SERVICING OF VALVES:

Handling, dismantling, removal, servicing, repair, reassembly, erection, alignment, installation, and testing of valves including isolation, opening of valve internals, cleaning, lapping, replacement of gland packing, gaskets, fasteners, seals, bushes, seats, and other worn-out components as required, complete with handling, transportation, shifting, fitment, tightening, operational checking, leak testing, and commissioning, including all labour, tools & tackles, consumables, PPEs, supervision, and safety precautions required for satisfactory operation and acceptance by Engineer-in-Charge (EIC).

2.36 ITEM NO 41: PAINTING APPLICATION:

Surface preparation and painting of equipment, piping, pipe supports, valves, and structural steel members including cleaning of surfaces to remove dirt, oil, grease, rust, and loose paint; application of one coat of approved primer and two coats of approved paint to achieve uniform colour and finish; including touch-up painting, cleaning of spillages, disposal of waste materials, and completion of work with all required labour, tools & tackles, consumables, PPEs, and supervision as per approved specifications and instructions of Engineer-in-Charge (EIC).

2.37 ITEM NO 43: P91 & P22 PIPING WELDING JOINTS:

The scope of work comprises of handling, shifting, alignment, fit-up, edge preparation, welding, grinding, repair welding, preheating, inter-pass temperature control, post-weld heat treatment (PWHT) assistance, and completion of P91 and P22 alloy steel piping joints for pipe-to-pipe, pipe-to-fitting, pipe-to-valve, and pipe-to-equipment connections as per approved drawings, WPS/PQR, technical specifications, and applicable codes. The scope shall include deployment of qualified welders, welding consumables, electrodes/filler wires, baking and holding of electrodes, joint preparation, weld visual inspection, rectification of weld defects, assistance for NDT activities (RT/UT/MT/PT), stage inspections, weld traceability records, protection of weld joints, handling of materials, housekeeping, and all labour, supervision, tools & tackles, equipment,

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PPEs, and safety measures required for completion and acceptance of the welding joints by the Engineer-in-Charge (EIC). Wherever applicable, coordination for PWHT, hardness testing, and final clearance of weld joints shall also be included in the contractor's scope.

Note:

1. Induction Heating Machines shall be provided by BHEL at free of charges. Refer relevant chapter.
2. Required P91 & P22 filler wires & electrodes shall be provided by BHEL at free of cost.

PACKAGE-B: SCOPE OF WORKS

2.38 ITEM NO 31: MANPOWER ASSISTANCE FOR O&M:

1. The scope under this item includes deployment of skilled and experienced manpower for providing Operation & Maintenance (O&M) assistance for a period of three (03) months from the date of synchronization of the unit/system. The deployed manpower shall support smooth operation, monitoring, maintenance assistance, troubleshooting, housekeeping coordination, and operational readiness activities during the stabilization and initial operation period.
2. Duration of Deployment
 - i. O&M manpower assistance shall be provided for a period of three (03) months commencing from the date of synchronization of the unit/system.
 - ii. Manpower deployment shall cover all operational days including holidays, shutdowns, and emergency requirements during the contract period.
3. Scope of O&M Assistance: The deployed manpower shall provide assistance for routine and breakdown-related Operation & Maintenance activities including, but not limited to:
 - a. Operational Assistance
 - i. Assistance during plant start-up, shutdown, trial operation, and stabilization activities.
 - ii. Monitoring of equipment/system operation in coordination with O&M personnel.
 - iii. Assistance in operation of valves, dampers, gates, drives, and auxiliary systems.
 - iv. Support during synchronization, load changes, and operational adjustments.
 - v. Reporting of abnormalities, leakages, vibration, overheating, unusual noise, and unsafe conditions.
 - b. Maintenance Assistance
 - i. Assistance in preventive, predictive, and breakdown maintenance activities.
 - ii. Attending minor rectification works, tightening, alignment checks, lubrication assistance, and cleaning activities.
 - iii. Support for dismantling, inspection, reassembly, and replacement activities during maintenance works.

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- iv. Assistance in handling tools, tackles, consumables, and maintenance equipment.
 - c. Equipment Monitoring
 - i. Regular monitoring of rotating and static equipment condition.
 - ii. Observation of system parameters and reporting deviations to Engineer-in-Charge (EIC)/O&M team.
 - iii. Identification of unsafe or abnormal operating conditions.
 - d. Housekeeping and Area Upkeep
 - i. Maintaining cleanliness of work areas associated with O&M activities.
 - ii. Removal of maintenance debris and ensuring safe access around equipment.
 - iii. Assistance in maintaining operational readiness of the plant area.
4. O&M manpower assistance for 03 months from the date of synchronization.
Manpower required to be deployed for this activity:
 - i. Experienced supervisor: 01 no
 - ii. Safety supervisor – 01 no
 - iii. Main fitter & supporting team – 10 nos
5. Shift Coverage
 - i. The above minimum manpower shall be deployed in all three (03) shifts on a round-the-clock basis.
 - ii. Adequate relievers/substitutes shall be arranged by the contractor to ensure uninterrupted manpower availability during weekly offs, leave periods, absenteeism, or emergencies.
 - iii. Shift deployment schedule shall be prepared in coordination with Engineer-in-Charge (EIC).
6. Tools, Tackles and Consumables
 - i. Contractor shall provide all required routine tools, tackles, hand tools, PPEs, and general consumables necessary for execution of the work.
 - ii. General consumables shall include items such as:
 - a. Grease, cleaning materials, cotton waste
 - b. Fasteners for routine works
 - c. Lubricants for minor servicing
 - d. Measuring tapes, marking materials, etc.
 - e. Specialized tools/equipment, if specifically required, shall be arranged as per site requirement unless otherwise specified.
7. Safety and Compliance
 - i. All manpower deployed shall be experienced, medically fit, and trained for industrial/O&M activities.
 - ii. Contractor shall ensure compliance with:
 - Site safety regulations
 - Permit-to-work system
 - PPE requirements
 - Statutory labor laws and insurance requirements

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- iii. Proper identity cards, safety gear, and statutory compliance documents shall be maintained throughout the contract period.
8. Documentation and Reporting
- i. Daily manpower attendance and shift deployment records shall be maintained and submitted to EIC.
 - ii. Daily/weekly activity reports covering works attended, observations, breakdown assistance, and pending issues shall be submitted.
 - iii. Incident/unsafe condition reports shall be submitted wherever applicable.
9. General Conditions
- i. Contractor shall ensure continuous availability of manpower throughout the contract duration without interruption.
 - ii. Any additional manpower required for safe and timely execution of urgent/emergency activities shall be arranged by the contractor as directed by Engineer-in-Charge (EIC).
 - iii. All activities shall be carried out in accordance with approved procedures, OEM recommendations, and site operational requirements.

2.39 ITEM NO 42: STEAM BLOWING WORKS:

1. Contractor shall lay the temporary pipelines with fittings, accessories and erection & commission of pumps, tanks and other installations as instructed by BHEL Engineer for the purpose of chemical cleaning/alkali flushing/steam blowing/ steam washing/ steam flushing/water flushing/ water washing/oil flushing etc., of piping and other equipments are within the scope of work. Necessary materials for this will be provided by BHEL. Overhauling / cleaning / revisioning /servicing of valves, fittings in temporary system and acid cleaning tanks for re-commissioning activities / operation like water flushing / steam blowing / washing / flushing / passivation / chemical cleaning etc. and also over hauling / revisioning of the pumps & equipment's and also to carry out the repairs to attend leaks etc. in the temporary piping & equipment's, prior & while carrying out the above operations/activities. All the above works are within the scope of work. All the chemicals will be supplied by BHEL free of cost.
2. Chemical cleaning (Acid cleaning of piping/alkali flushing) will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves, and installation of temporary tanks for chemical and for mixing. Necessary temporary access platforms to mixing tank are to be made by the contractor. The dissolving tank, neutralizing tank etc. required for acid pickling will have to be carried out by the contractor. Required materials will be provided by BHEL free of cost. Chemicals for chemical Cleaning will be provided by BHEL. All other consumable are to be provided by the contractor.
3. Contractor shall lay all necessary electric cables, switches, etc. required for flushing etc., and maintain the system till the tests are completed satisfactorily.
4. Steam blowing of system piping if required will involve laying of temporary pipe

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lines, valves, etc and dismantling & restoration of piping. The required steam shall be provided at a central point by BHEL.

5. Raw materials for all temporary piping necessary for conducting Hydraulic test, Chemical cleaning, Steam blowing, Flushing, effluent disposal, etc. will be provided by BHEL free of cost. However, fabrication, servicing, erection and dismantling the same and return of the temporary piping, flanges, valves etc. to BHEL stores is the responsibility of the contractor without any extra charges.
6. For conducting Hydro test / steam blowing of MSL, CRH&HRH internals of valves and NRVs (LP BP, ESV, IV & LP BP Valves & NRVs) are to be removed, Hydro Test devices are to be fixed and after Hydro Test the internals are to be re-assembled by the contractor as instructed by BHEL without any additional cost.

2.40 EXCLUSIONS:

1. All Civil works
2. All the Electrical and C&I works
3. Turbine Insulation removal & application
4. Supply of required spares & erection material which go into the equipment.
5. Temporary piping materials for steam blowing/Chemical cleaning.
6. Special T&Ps, if any, supplied by the respective equipment manufacturer shall be provided by customer on returnable basis.
7. Service calls, inspection visits, supervision, troubleshooting assistance, or deputation of service engineers from OEMs/vendors for bought-out equipment are not within the scope of the contractor. Any such services, if required, shall be arranged separately by BHEL/Owner. However, the contractor shall provide necessary coordination and manpower assistance during such inspections/services as instructed by Engineer-in-Charge (EIC).

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VOLUME-IA PART – I CHAPTER – III FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR/ BHEL SCOPE MATRIX

Sl.No.	Description	Scope to be taken care by		Remarks
		BHEL	BIDDER	
	PART-I			
1.3.1.1.0	ESTABLISHMENT			
1.3.1.1.1	FOR CONSTRUCTION PURPOSE:			
A	Open space for office	Yes		Free of charges as provided by BHAVINI. Location will be finalized after joint survey.
B	Open space for storage/T&P	Yes		Free of charges as provided by BHAVINI. Location will be finalized after joint survey.
C	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	At bidder's own cost
D	Bidder's all office equipment's, office/ store/ canteen consumables		Yes	At bidder's own cost
E	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	At bidder's own cost
F	Firefighting equipment's like buckets, extinguishers etc.		Yes	At bidder's own cost
G	Fencing of storage area, office, canteen etc. of the bidder		Yes	At bidder's own cost
1.3.1.1.2	FOR LIVING PURPOSES OF THE CONTRACTOR'S PERSONNEL			
A	Open space for labour colony		Yes	At bidder's own cost. Contractor has to make his own arrangements for shelter and transportation of labours as per requirement.
B	Living accommodation		Yes	At bidder's own cost

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1.3.1.2.0 ELECTRICITY				
Sl.No.	Description	Scope to be taken care by		Remarks
		BHEL	BIDDER	
1.3.1.2.1	Electricity For construction purposes	Yes		Free of charge
1.3.1.2.2	Single/Multi point source (In general)	Yes		Free of charge
1.3.1.2.3	Further distribution for the work to be done which include supply of materials and execution		Yes	At bidder's own cost
1.3.1.2.4	Electricity for the office, stores, canteen, labour colony, etc of the bidder which include:		Yes	At bidder's own cost
A.	Distribution from single point including supply of materials and service		Yes	At bidder's own cost
B.	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	At bidder's own cost
1.3.1.2.5	Duties and deposits including statutory clearances for the above		Yes	At bidder's own cost
1.3.1.2.6	Demobilization of the facilities after completion of works		Yes	At bidder's own cost
1.3.1.2.7	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	At bidder's own cost
1.3.1.3.0 WATER SUPPLY				
1.3.1.3.1	For construction purposes:	Yes		Free of charge
1.3.1.3.2	Making the water available at single point	Yes		Free of charge
1.3.1.3.3	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost
1.3.1.3.4	Water supply for bidder's office, stores, canteen, labour colony, etc.		Yes	At bidder's own cost
A	Making the water available at single point		Yes	At bidder's own cost
B	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost

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1.3.1.4.0	LIGHTING			
1.3.1.4.1	For construction work (supply of all the necessary materials) a. At office storage area b. At the labour hutment		Yes	At bidder's own cost
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) a. At office storage area b. At the labour hutment		Yes	At bidder's own cost
1.3.1.5.0	COMMUNICATION FACILITIES for site operations of the bidder			
1.3.1.5.1	Telephone, internet, E-mail, PC & Printer etc		Yes	At bidder's own cost
1.3.1.6.0	COMPRESSED AIR SUPPLY			Free of charges, further distribution in bidders' own cost.
1.3.1.7.0	TRANSPORTATION			
1.3.1.7.1	For site personnel of the bidder		Yes	At bidder's own cost
1.3.1.7.2	For bidder's equipment's & consumables (T&P, Consumable etc)		Yes	At bidder's own cost
1.3.1.8.0	DEMOBILIZATION OF ALL THE ABOVE FACILITIES		Yes	At bidder's own cost

	PART-II			
	CONSTRUCTION FACILITIES			
1.3.2.1.0	Engineering works for construction			
1.3.2.1.1	Providing the construction drawings for all the equipment covered under this scope	Yes		As per Requirement
1.3.2.1.2	Detailed drawings for Commissioning	Yes		
1.3.2.1.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small-bore pipes		Yes	In consultation with BHEL
1.3.2.1.4	Shipping lists etc for reference and planning the activities			Not Applicable
1.3.2.1.5	Preparation of site schedules and other input requirements		Yes	In consultation with BHEL, as per requirement of BHEL targets
1.3.2.1.6	Review of performance (Form-14) and revision of site construction schedules in		Yes	

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	order to achieve the end dates and other commitments			
1.3.2.1.7	Weekly construction schedules based on SI No 1.3.2.1.5		Yes	
1.3.2.1.8	Daily construction / work plan based on SI No 1.3. 2.1.7		Yes	For daily monitoring meeting at site
1.3.2.1.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months		Yes	At bidder's own cost
1.3.2.1.10	Preparation of preassembly bay, if any required			NA
1.3.2.1.11	Laying of racks for gantry crane if provided by BHEL or brought by the contractor / bidder himself			NA
1.3.2.1.12	Arranging of gate pass for workers from M/s BHAVINI which requires Police verification certificate, Medical certificate and copy of Aadhaar card as per BHAVINI procedure		Yes	At bidder's own cost
1.3.3.0	OPEN SPACE			
	<p>Minimum Open space as made available by customer will be provided at free of charges to the contractor, for construction of temporary office shed and storage area.</p> <p>BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements</p> <p>Contractor has to make his own arrangements for labour colony. The contractor shall provide adequate water arrangement for drinking/washing/bathing with required toilets, drainage system, and electrification etc. in labour colony at his own cost. Suitable paved area, as & if directed by customer based on hygiene requirement of labour, to be provided in the labour colony at the cost of contractor.</p> <p>The Contractor shall provide adequate arrangements for electricity requirements for labour colony. Location and area requirement for office/storage sheds/ fabrication yard shall be discussed and mutually agreed to.</p>			

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1.3.4.0	ELECTRICITY:
1.3.4.1	In general, Construction power will be provided to the contractor FREE of Cost. The contractor to provide necessary energy meter for measuring the power consumption. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc.
1.3.4.2	Necessary “Capacitor Banks” to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at their cost. Penalty if any levied by customer on this account will be recovered from contractor’s bills.
1.3.4.3	Provision of distribution of electrical power from the given points to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State/ BHEL / their customer with appropriate statutory requirements shall be the responsibility of the bidder / contractor.
1.3.4.4	BHEL is not responsible for any loss or damage to the contractor ‘s equipment as a result of variations in voltage / frequency or interruptions in power supply.
1.3.4.5	Contractor has to make their own arrangements for their electricity requirement for their labour colony at their cost.
1.3.5.0	WATER
1.3.5.1	Water (DM Water & Raw water) required for construction purposes will be provided at one single point within the plant area free of cost. The contractor to Provide necessary meter for measuring the water consumption. The required pumps & accessories, pipes for drawing water from the given point and further distribution will be arranged by the contractor at their cost to go on without interruptions.
1.3.5.2	Contractor to make his own arrangements for drinking water / water for sanitation for their labour & staff at bidders’ cost.
1.3.6.0	RECORD KEEPING/PROGRESS REPORTING:
1.3.6.1	Two No of computer along with Multi-Function Printer (MFP) of latest configuration (preferably i5 processor, 8 GB Ram, 1 TB Hard disk, with internet provision on all the computers to be arranged by contractor for reporting of daily progress, billing and other similar activities, within the quoted rate.
1.3.7.0	CONSUMABLES:
1.3.7.2	Wherever required electrodes (in their scope) as approved by BHEL shall be arranged by contractor at their cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding, suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL/Customer. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.
1.3.7.3	General electrodes required shall be arranged by the contractor at their cost. The Contractor shall use the Customer approved quality welding electrodes only.
1.3.7.4	Wherever required, the contractor shall provide within finally accepted price / rates, all consumables like welding electrodes all gases (inert, welding, and cutting), soldering

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	material, dye penetrants, radiography films. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials, hardware items etc. required for temporary works such as supports, scaffoldings, bed are to be arranged by them. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by them.
1.3.7.5	Non-availability of any consumables shall not be accepted as a reason for delay in work or any extra claim. Contractor has to make alternate arrangements for completing the work.
1.3.7.6	In the event of failure of contractor to bring necessary and sufficient consumables, BHEL shall arrange for the same at the risk and cost of the contractor. The entire cost towards this along with standard BHEL overhead shall be deducted from the contractor's immediate due bills.
1.3.8.0	MATERIAL SUPPLY:
1.3.8.1	All the equipments & Piping Systems are already erected. BHEL/Customer will supply the spares as required from their respective manufacturing units which are to be replaced/erected/ in the permanent system. Any item required for successful commissioning of the system shall be provided by BHEL, which shall be erected and commissioned by the agency as per the BOQ.
1.3.9.0	POSSESSION OF GENERATORS:
1.3.19.1	Not Applicable
1.3.10.0	LIGHTING FACILITY (with ELCB):
1.3.10.1	For construction work, At Contractor's own cost
1.3.11.0	GASES:
1.3.11.1	All the required gases like LPG / Oxygen / Acetylene / argon /Nitrogen required for work shall be supplied by the Contractor at their cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non-availability of gases cannot be considered as reason for not attaining the required progress.
1.3.11.2	BHEL reserves the right to reject the use of any gas in case required purity is not maintained.
1.3.11.3	The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
1.3.11.4	The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal working place with proper security etc.

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1.3.12.0	POWER REQUIREMENT:
1.3.12.1	For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum kW demand before starting the work at site to BHEL Site Engineer.
1.3.13.0	CONTRACTOR'S OBLIGATION ON COMPLETION:
1.3.13.1	On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and levelled and debris shall be removed as per instruction of BHEL by the contractor at their cost. In the event of their failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

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VOLUME-IA PART – I CHAPTER – IV

T&Ps TO BE DEPLOYED BY CONTRACTOR

- 1.4.1** All the tools & plants including the consumables required for this scope of work, are to be arranged by the contractor within the quoted rates.
- 1.4.2** The contractor is required to arrange all the T&Ps for the satisfactory completion of the work.
- 1.4.3** Major Tools & Plants including the required slings & ropes, clamps, etc. and the consumable like diesel, lube oil, etc. are in the scope of the contractor and are essential to the contract.
- 1.4.4 Major T&P:** Major Tools & Plants (T&P) shall be arranged by the Contractor for execution of work as per Technical Conditions of Contract of this tender within the quoted rate as mentioned below.

Sr No	Description of Equipment's	Deployment Period		
		Tentative Quantity	Tentative Deployment	Tentative Duration
1.	Pick & carry type tyre mounted mobile crane - 12 MT or above capacity.	01 no	As per site requirement	To be deployed as per work requirement and as per instruction of BHEL Engineer.
2.	Trailer with prime mover	01 no	As per site requirement	To be deployed as per work requirement and as per instruction of BHEL Engineer.
3.	Ultrasonic testing Instrument with recording facility. /Radiography Testing Equipment.	As per site requirement		To be deployed as per work requirement and as per instruction of BHEL Engineer.
4.	Borescope	As per site requirement		To be deployed as per work requirement and as per instruction of BHEL Engineer.
5.	Induction Heating Coils	As per site requirement		To be deployed as per work requirement and as per instruction of BHEL Engineer.

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1.4.5 Other T&Ps: The following Other Tools & Plants (T&P) shall be arranged by the Contractor for execution of work as per Technical Conditions of Contract of this tender within the quoted rate.

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
1	Welding Machines	As per requirement	As per requirement	As per requirement
2	Gas cutting Machine	As per requirement	As per requirement	As per requirement
4	Mother oven, Portable oven & Transfer oven for welding electrodes	As per requirement	As per requirement	As per requirement
5	RT source with camera	As per requirement	As per requirement	As per requirement
6	UT machine, X-ray machine	As per requirement	As per requirement	As per requirement
7	Radiography film viewer	As per requirement	As per requirement	As per requirement
8	RT film Digitization equipment	As per requirement	As per requirement	As per requirement
9	Electric/hand winch	As per requirement	As per requirement	As per requirement
10	Battery Driven emergency light	As per requirement	As per requirement	As per requirement
11	Scaffolding materials with forged clamps	As per requirement	As per requirement	As per requirement
12	Portable grinding m/c	As per requirement	As per requirement	As per requirement
13	Chain pulley blocks / Hoisting and pulley devices/pulleys	As per requirement	As per requirement	As per requirement
14	Hydraulic Jacks	As per requirement	As per requirement	As per requirement
15	Dewatering pumps (Electrical & Diesel)	As per requirement	As per requirement	As per requirement
16	Equipment for carrying out NDT test like LPI/MPI etc along with consumables.	As per requirement	As per requirement	As per requirement
19	Hydraulic test/pressurizing pump (Along with Suitable/calibrated Pr. Gauges)	As per requirement	As per requirement	As per requirement

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1.4.6 Tentative List of T&Ps for the job is mentioned below. Contractor has to arrange T&Ps as may be required for successful completion of the job. T&Ps are to be mobilized by Contractor as and when required to match the work schedule & complete the job on time. BHEL has the authority to penalize the Contractor suitably including termination of contract if the required/necessary T&P's are not mobilized in time for successful completion of job.

S.No	Description	Quantity
	MEASURING TOOLS	
1.01	Dial Indicator with Magnetic Base	10 sets
1.02	Dial indicator – button type and LASTWARD (3 mm travel, 25 mm dia dial with links for coupling alignment)	2 set each
1.03	Slip gauge upto 10 mm	1 set
1.04	Micro-head level, accuracy 0.1 mm per metre, 150 mm long	1 no.
1.05	Square level for leveling major parts for installation (accuracy 0.1 mm, 150 mmX150 mm)	1 no.
1.06	Vernier Caliper 150 mm and 300 mm	1 no. each
1.07	Set of spring caliper and divider(150 mm)	1 set
1.08	Zenith caliper for marking (150 mm)	1 no.
1.09	Steel Scale 150 mm, 300 mm, 1000 mm	2 nos each
1.10	Telescopic gauge up to 150 mm	1 set
1.11	Bore dial gauge up to 75 mm	1 set
1.12	Inside micrometer up to 1500 mm	1 set
1.13	Outside micrometer 0-25 mm	2 nos
	Outside micrometer 0-50 mm	1 no
	Outside micrometer 50-200 mm	1 no
	Outside micrometer 200-300 mm	1 no
	Outside micrometer 300-400 mm	1 no
	Outside micrometer 400-500 mm	1 no
	Outside micrometer 0-25 mm	1 no
1.14	Taper Gauge up to 20 mm	1 no
1.15	Taper gauge 0.1 – 10 mm	1 no
1.16	Feeler gauge 100 mm, 200 mm, 300 mm long (from 0.03 to 1.0 mm thick)	1 set each
1.17	Feeler strip 0.03 mm, 0.04 mm, 0.05 mm, 0.10 mm X 300 mm long	5 each
1.18	Thread Gauge M4 to M56	1 set
1.19	Depth micrometer	1 no
1.20	Surface plate 300 mm X 300 mm	1 no
1.21	Combination set	1 no
1.22	Ball pen gauge for 3 to 10 mm bore	1 set
1.23	Measuring steel tape 3 M, 15 M	2 each
1.24	24 500 V hand / motorized megger	1 no
1.25	1000 V hand / motorized megger	1 no
1.26	250 V megger	1 no

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1.27	3 1/2 Digit digital multimeter	1 no
1.28	Lever type dial gauge for centering	1 no
	CUTTING TOOLS	
2.01	Tap set M 5 to M42 (including M27 & m 33)	1 set each
2.02	Die set M 14 to M 65	1 set each
2.03	Pistol Drill 6 mm	2 nos
	Pistol Drill 15 mm	1 no
	Pistol Drill with magnetic stand 19 mm	1 no
2.04	Straight grinder GQ 4	3 nos
2.05	Angle grinder AG 7 and AG 5	2 nos. each
2.06	Pistol grinder	1 no
2.07	Flexible grinder with necessary accessories	2 nos
2.08	Bench grinder 150 mm	1 no.
2.09	Hole punch up to 32 mm	1 set
2.10	Easy out up to M 24	1 set
2.11	Taper reamer up to 18 mm	1 set
2.12	Hand ratchet	2 nos
	LIFTING TOOL	
3.01	Sling- 8 mm, 2.5 metre long tip to tip along with 150 mm eye at both end	1 pair
3.02	Sling 12 mm, eye at both end of 300 mm, 1.5 metre long	1 pair
	Sling 12 mm, eye at both end of 300 mm, 2.5 metre long	1 pair
	Sling 12 mm, eye at both end of 300 mm, 3.5 metre long	1 pair
3.03	Sling 19 mm, eye at both end of 450 mm, 2.0 metre long	1 pair
	Sling 19 mm, eye at both end of 450 mm, 3.0 metre long	1 pair
3.04	Sling 25 mm, eye at both end of 450 mm, 3.0 metre long	1 pair
	Sling 25 mm, eye at both end of 450 mm, 6.0 metre long	1 pair
3.05	Eye bolt 10, 12, 14 & 16	4 nos. each
3.06	Eye bolt 20, 24, 27, 36 & 42	2 nos. each
3.06	D-shackles pin dia. 10 mm, 12 mm	5 pairs each
3.07	D-shackles pin dia. 20 mm, 25 mm, 32 mm, 36 mm & 44 mm	1 pair each
3.08.	Ratchet hoist 0.5 T	1 no
3.09	Chain block 2 T, 5 T	1 no. each
3.10	Manila rope 25 mm, 30 metre long	1 pair
3.11	Cotton rope 25 mm, 10 metre long	1 no
	OTHER T & P	
4.01	Gas welding machine	1 set
4.02	Hand lamp with 30 metre cable	6 nos
4.03	Switch board with 50 metre cord	2 nos
4.04	Scissors-300 mm	1 set
4.05	Shim cutter – 350 mm	1 set
4.06	Magnifying glass – 75 mm dia	1 no
4.07	Mirror with handle	1 no
4.08	Vacuum cleaner	1 no
4.09	Carpenter's saw	1 no

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4.10	Carpenter's chisel	3 nos.
4.11	Open <D= D.E. spanner 36X41, 41X46	2 nos. each
4.12	S.E. span <D= spanner 46, 50, 55, 65, 70, 75, 80, 85, 90, 95, 100, 105	1 no each
4.13	Slogging spanners 36, 41, 55, 65	2 nos. each
4.14	Slogging spanner 46 mm	4 nos
4.15	Slogging spanners 50, 60, 70, 75, 80, 85, 90, 95, 100, 105	1 each
4.16	Box spanner set with straight handle, ratchet handle, universal extension piece – all heavy duty, up to 46 mm	1 set
4.17	Tubular spanner 20 to 46 mm	1 set
4.18	Allen key set 4 to 27	2 sets
4.19	Pipe wrench 150, 350 & 450 mm	1 no. each
4.20	Slide wrench 200 mm, 300 mm	2 nos. each
4.21	Spray gun for generator varnishing / painting with necessary high pressure hose	1 no.
4.22	High pressure air hose at least 30 metre long	1 no.
4.23	Tubular spanner	1 set
4.24	Gland packing remover	1 set
	HAND TOOLS	
5.01	Chisels (Chrome-Vanadium) 1 mm	6 nos
5.02	Center punch (Chrome-Vanadium) small & big	1 each
5.03	Letter punch – 4 mm size	1 set
5.04	Number punch – 6 mm size	1 set
5.05	Bearing scrapper – half round and triangular	2 nos. each
5.06	Flat scrapper (made out of 1.5 inch power saw blades and pipes)	8 nos.
5.07	Hammer 250 gms., 500 gms.	1 no. each
5.08	Hammer 1 kg., 2 kg.	3 nos. each
5.09	Hammer 5 kg.	2 nos
5.10	Hammer 8 kg.	1 no.
5.11	Copper Hammer 2 kg.	1 no.
5.12	Lead Hammer 2 kg.	1 no.
5.13	Nylon mallet	3 nos.
5.14	Needle file	2 sets
5.15	Assorted file	4 dozens
5.16	Screw driver 150 mm, 300 mm, 450 mm (Taparia make)	2 nos. each
5.17	Tommy bar 32 mm X 1 metre	1 no.
5.18	Crow bar – big and small	2 nos. each
5.19	Hole bar (Assorted size)	4 nos.
5.20	Hacksaw frame (good quality)	2 nos
5.21	Pliers, cutting nose, grip, O/S circlip, I/S circlip	2 nos. each
5.22	Magnetic needle for dust in small holes	1 no
5.23	Oil stone (rough and smooth)	6 nos. each
5.24	H.S.S. 12 mm square section X 100 mm parallel bits (accurate with 0.01 mm in section)	2 nos
5.25	Copper rod 12 mm dia., 25 mm dia., 50 mm dia., 300 mm length	1 pc. each

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5.26	Bench vice 150 mm	2 nos
5.27	Channel lock 150 mm	2 nos.
5.28	Vice grip 150 mm	1 no
5.29	Cutogen gas cutting set with hose, jubilee clamps and regulators	1 set
5.30	Hydraulic jacks (50 tons capacity)	4 nos
5.31	Welding generators (with lead holder)	1 no
5.32	Brazing torch set	2 no
5.33	Cutting nozzle no 19, 20	2 no each
5.34	Hydraulic jacks (25 tons and 100 tons capacity)	4 nos. each

The above list of T&P's is not exhaustive but indicative only and any shortage may be made up by the Contractor as may be required for overall job completion.

1.4.7 LIST OF CONSUMABLES TO BE ARRANGED BY THE CONTRACTOR IN ADDITION TO THE NORMAL CONSUMABLES.

S.NO	Description	Quantity
1	Dye penetration test kit	As may be required.
2	Emery paper (fine and coarse)	As may be required.
3	Emery clothes sheets.	As may be required.
4	Eutectic electrode L & T – 670/680	As may be required.
5	Petrol, Diesel	As may be required.
6	Rustolene.	As may be required.
7	25 mm thick planks X 200mm wide X 3000 mm long for keeping dismantled parts	As may be required.
8	Asbestos cloth and asbestos powder.	As may be required.
9	Acetone	As may be required.
10	Stag B, Molykote, Holdtite, M seals, Hylomar, Selastic etc.	As may be required.
11	All consumables as may be required for welding, brazing, gas cutting etc	As may be required.

Any other consumables, supplementary requirement has to be provided by the Contractor for successful completion of the job.

1.4.8 List of suggestive safety Equipment's /PPEs to be included in List of minimum T&P for package:

1.	Safety Net (Conforming IS 11057:1984) Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12mm diameter polypropylene rope (tested as per IS: 5175). Two meters length shall be provided at all four corners.	As per Requirement
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2.	<p>Fall Arrester 'Rope grab fall arrester' & anchorage line. Anchorage Line: 14mm- 16 mm diameter, three strand twisted Polyamide rope.</p> <p>Rope Grab fall arrester: Openable & Guided type Fall Arrester (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope. Material: Nickel Chrome plated Steel. Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN), material: Steel</p> <p>Retractable Fall arrester Block (Range 6 Mtr to 15 Mtr)</p>	As per Requirement
3.	<p>Horizontal life line Stainless Steel Wire rope of 8mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end).</p>	As per Requirement
4.	Height Rescue Kit and Confined space rescue kit	1 No
5.	Lux Meter & Breathe Analyzer	1 No
6.	Multi Gas Meter	1 No
7.	ELCB & RCCB Tester	1 No
8.	Earth Resistance meter	1 No
9.	Scaffolding materials as per EN 74 for hard barricading	As per requirement
10.	Axial Fan with exhaust hood for confined space working and DC Light Unit	Min 2 Nos required for working in the CW Pipeline
11.	Oxygen Meter	1 No
12.	Fire Blanket	As per requirement and instruction of BHEL
13.	Fire resistant tarpaulins	As per requirement and instruction of BHEL
14.	Safety Posters as per BHEL Guidelines	As per requirement and instruction of BHEL
15.	<p>Fire Extinguishers: ABC – 6 Kg: 50 Nos, Co2 – 4.5 Kg: 20 Nos, Foam – 9 Kg: 5 Nos Fire Bucket (set of ¾ buckets) with stand – 10 Nos</p>	As per requirement and instruction of BHEL
16.	Rubber Mat as per IS 15652	As per requirement and instruction of BHEL
17.	Electrical rubber gloves	As per requirement
18.	Water Sprinkling tanker for dust suppression	As per requirement

1.4.9 The above list of T&Ps mentioned is suggestive requirement. However, mobilization schedule as mutually agreed at site for T&Ps, have to be adhered to. Numbers/time of requirement will be reviewed from time to time at site and contractor will provide required T&Ps/equipment to ensure completion of entire work within

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schedule/target date of completion without any additional financial implication to BHEL.

- 1.4.10** In addition to the above, any other tools and plants required for execution of the above work are in contractor's scope.
- 1.4.11** Any special T&P i.e. T&P made available by the manufacture of the equipment to the customer can be made available to the Contractor free of charges subject to availability at site.
- 1.4.12** Any consumables required / recommended for the work against this tender shall have to be mobilized by the Contractor fully at their expenses within the quoted price.
- 1.4.13** APR (As per Requirement)- Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer.
- 1.4.14** Apart from above mentioned T&P, any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL in writing in a reasonable period within two weeks from the written instruction from BHEL.
- 1.4.15** Contractor shall submit the T&P mobilization schedule indicating the quantity and duration of deployment on monthly basis for the entire contract period in mutual concurrence with BHEL Engineer at the time of commencement of work.
- 1.4.16** For Heavy equipment such as crane etc., the age of the contractor deployed Heavy Equipment, at the time of deployment, as indicated above should be less than 15 years from the current year (i.e YR. 2025), at project Site. Contractor has to provide documentary evidence/ proof for age of the crane at the time of deployment to BHEL Engineer.
- 1.4.17** Considering operational safety, contractor to note that Hydra Shall not be used for material transport. agencies have to deploy the New Generation Pick & carry tyre mounted mobile crane of required capacity.
- 1.4.18** Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor's account.
- 1.4.19** Regular maintenance period of one day per month shall be permitted and Preventive maintenance period of six days per year with each spell not exceeding three days shall be permitted for the T&Ps.
- 1.4.20** Contractor has to submit the Calibration certificates of all the precision equipment to BHEL. BHEL may ask for recalibration of the MMEs /precision equipment's for ensuring quality of work. Contractor must re-ascertain/ recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration/ deployment.
- 1.4.21** All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the NABL accredited agencies that are approved by BHEL or calibration tractability is established up to National Test House/Laboratory. Details of all MMDs mobilized to site necessarily be entered into BHELs 'Field Calibration Monitoring System' (FCMS).

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- 1.4.22** Contractor has to arrange slings of all sizes for completing the works covered under these specifications.
- 1.4.23** In the event of need of change of type of any of major T&Ps, approval shall be taken from BHEL Engineer in-charge prior to mobilization. The decision of Number of T&P required due to replacing the enlisted T&P as per above table, shall be taken after analyzing the production capacity and suitability of both the T&Ps.
- 1.4.24** All the T&Ps deployed by the Contractors shall have valid test certificates, fitness certificates, registration certificate, insurance etc. The documentary proof shall be submitted to BHEL engineer along with applicable valid certificates. The contractor shall submit the valid test certificate/calibration certificates for all the T&Ps before put into actual use at site. The certificates shall be renewed time to time as instructed by BHEL Engineer.
- 1.4.25** All above T&Ps are to be deployed by contractor as and when required as per instruction of BHEL engineer. In case Contractor fails to deploy T&Ps as per requirement of BHEL and work gets delayed/hampered due to non-availability of above T&Ps, BHEL reserves the right to deploy own/hired/otherwise arranged resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads/ "BHEL internal hiring rates".
- 1.4.26** Contractor shall have at all times experienced operators and technicians for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant BHEL rectifying the defect and charging the cost to the contractor.
- 1.4.27** Crane operators deployed by the contractor shall be tested by BHEL before they are allowed to operate the cranes.
- 1.4.28** The contractor shall arrange operator, diesel, petrol and other consumables including electrical / water / air connections required for the tools and plants, equipment such as crane, winch, temporary Jhoola, Sky Climber etc. Preventive and routine maintenance of T & P are also to be arranged by the contractor at his cost without any delay. Required number of experienced mechanics and helpers for routine maintenance of the above T&Ps shall be provided by the contractor within his quoted rate.
- 1.4.29** Filling pump, for hydro test shall be arranged by the contractor, if required. For testing CW lines, necessary hydraulic test pumps/ hand pumps are to be arranged by the contractor.
- 1.4.30** Such of those consumables as indicated as consumables provided by BHEL alone will be provided to the contractor by BHEL free of charge for erection activities. Other required consumables like electrodes, all gases, and other materials for this scope of work are to be arranged by the contractor at their cost.
- 1.4.31** Gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.

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1.4.32 The loading, unloading and transportation of contractors T&Ps shall be in the scope of contractor. All necessary items such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor at his own cost.

1.4.33 If the work related to T & Ps mentioned above is completed then, BHEL can release that T&P during contract period / extended period (if any). However, written permission shall be taken by contractor from BHEL Construction Manager and gate pass formalities shall be followed by the contractor for releasing the T&P.

1.4.34 CRANE OPERATOR FOR CRANES PROVIDED BY CONTRACTOR

- i. Must be capable of independently operating hydraulic/ mechanical crawler/ tyre mounted cranes of respective categories.
- ii. Must have minimum 2 years' experience in operation of hydraulic/ mechanical crawler/ tyre mounted cranes in respective categories & hold valid HMV/TRANS license. Should be able to read and interpret the operation and maintenance manual, boom load chart, boom angle and other indicating devices.
- iii. Operator shall have latest physician's certification for their physical fitness in vision with/ without lenses & adequate hearing with or without hearing aid.

1.4.35 If above mentioned T&P are not deployed in specified time BHEL shall reserve right to levy penalty on contractor.

1.4.36 FACILITY TO BE PROVIDED BY THE CONTRACTOR FOR P91/P22 WELDING

- i. Required number of operators/ Technicians/ Electrician for installation, commissioning & operating continuously
- ii. Gas Burners arrangement with required gas for maintaining temperature in the event of power failure
- iii. Ultrasonic Flaw detector with recording device & complete accessories (Digital Type – Krautkramer Model USN 50 or equivalent) capable of storing calibration data. All recordable indications will be stored in memory of digital flaw detector and in PC (to be provided by the contractor) for review at later period.
- iv. EQUOTIP or MICRODUR make or equivalent portable hardness tester.
- v. MPI/LPI Kits with required consumables.
- vi. Consumables
 - a. Glass fibre cloth – 1mm x 1000mm – Temp rating – 1260 Deg C
 - b. Glass fibre cord – Dia 3mm (twisted) Temp rating – 1260 Deg C
 - c. Ceramic fibre Blanket – RT Grade, density 96Kg/M3 - Temp rating – 1260 Deg C
 - d. rating – 1260 Deg C
 - e. Ceramic fibre rope – Fibre Glass braided, Dia 12mm – Temp rating – 1260 Deg C.
 - f. K Type Thermocouple – 0.5mm Dia Single Strand individual fibre glass insulated.
 - g. Heavy duty TC connectors for - K Type Thermocouple – 0.5mm Dia Single

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Strand individual fibre glass insulated.

All other consumables/ equipments required to carry out the work

1.4.37 PENALTY DUE TO NON-AVAILABILITY OF T&PS:

If contractor fails, due to the cases mentioned hereunder, BHEL shall be entitled to impose penalty as applicable on Contractor till any alternate arrangement is made by 'Contractor' OR 'BHEL (on cost recovery basis)'.

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VOLUME-IA PART – I CHAPTER – V

T&PS PROVIDED BY BHEL ON SHARING BASIS

1.5.0.0	T&Ps AND MMEs TO BE DEPLOYED BY BHEL ON SHARING BASIS
1.5.0.1	<p>List of T&Ps to be made available by BHEL to contractor free of hire charges on sharable basis. Operator to be arranged by the contractor within the quoted rates.</p> <ol style="list-style-type: none">1. EOT Crane – 1 No (on Shared basis) <p>Note: EOT crane operators for round the clock operation is in Contractor's scope. Since the job involves handling of heavy components by special arrangement by EOT crane. Experienced EOT crane operators and riggers must be deployed in all the shifts.</p> <ol style="list-style-type: none">2. Induction Heating machine with complete accessories for P91/P22 welding.
1.5.0.2	<p>The availability of crane is likely to be hampered from time to time due to routine preventive maintenance or breakdown maintenance. Contractor has to make alternative arrangement or plan / modify / alter their activities to suit the above conditions and the contractor will not be liable for any compensation or extension of time due to this non-availability, for maintaining the erection schedule.</p>
1.5.0.3	<p>In the event of the crane not available for longer duration due to major breakdown or any other reasons, BHEL will reschedule the work in consultation with Contractor and direct the Contractor to concentrate on other areas till such time the cranes are made available.</p>
1.5.0.4	<p>Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.</p>
1.5.0.6	<p>Contractor shall make good any loss or damage to the equipment's supplied to them and day to day maintenance and operations of equipment's shall be borne by the contractor including all consumables like petrol, oil and air filters etc.,</p>
1.5.0.7	<p>All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.</p>
1.5.0.8	<p>FACILITY TO BE PROVIDED BY BHEL FOR P91/P22 Welding.</p> <ol style="list-style-type: none">i. Required number of Induction Heating Machinesii. Spot Welding Machine for fixing thermocoupleiii. Compensating Cablesiv. Only one set of annealing cable will be supplied by BHEL irrespective of number of Induction Heating Machines deployed by BHEL. Additional sets of annealing cables have to be arranged by the contractor within the quoted rates.

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- v. DG set as per requirement. The contractor shall provide necessary cables & switches, fuel, lubricants and operator.
- vi. Digital temperature indicator
- vii. The induction heating equipment's and other equipment's shall be drawn from BHEL stores, transported and installed & commissioned wherever required. For routine maintenance & attending all type of brake-down maintenance, contractor shall deploy sufficient manpower, tools and plant within the quoted rate. The contractor shall provide electrical cables & Switches required. All the equipment's shall be protected by providing covers or sheds at site by the contractor with in the quoted rate.

Note: BHEL shall provide Induction Heating Machines along with associated accessories required for preheating and PWHT activities. However, in the event of non-availability of the required Induction Heating Machines and accessories with BHEL, the contractor shall arrange the same to meet the project schedule requirements. The cost towards such arrangement shall be reimbursed by BHEL at mutually agreed rates upon submission of supporting documents and certification by the Engineer-in-Charge (EIC).

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VOLUME-IA PART – I CHAPTER-VI

TIME SCHEDULE

- 1.61 PACKAGE-A:** The entire work of Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU, shall be completed within **04 (FOUR) months from the "START OF CONTRACT PERIOD"**.
- 1.62 PACKAGE-B:** The work of Commissioning, Steam blowing, Synchronization & Stabilization of TG at 1X500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU shall be completed within **03 (Three) months** from completion of overhauling activities.
- 1.63** The date of commencement of work for both the packages i.e., Package A & Package B shall be the mutually agreed date between the Contractor and BHEL engineer. In case of discrepancy the decision of BHEL engineer is final.
- 1.64 Tentative start date of execution period shall be intimated by BHEL up on award of work. Contractor has to mobilize the site within 07 days from intimation of communication from BHEL** for fulfilling all statutory requirements like Police verification, Medical fitness, Gate/Entry pass formalities etc. However, in case of urgency, Contractor may be asked to mobilise the site immediately on getting intimation from BHEL. We shall inform to the Contractor through any available mode of communication. The Contractor has to specifically confirm that all required resources and manpower will be mobilized immediately after intimation. **For making gate pass for overhauling works, mobilization is to be done immediately for fulfilling all statutory requirements.**
- 1.65** The entire work shall be carried out by the Contractor as decided by Resident Manager / BHEL with the best skills and know how available. The scope of work is only an indicated and not exhaustive. However, Contractor should abide by the decision of the Resident Manager for any variations of the work. The contractor has to subsequently augment his resources in such a manner that the project milestones are completed on specified schedules and entire work completed within the entire contract period, as specified in the following clause from the date of start of work, in a manner required by BHEL to match with the project schedule.
- 1.66 Compulsory Three shift operation** to be taken up as decided by BHEL/Site In-charge: All the works are to be taken up round the clock (i.e. 24 hours) in three shift operation. Hence all the

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works are to be planned round the clock without any break. No extra claim will be entertained for three shift operation, idling of manpower /T&P due to delay in arrangement of inputs etc. The entire work is to be taken up on war footing with maximum effort. Contractor has to engage sufficient manpower including safety Engineer and Supervisor, required skilled manpower etc with the required T&P to ensure work with equal pace in all the three shifts.

1.6.7 In case of any additional works as mutually agreed between BHEL & Contractor, completion period will be suitably increased.

1.6.8 SCHEDULE OF COMPLETION:

The schedule of important milestones is as follows for **PACKAGE-A**

SL No.	Milestones	Tentative Schedule w.r.t date of start of work
1	Start of Overhauling works of HP, IP & LP turbine & other equipment's	1 st Month
2	Completion of Overhauling works of HP, IP & LP turbine & other equipment's and Turbine Barring Gear	4 th Month

The schedule of important milestones is as follows for **PACKAGE-B**

1	Completion of Steam Blowing/Flushing activities	5 th Month
2	Turbine Synchronization & Completion of Stabilization run: 72 hours continuous run at the load available at the time of commissioning	6 th Month
3	Completion of contractual obligations	7 th Month

The above schedule is tentative, based on project requirements the schedule may be advanced, either wholly or partially, to meet critical project milestones and customer requirements. The commissioning programme of the Prototype Fast Breeder Reactor (PFBR) is of national importance, as it represents a crucial milestone in India's Stage-II of the three-stage Nuclear Power Programme. The PFBR project is a highly prestigious and strategically significant project, being one of the nation's most important nuclear power initiatives. Further, BHAVINI has indicated the availability of steam by the first week of October 2026. In order to achieve this target and any other intermediate milestones established by the customer from time to time, the Contractor shall mobilize, augment, and deploy all necessary manpower, tools, equipment, and

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other resources as directed by the BHEL Engineer. The Contractor shall ensure timely resource enhancement whenever required to meet the revised project schedules, commissioning targets, and overall project requirements without any hindrance to the progress of the works.

1.6.9 The under mentioned Records/ Log-books/ Registers applicable to be maintained.

- a) Hindrance Register.
- b) Site Order Book.
- c) Test Check of measurements.
- d) Records of Test reports of Field tests.
- e) Records of manufacture's test certificates.
- f) Records of disposal of scraps generated during and after the work completion.

Contractor shall carry out all the work in line with BHEL protocols regarding clearance, dimensional checks, blue matching, Alignment etc. All the reading/values/critical works to be witnessed by BHEL & customer executive. The Contractor shall prepare and maintain the required log books, protocols, and reports.

1.6.10 Demobilization and remobilization: In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than **30 days**, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de-mobilize forthwith and re-mobilize at an agreed future date. Cost of such demobilization/remobilization is mentioned below. The duration of contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

S.no	Description	UOM	Amount in Rs (Excl GST)
1	Cost towards total de-mobilization due to suspension of work	Lump Sum	6,37,500
2	Cost toward total re-mobilization	Lump Sum	9,37,500

1.6.10 COMPLETION OF WORK AND COMMENCEMENT OF GUARANTEE PERIOD

PACKAGE-A

- i. The works shall be completed to the entire satisfaction of the Engineer and in accordance with the completion schedule as specified in the Contract, and all unused stores and materials, tools, plant, equipment, temporary buildings, site office, labor hutments and other things shall be removed and the site and work cleared of rubbish and all waste

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materials and delivered up clean and tidy to the satisfaction of the Engineer at the Contractor's expenses.

- ii. BHEL shall have power to take over from the Contractor from time to time such sections of the work as have been completed to the satisfaction of the Engineer. Such work however shall not be treated as have been completed until the remaining / pending works are executed to the satisfaction of Engineer.
- iii. The guarantee period shall commence from the date of completion of overhauling works. The Engineer shall certify to the contractor the date on which the work is completed and the date thereof for commencement of Guarantee Period. The guarantee period shall be 06 months from the date of commencement of guarantee period. The work shall be deemed to be completed upon substantial completion of work leaving aside minor pending works/punch point liquidation/defects which are not likely to affect overall performance of the system. The decision of EIC shall be final and binding on the vendor.

PACKAGE-B

- i. The works shall be completed to the entire satisfaction of the Engineer and in accordance with the completion schedule as specified in the Contract, and all unused stores and materials, tools, plant, equipment, temporary buildings, site office, labor hutments and other things shall be removed and the site and work cleared of rubbish and all waste materials and delivered up clean and tidy to the satisfaction of the Engineer at the Contractor's expenses.
- ii. BHEL shall have power to take over from the Contractor from time to time such sections of the work as have been completed to the satisfaction of the Engineer. Such work however shall not be treated as have been completed until the remaining / pending works are executed to the satisfaction of Engineer.
- iii. The guarantee period shall commence from the date of acceptance/handing over of the TG system upon stabilization or completion of original contract period whichever is earlier. The Engineer shall certify to the contractor the date on which the work is completed and the date thereof for commencement of Guarantee Period. The guarantee period shall be 06 months from the date of commencement of guarantee period. The work shall be deemed to be completed upon substantial completion of work leaving aside minor pending works/punch point liquidation/defects which are not likely to affect overall

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performance of the system. The decision of EIC shall be final and binding on the vendor.

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VOLUME-IA PART – I CHAPTER-VII TERMS OF PAYMENT

1.7.1 The progressive payment for Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works, Commissioning, Steam blowing, Synchronization & Stabilization of TG at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification on accepted price of contract value will be released as per the break up given hereinafter:

Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
1	Overhauling HP Turbine Module: Overhauling of HP Turbine, Scope Includes Complete Dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
2	Overhauling of IP Turbine Module: Overhauling of IP Turbine, Scope Includes Complete Dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
3	Overhauling of LP Turbine Module: Overhauling of LP Turbine & extraction bellow inspection, scope includes complete dismantling of LP module, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
4	Overhauling of Turbine & Generator Bearing pedestals & Bearings: Overhauling of bearing pedestals, bearings, scope includes inspection, servicing and measurement of bearing clearances, repair, replacement of any part as required, assembling, bearing revisioning for Turbine bearings 1 to 7, alignment and coupling includes HP-IP, IP-LP, LP-Generator alignment & coupling including swing check valve at HP Turbine front.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
5	Overhauling of Governing system: Overhauling of Main Governing and LPBP Governing Racks System. Scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
6	HP Emergency/Main Stop Valve & Control Valves: Overhauling of valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
7	IP Interceptor Valve & Control Valve: Overhauling of valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
8	Control Oil System: Inspection & servicing of system equipment like tank, pump, fans, coolers, centrifuge, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
9	Lube Oil system: Inspection & servicing of system equipment like tank, pump, fans, coolers, centrifuge, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
10	Seal steam system: Inspection & servicing of system equipment like GSC, spring cages, fans, valves,, dampers, etc	Dismantling	Cleaning & Steam blowing	Inspection	Assembly	Commissioning of the system
11	Turbine Drainage system: Inspection & servicing of system equipment like angle drain valves, spring cages, spray nozzles, dampers, etc	Dismantling	Inspection	Flushing & Cleaning	Assembly & Normalization	Commissioning of the system
12	HP Bypass system: Overhauling of HPBP valves, spray valves, water injection valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc. Inspection of system equipment like actuators, rack, valves, de-superheating system, hydraulic unit, I&C system, etc	Dismantling	Inspection	Servicing	Assembly	Commissioning of the system
13	LP Bypass system: Overhauling of LPBP valves, spray valves, water injection valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc. Inspection of system equipment like	Dismantling	Inspection	Servicing	Assembly	Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
	actuators, rack, valves, de-superheating system, hydraulic unit, I&C system, etc					
14	Condenser & its Auxiliaries: External & Internal inspection of casing, seals, tubes, vacuum system, springs, supports, cleaning, servicing etc	Dismantling	Inspection	Cleaning	Assembly	Commissioning of the system
15	Generator, Exciter, Primary Water System & Auxiliaries: Inspection & servicing of rotor, stator, bearings, end shielding, compressor, terminal bushings, exciter, ATT of stator, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
16	Condensate Extraction Pumps - 3 No's: Dismantling, Inspection & servicing of pump casing, impeller, bearings, motor, etc	Dismantling	Inspection	Assembly		Commissioning of the system
17	Live Steam Re-heater – 02 nos: Inspection & servicing of tubes & shell for leaks, control & monitoring system and safety system, etc	Dismantling	Inspection	Assembly	Hydro test	Commissioning of the system
18	HP heaters (04 nos), LP heaters (03 nos), Deaerator, Drain cooler, Gland steam condenser: Inspection of tubes & shell for leaks, control & monitoring system and safety system, etc	Dismantling	Inspection	Assembly	Hydro test	Commissioning of the system
19	Overhauling of MS & HRH steam strainers, Extraction NRV's, CRH NRV & its servomotor: Inspection & servicing of MS,	Dismantling	Inspection	Assembly		Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
	HRH steam strainers, extraction valves, NRV's & its servo motors, etc.					
20	BFP Drive Turbine & Auxiliaries (02 nos): Overhauling of TDBFP drive turbine, Inspection, servicing & testing of internals, bearings, couplings, gear box, , governing system, ESV/MSV/ACV assemblies, lube oil system, pumps, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
21	Turbine Driven Boiler Feed Pump & Auxiliaries (02 nos): Overhauling of BFP & Auxiliaries, Inspection, servicing & testing of internals, impeller, shaft, Feed water discharge & suction valves, booster pump, control system, seals, bearings, couplings, gaskets, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
22	Motor driven boiler Feed Pump & Auxiliaries (01 no): Overhauling of MDBFP & Aux, Inspection, servicing & testing of internals, impeller, shaft, Feed water discharge & suction valves, booster pump, control system, seals, bearings, hydraulic coupling (Voith), gaskets, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
23	Overhauling of Electromatic Relief Valves (ERV-7 no's): Dismantling, inspection, servicing, replacement of spares & testing of internals, control system, pressure setting, seals, gaskets, etc	Dismantling	Inspection	Lapping and Assembly	Hydro test	Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
24	Overhauling of Steam Generator outlet manual safety Relief Valves (SRV-16 no's): Dismantling, inspection, servicing, replacement of spares & testing of internals, pressure setting, seals, gaskets, etc	Dismantling	Inspection	Lapping and Assembly	Hydro test	Commissioning of the system
25	Overhauling of SRV's of HP/LP heaters, LSR steam drum, etc (12 no's): Dismantling, inspection, servicing, replacement of essential spares & testing of internals, pressure setting, gaskets, etc	Dismantling	Inspection	Lapping and Assembly	Hydro test	Commissioning of the system
26	Seal Oil System: Overhauling, Inspection, servicing & testing of pumps, filters, valves, gaskets, seals, etc	Dismantling	Inspection	Assembly	Barring Gear	Commissioning of the system
27	Mechanical Piping Systems & Misc Equipments: Inspection of various piping system, misc equipments, joints, flanges, hangers & supports, insulation, etc & submission of report.	Inspection	Servicing	Assembly	Hydro test	Commissioning of the system
28	FD fan, Gates & Dampers: Scope includes Inspection and servicing of FD fan internal, bearings and replacement, testing of fan internals and reassembly, Inspection motor and replacement of bearing if required, Inspection and servicing of Dampers, replacement of bearing and commissioning of dampers, Inspection and servicing of Inlet Guide vane.	Dismantling	Inspection	Servicing	Assembly	Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
29	Dehumidification & Dry air preservation system for TG set: Scope includes Inspection, servicing of the unit, erection, arrangement of connection from unit to turbine, Commissioning of the unit and testing.	Inspection	Erection		Completion of all Connections	Commissioning of the system
30	Turbine Cleading (Acoustic Enclosure): Material handling & Installation of Turbine Cleading (Acoustic Enclosure) as per drawing.	Material handling, shifting,	Erection of support structures	Installation and fitment completion		Final inspection, completion
31	O&M Support: O&M assistance for three months from the date of synchronization. Experienced supervisor: 01 no, Safety supervisor – 01 no, Main fitter & supporting team – 10 nos. Above minimum manpower to be deployed in all 03 shifts along with required tools and general consumables.	Deployment of manpower and duly certified by EIC				
32	Insulation removal/dismantling Works: Scope includes arrangement of required approach, tools, removal, handling, transportation and storage at identified location.	Insulation removal/dismantling		Handling, transportation, shifting,		Area clearance & housekeeping
33	Insulation application works: Scope includes arrangement of required approach, tools, handling, transportation & application.	Handling, transportation, cutting, fitting, fixing, and application of insulation materials and cladding			Area clearance & housekeeping	Submission of report
34	CS Piping Dismantling works: Cutting, grinding, dismantling, removal of erected material, handling, transportation and storage at identified location and completion of work with acceptance of EIC. Note: This	Cutting, grinding, dismantling, removal, handling, transportation, shifting,			Area clearance & housekeeping	Submission of report

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
	item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.					
35	<p>CS Piping Erection Works: Handling, Erection, Cutting, Edge Preparation, Fitup, Welding & NDT.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Erection	Fit-up	Welding	NDT	Submission of report
36	<p>Structure & Supports Dismantling Works: Cutting, grinding, dismantling, removal of erected material, handling, transportation and storage at identified location, cleaning, preparation of reports and completion of work with acceptance of EIC.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Cutting, grinding, dismantling, removal, handling, transportation, shifting,			Area clearance & housekeeping	Submission of report
37	<p>Structure & Supports Erection Works: Handling, Erection, Cutting, Edge Preparation, Fitup, Welding & NDT.</p> <p>Note: This item shall be operated exclusively</p>	Erection	Fit-up	Welding	NDT	Submission of report

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
	for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.					
38	<p>Servicing of Valves up to 02 Inch: Scope includes handling, removal, servicing, erection & testing etc.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Handling & Removal		Servicing	Testing	Commissioning of the system
39	<p>Servicing of Valves above 02 Inch and up to 08 Inch: Scope includes handling, removal, servicing, erection & testing etc.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Handling & Removal		Servicing	Testing	Commissioning of the system
40	<p>Servicing of Valves up to above 08 Inch: Scope includes handling, removal, servicing, erection & testing etc.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Handling & Removal		Servicing	Testing	Commissioning of the system

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
41	<p>Painting Application: Surface preparation and painting of equipment, piping, pipe supports, valves, and structural steel members including cleaning of surfaces to remove dirt, oil, grease, rust, and loose paint; application of one coat of approved primer and two coats of approved paint; including touch-up painting.</p>	Surface Preparation	Painting			Inspection & Report Submission
42	<p>Steam Blowing Works: Execution of steam blowing/chemical cleaning/ alkali flushing/water flushing and associated commissioning activities including fabrication, erection, operation, maintenance, servicing, dismantling, and restoration of temporary piping systems, valves, fittings, pumps, tanks, supports, removal and reassembly of valve/NRV internals, installation of hydro test devices, leak rectification, operation assistance, return of temporary materials to BHEL stores, housekeeping, and completion of all related works with required labour, supervision, consumables, tools & tackles, PPEs, and safety arrangements as per approved procedures and instructions of Engineer-in-Charge (EIC). Note: 1. Approx Tonnage of Temporary Piping: 65</p>	Fabrication, erection, servicing, and commissioning readiness	Successful completion of steam blowing/ chemical cleaning/ alkali flushing/water flushing/hydro testing, and associated commissioning activities, duly certified by the EIC.		Dismantling and restoration of temporary systems	Housekeeping, material reconciliation, submission of reports, and final acceptance by the EIC.

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
	<p>MT</p> <p>2. Temporary piping materials, valves, fittings, tanks, and chemicals shall be supplied by BHEL free of cost unless otherwise specified.</p> <p>3. Contractor scope includes fabrication, servicing, erection, operation, maintenance, dismantling, and return of temporary materials to BHEL stores.</p> <p>Note: Based on site requirement, this item may or may not be operated.</p>					

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Item No	Work description	Stage 1 30%	Stage 2 10%	Stage 3 30%	Stage 4 20%	Stage 5 10%
43	<p>P91 & P22 Welding Joints: Carrying out cutting, fit-up, welding, grinding, preheating, inter-pass temperature control, post weld heat treatment (PWHT) assistance, and completion of P91 and P22 alloy steel pipe-to-pipe, pipe-to-fitting, pipe-to-valve, and pipe-to-equipment welding joints as per approved WPS/PQR, applicable codes, drawings, and specifications, including edge preparation, alignment, consumables handling, weld defect rectification, NDT coordination, documentation, and all labour, tools & tackles, welding consumables, supervision, PPEs, and safety requirements necessary for obtaining acceptable weld quality and clearance by Engineer-in-Charge (EIC). Note: 1. Induction Heating Machines shall be provided by BHEL at free of charges. 2. Required P91 & P22 filler wires & electrodes shall be provided by BHEL at free of cost.</p>	Cutting, Grinding & Fit-up	Welding, Grinding,	PWHT Completion	NDT Completion	Submission of welding and inspection records

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1.72 Items covered under Package A: Item no 1 to 30, 32-41, 43.

1.73 Items covered under Package B: Item no 31, 42.

1.74 Progressive Payment/ Final Payment: The payments for works under the scope of this contract shall be as per conditions of contract. All documents like HR Clearance, Quality and Safety Compliances, etc. required for processing the RA Bills should be submitted along with RA Bills.

1.75 Documents required for RA Bill:

- i. GST Complied Invoice of the work done as per approved BBU.
- ii. WAM -6 for RA Bill.
- iii. Jointly signed Measurement sheet.
- iv. Power of Attorney before submission of Bill.
- v. Validity of Bank Guarantees as applicable under the contract.
- vi. Monthly HSE Compliance Certificate certified by BHEL- Safety
- vii. Monthly Material reconciliation statement along with RA Bill.

HR/IR compliance documents:

- i. Wages payment sheet as per applicable minimum wages.
- ii. Proof of PF contribution submission.
- iii. Proof of ESI/ WC contribution submission

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- iv. Proof of Bonus payment as per Bonus Act if applicable.
- v. Proof of EL payment if applicable.
- vi. Any other statutory document if applicable.

1.7.6 Documents required for Final Bill:

The final bill is drawn as soon as the entire work is completed. From the final amount due, all amounts already claimed up to the previous running account bill will be deducted. It should be ensured that in the final bill the following additional particulars have been provided:

- i. Final Bill in WAM-7 Format.
- ii. 'No claim' certificate from the contractor.
- iii. Clearance certificates where ever applicable viz. Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax department etc.
- iv. Final Material re-conciliation statement duly approved by BHEL.
- v. Indemnity Bond as per prescribed format.
- vi. Deviation statement showing the difference between the actuals and as per the contract.
- vii. Final Delay Analysis.

1.7.7 The payment for running bills will be released after submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc. and other dues in the meanwhile. No interest shall be payable for the delayed payment (if any). Few points of consideration are as below:

- i) The measurements sheets of work done in a month shall be submitted in triplicate duly agreed/signed by BHEL Engineer. The contractor shall extend all necessary assistance for verification of measurements of works without any extra cost.
 - ii) Material reconciliation shall be complied on monthly basis.
 - iii) The RA bill payments are interim payments and bills shall be submitted in prescribed formats.
 - iv) Recoveries on account of electricity for Office, water, statutory deductions etc. shall be made as per terms of contract.
 - v) BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS.
-

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- vi) Final bill shall be submitted after completion of works and upon material reconciliation along with all prescribed formats.
- vii) Quoted Rates are inclusive of all labour, contractor's equipment, temporary works, consumables and all matters and things of whatsoever nature, charges for Safety Aspects/Compliance to Safety Rules including operations and maintenance services (if applicable) etc., and other services, as identified in the tender Documents, as necessary for the proper execution of the subject work.

- 1.7.8 Final bills of Package A & Package B can be closed separately upon completion of their respective scope of works. For this purpose retention amount, security deposit shall also be paid upon closure of respective package final bills.**
- 1.7.9 Secured advance/Mobilization advance is not applicable for this tender.**
- 1.7.10 PVC & ORC is applicable as per GCC.**
- 1.7.11 Retention amount is applicable as per GCC.**

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VOLUME-IA PART – I CHAPTER-VIII TAXES AND DUTIES

1. All taxes and duty other than GST & Cess and BOCW Cess

The contractor shall pay all (**except the specific exclusion viz GST & Cess and BOCW Cess, both of which are dealt separately**) taxes, fees, license charges, deposits, duties, tools, royalty/ seigniorage, commissions, Stamp Duties, or other charges / levies, which may be levied on the input goods (including construction material viz. sand, coarse aggregates, moorum, borrowed earth, etc.) & services consumed and output goods & services delivered in course of his operations in executing the contract **and the same shall not be reimbursed by BHEL**. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

2. Goods and service Tax (GST) -

For GST Registered bidder:

- 2.1. The successful bidder shall furnish proof of GST registration under GST Law, covering the supply and services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the successful bidder on BHEL for this project/ work. The bidder to specify in their offer the category of registration under GST i.e. Regular dealer or composite dealer.
- 2.2. Bidder's price/rates shall be exclusive of GST & GST Compensation Cess (herein after termed as GST).
- 2.3. Vendor / Contractor require to ensure that all Input Tax benefits as per existing laws have been considered.
- 2.4. Price quoted by the composite dealer shall be considered as inclusive of GST. In the event of any change in the status of vendor / Contractor

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from composite to regular dealer after the submission of the bid but before completion of supply of services or goods, Contract value shall be amended to remove the embedded GST and any ITC benefit arising due to change of status, which shall be passed on to BHEL. GST paid on the amended contract value shall be reimbursed at actuals against the Tax invoice if BHEL is able to take input tax credit. However, no reimbursement of GST shall be made if BHEL is not able to take input tax credit. The decision of BHEL in this regard will be final and binding on the vendor/contractor.

2.5. It is the responsibility of the vendor / contractor to adhere to all the provisions of E- Invoicing under GST Act (if applicable). As per the E-Invoicing provisions vendor / Contractor has to generate IRN and QR Code from the E-Invoicing system and the same need to be printed in the invoice submitted to their customer. Invoices that do not comply to the above requirements, will not be accepted by BHEL. If the successful Bidder is not falling under the preview of E-Invoicing, then he has to submit a declaration in that respect along with relevant financial statements. However, applicability of E-invoicing, shall be verified from the E-Invoicing portal on submission of vendor / Contractor GSTN. BHEL shall reimburse GST only if all the provisions of E-invoicing are complied with.

2.6. It is the responsibility of the vendor/ Contractor to issue the Tax Invoice strictly as per the format prescribed under the GST Act within the prescribed time period in order to enable BHEL to avail input tax credit within the due date. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge. Tax invoice should also contain below details

- a. Contractor Name and Contact details.
- b. GST No of Contractor
- c. PAN No of Contractor
- d. Document Type: Tax Invoice/ Debit Note/ Credit Note
- e. Category: B2B / B2C (B2B is only applicable w.r.t BHEL)
- f. Customer Name and Contact details / Bill To Details (as mentioned below)

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- g. Unique Tax Invoice Number
- h. Invoice Date
- i. IRN No, QR Code, Acknowledgment No and Acknowledgment Date generated from E-Invoice Portal as per E-invoicing provisions under GST Act (If applicable)
- j. Place of Supply (as mentioned below)
- k. Description of service provided
- l. 8 Digit SAC code
- m. GST Rate
- n. Gross value of Invoice
- o. Taxable Value
- p. Tax / GST Amount
- q. Total Invoice value including GST.

Above are inclusive and not exhaustive list of requirements.

2.7. Bidder should mention the “Bill To “and “Place of supply” as below in the Tax Invoice

Bill To: Location of BHEL Site office

-----,

State: -----

GSTN of BHEL: -----

Place of Supply: Location of BHEL Site office

-----,

State: -----

GSTN of BHEL: -----

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(Above details will be given later, contractors may contact BHEL, PSSR before billing)

2.8. In case of supply of goods contract, the successful bidder must promptly provide details of the dispatched items on the same day they are removed for shipment to the BHEL site. This intimation must include all relevant information and documents about the goods and a scanned copy of the tax invoice. If any financial liabilities arise for BHEL due to non-compliance with GST laws resulting from the bidder's delay in providing this information, the bidder will be held liable, unless the delay is directly attributable to BHEL.

2.9. BHEL will reimburse the GST amount claimed by the Vendor/Contractor against a tax invoice along with the amount due to the contractor in the RAB. However, If the Vendor/Contractor fails to fulfill the GST compliance requirements detailed below for any preceding invoice, BHEL reserves the right to recover an amount equivalent to the reimbursed GST from the subsequent bills as a measure against statutory non-compliance. Additionally, an amount equivalent to the GST claimed in subsequent bills will be withheld until statutory compliance for the prior invoice is ensured.

In the case of one-time vendors/contractors or the Vendor/Contractor's final bill, BHEL will withhold an amount equivalent to the GST claimed from the same bill towards pending statutory compliance. This withheld amount will only be released once the following GST compliance requirements are fully satisfied.

GST Compliance Requirements:

- a. Vendor / Contractor must provide the original copy of Tax invoice /debit note as per the prescribed format under the GST act within the prescribed time period in order to enable BHEL to avail input tax credit within the due date.
- b. The details of the invoice or debit note referred to in clause (a) must be furnished/filed by the Vendor/ Contractor in the statement of outward supplies (presently in GSTR1 or IFF) and such details should

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get reflected in the BHEL GST login (both in GSTR 2A and GSTR 2B) in the manner specified under GST Act.

- c. Details of vendor/contractor invoice reflected in BHEL GST login should match with the details in the tax invoice submitted by the vendor/contractor, including the invoice number, invoice date, GSTIN, and place of supply. Additionally, the status of GSTR-1 and GSTR-3B filings must be "Yes."
 - d. The tax charged in the invoice /debit note referred to in clause (a) must be paid to the Government by the Vendor/Contractor, either in cash or through the utilization of input tax credit.
- 2.10 In case, any GST credit is delayed/denied to BHEL or BHEL has to incur any liability (like interest / penalty) due to non/delayed receipt of goods or submission of tax invoice after the expiry of timeline prescribed in the relevant GST Act for availing ITC, or any other reasons not attributable to BHEL, Then the same shall be recovered from the vendor/contractor along with interest levied/ leviable on BHEL.
- 2.11 GST shall be levied on recoveries, wherever applicable and same shall be recovered from payments. BHEL shall issue / raise Tax invoice on contractor/vendors for such recoveries.
- 2.12 E-way bills / Transit passes / Road Permits, if required for materials / T&P etc., bought into the project site is to be arranged by the Vendor / Contractor themselves. BHEL shall not issue or raise any Road Permit/ E- Way Bill for this purpose. Any claim or demand raised by the GST department for non- generation / non-submission of E-way bill shall be to the contractor/ vendor account
- 2.13 BHEL shall not reimburse any expenditure incurred by the contractor towards demand, additional liability or interest / penalty etc., raised by the GST department due to issues such as wrong rates / wrong classification of services or goods.

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- 2.14 Where GST is payable by BHEL under reverse charge basis, any demand raised or any interest or penalty levied / leviable by the GST department due to non-submission or delayed submission of invoice by the contractor or for any other reason not attributable to BHEL, the same shall be recovered from the vendor/contractor.
- 2.15 Tax Deduction at Source (TDS) as per Sec 51 of the CGST Act shall be deducted (if applicable). GST TDS certificate in Form GSTR -7A shall be issued to be contractor. However, GST TDS certificate can be generated only if the contractor accepts the TDS details uploaded by BHEL and files his return. If any specific exemption from GST TDS is applicable to any contractor/vendor, then a declaration to that effect along with relevant documents as may be required by BHEL, substantiating such exemption in line with GST law provisions or notification, shall be submitted by the vendor/contractor.

For GST Unregistered bidder:

- 2.16 In case, bidder is not required to register under Goods and service Tax (GST) & Cess, the same is to be specified in the offer.
- 2.17 Successful bidder to furnish a Self-declaration that registration under GST is not required or not applicable as per the provisions of GST Law along with relevant document and provisions in the GST law.
- 2.18 In case BHEL has to incur any liability (like interest / penalty etc.) due to non-compliance of GST law in respect of the invoice submitted by the contractor, for the reasons attributable to the contractor, the same shall be recovered from the contractor.
- 2.19 TDS under GST (as & when applicable) shall be deducted at prevailing rates on gross invoice value.
- 2.20 If RCM is made applicable at a later date, GST will be paid by BHEL to the department at applicable rate treating the quoted the price as inclusive of GST if BHEL is not able to take Input tax credit.

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2.21 In the event of any change in the status of bidder from unregistered to registered under the GST law after the submission of bid but before the completion of supply of services or goods, the same need to be intimated and all the clauses applicable for Registered bidder need to be followed. The vendor/ contractor is required to pass on the ITC benefit arising due to change of status, to BHEL. Contract value shall be amended accordingly. GST paid on the amended contract value shall be reimbursed at actuals against the Tax invoice only if BHEL is able to take input tax credit.

3 Statutory Variations

3.1 BHEL shall pay statutory variation only for GST, and no other variations shall be payable

3.2 In general, Statutory variation for GST is payable to the Vendor/Contractor during the contract period including extension thereof. Beyond the contract period, BHEL will reimburse the actual applicable tax only if BHEL is able to take the input tax credit. However, the decision of BHEL in this regard will be final and binding on the vendor/contractor

4 New Taxes/Levies –

In case Government imposes any new levy / tax after submission of bid during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract. However, Contractor/ Vendor shall obtain prior consent from BHEL before depositing new taxes and duties.

Any benefits arise out of new tax levies and/or abolition of existing taxes must be passed on to BHEL.

The decision of BHEL in this regard will be final and binding on the vendor/contractor.

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5 Direct Tax

5.1 Vendor/ Contractor is required to update himself on its own and comply with provisions of Indian Income Tax Act as notified from time to time. Purchaser shall not be liable towards liability of income tax accruing to the vendor/contractor of whatever nature including variations thereof, arising out of this Order/ Contract, as well as tax liability of the vendor/ Contractor and his personnel

5.2 Deductions of Tax at source as per Income Tax Act, at the prevailing rates shall be effected by the Purchaser before release of payment, as a statutory obligation, if applicable. TDS certificate will be issued by the Purchaser as per the statutory provisions. The Vendor/Contractor has to mention their Permanent Account Number (PAN) and GSTIN in all invoices.

6 BOCW Act & BOCW Welfare Cess Act

6.1 Contractor's price/rates shall be exclusive of BOCW Cess .

6.2 The Contractor should Register their Establishment under BOCW Act 1996 read with rules 1998 by submitting Form I (Application for Registration of Establishment) and Form IV (Notice Of Commencement / Completion of Building other Construction Work) to the respective Labour Authorities i.e.,

- a. Assistant Labour Commissioner (Central) in respect of the project premises which is under the purview of Central Govt.–NTPC, NTPL etc.
- b. Appropriate State authorities in respect of the project premises which is under the purview of State Govt.

6.3 The Contractor should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL.

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- 6.4 The contractor should ensure compliance regarding Registration of Building Workers as Beneficiaries, Hours of work, welfare measures and other conditions of service with particular reference to Safety and Health measures like Safety Officers, safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.
- 6.5 The contractor irrespective of their nature of work and manpower (Civil, Mechanical, Electrical works etc) should register their establishment under BOCW Act 1996 and comply with BOCW Welfare Cess Act 1996.
- 6.6 Contractor shall make remittance of the BOCW Cess as per the Act in consultation with BHEL as per the rates in force (presently 1%). BOCW remittance should be made only after obtaining prior consent from BHEL. BHEL shall reimburse the same upon production of documentary evidence. However, BHEL shall not reimburse the fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.
- 6.7 Non-compliance to Provisions of the BOCW Act & BOCW Welfare Cess Act is not acceptable. In case of any non-compliance, BHEL reserves the right to withhold any sum as it deems fit. Only upon total compliance with the BOCW Act and the discharge of total payment of Cess (in consultation with BHEL) under the BOCW Cess Act by the Contractor, BHEL shall consider refund of the amounts.

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VOLUME-IA PART – I CHAPTER – IX BILL OF QUANTITY (BOQ)

1.9.0 BOQ for the scope of work mentioned in the tender: -

PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.			
Item No	Work description	UOM	Item Qty
1	Overhauling HP Turbine Module: Overhauling of HP Turbine, Scope Includes Complete Dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Lump Sum	1
2	Overhauling of IP Turbine Module: Overhauling of IP Turbine, Scope Includes Complete Dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Lump Sum	1
3	Overhauling of LP Turbine Module: Overhauling of LP Turbine & extraction bellow inspection, scope includes complete dismantling of LP module, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Lump Sum	1
4	Overhauling of Turbine & Generator Bearing pedestals & Bearings: Overhauling of bearing pedestals, bearings, scope includes inspection, servicing and measurement of bearing clearances, repair, replacement of any part as required, assembling, bearing revisioning for Turbine bearings 1 to 7, alignment and coupling includes HP-IP, IP-LP, LP-Generator alignment & coupling including swing check valve at HP Turbine front.	Lump Sum	1
5	Overhauling of Governing system: Overhauling of Main Governing and LPBP Governing Racks System. Scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Lump Sum	1
6	HP Emergency/Main Stop Valve & Control Valves: Overhauling of valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Lump Sum	1

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.			
Item No	Work description	UOM	Item Qty
7	IP Interceptor Valve & Control Valve: Overhauling of valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc.	Lump Sum	1
8	Control Oil System: Inspection & servicing of system equipment like tank, pump, fans, coolers, centrifuge, etc	Lump Sum	1
9	Lube Oil system: Inspection & servicing of system equipment like tank, pump, fans, coolers, centrifuge, etc	Lump Sum	1
10	Seal steam system: Inspection & servicing of system equipment like GSC, spring cages, fans, valves,, dampers, etc	Lump Sum	1
11	Turbine Drainage system: Inspection & servicing of system equipment like angle drain valves, spring cages, spray nozzles, dampers, etc	Lump Sum	1
12	HP Bypass system: Overhauling of HPBP valves, spray valves, water injection valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc. Inspection of system equipment like actuators, rack, valves, de-superheating system, hydraulic unit, I&C system, etc	Lump Sum	1
13	LP Bypass system: Overhauling of LPBP valves, spray valves, water injection valves, servomotors, scope includes dismantling, Inspection, Testing, Repair and Replacement of any part as required, assembling, etc. Inspection of system equipment like actuators, rack, valves, de-superheating system, hydraulic unit, I&C system, etc	Lump Sum	1
14	Condenser & its Auxiliaries: External & Internal inspection of casing, seals, tubes, vacuum system, springs, supports, cleaning, servicing etc	Lump Sum	1
15	Generator, Exciter, Primary Water System & Auxiliaries: Inspection & servicing of rotor, stator, bearings, end shielding, compressor, terminal bushings, exciter, ATT of stator, etc	Lump Sum	1

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.			
Item No	Work description	UOM	Item Qty
16	Condensate Extraction Pumps - 3 No's: Dismantling, Inspection & servicing of pump casing, impeller, bearings, motor, etc	Lump Sum	1
17	Live Steam Re-heater – 02 nos: Inspection & servicing of tubes & shell for leaks, control & monitoring system and safety system, etc	Lump Sum	1
18	HP heaters (04 nos), LP heaters (03 nos), Deaerator, Drain cooler, Gland steam condenser: Inspection of tubes & shell for leaks, control & monitoring system and safety system, etc	Lump Sum	1
19	Overhauling of MS & HRH steam strainers, Extraction NRV's, CRH NRV & its servomotor: Inspection & servicing of MS, HRH steam strainers, extraction valves, NRV's & its servo motors, etc.	Lump Sum	1
20	BFP Drive Turbine & Auxiliaries (02 nos): Overhauling of TDBFP drive turbine, Inspection, servicing & testing of internals, bearings, couplings, gear box, , governing system, ESV/MSV/ACV assemblies, lube oil system, pumps, etc	Lump Sum	1
21	Turbine Driven Boiler Feed Pump & Auxiliaries (02 nos): Overhauling of BFP & Auxiliaries, Inspection, servicing & testing of internals, impeller, shaft, Feed water discharge & suction valves, booster pump, control system, seals, bearings, couplings, gaskets, etc	Lump Sum	1
22	Motor driven boiler Feed Pump & Auxiliaries (01 no): Overhauling of MDBFP & Aux, Inspection, servicing & testing of internals, impeller, shaft, Feed water discharge & suction valves, booster pump, control system, seals, bearings, hydraulic coupling (Voith), gaskets, etc	Lump Sum	1
23	Overhauling of Electromatic Relief Valves (ERV-7 no's): Dismantling, inspection, servicing, replacement of spares & testing of internals, control system, pressure setting, seals, gaskets, etc	Lump Sum	1
24	Overhauling of Steam Generator outlet manual safety Relief Valves (SRV-16 no's): Dismantling, inspection, servicing, replacement of spares & testing of internals, pressure setting, seals, gaskets, etc	Lump Sum	1

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.			
Item No	Work description	UOM	Item Qty
25	Overhauling of SRV's of HP/LP heaters, LSR steam drum, etc (12 no's): Dismantling, inspection, servicing, replacement of essential spares & testing of internals, pressure setting, gaskets, etc	Lump Sum	1
26	Seal Oil System: Overhauling, Inspection, servicing & testing of pumps, filters, valves, gaskets, seals, etc	Lump Sum	1
27	Mechanical Piping Systems & Misc Equipments: Inspection of various piping system, joints, flanges, hangers & supports, insulation, etc & Misc equipments and submission of report.	Lump Sum	1
28	FD fan, Gates & Dampers: Scope includes Inspection and servicing of FD fan internal, bearings and replacement, testing of fan internals and reassembly, Inspection motor and replacement of bearing if required, Inspection and servicing of Dampers, replacement of bearing and commissioning of dampers, Inspection and servicing of Inlet Guide vane.	Lump Sum	1
29	Dehumidification & Dry air preservation system for TG set: Scope includes Inspection, servicing of the unit, erection, arrangement of connection from unit to turbine, Commissioning of the unit and testing.	Lump Sum	1
30	Turbine Cleading (Acoustic Enclosure): Material handling & Installation of Turbine Cleading (Acoustic Enclosure) as per drawing.	Lump sum	1
32	Insulation removal/dismantling Works: Scope includes arrangement of required approach, tools, removal, handling, transportation and storage at identified location.	SQM	1000
33	Insulation application works: Scope includes arrangement of required approach, tools, handling, transportation & application as per EIC.	SQM	1000

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PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.

Item No	Work description	UOM	Item Qty
34	<p>CS Piping Dismantling works: Cutting, grinding, dismantling, removal of erected material, handling, transportation and storage at identified location and completion of work with acceptance of EIC.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	MT	50
35	<p>CS Piping Erection Works: Handling, Erection, Cutting, Edge Preparation, Fitup, Welding & NDT.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	MT	50
36	<p>Structure & Supports Dismantling Works: Cutting, grinding, dismantling, removal of erected material, handling, transportation and storage at identified location, cleaning, preparation of reports and completion of work with acceptance of EIC.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	MT	50
37	<p>Structure & Supports Erection Works: Handling, Erection, Cutting, Edge Preparation, Fitup, Welding & NDT.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	MT	50
38	<p>Servicing of Valves up to 02 Inch.</p> <p>Scope includes handling, removal, servicing, erection & testing etc.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Nos	30
39	<p>Servicing of Valves above 02 Inch and up to 08 Inch.</p> <p>Scope includes handling, removal, servicing, erection & testing etc.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Nos	20
40	<p>Servicing of Valves up to above 08 Inch.</p> <p>Scope includes handling, removal, servicing, erection & testing etc.</p> <p>Note: This item shall be operated exclusively for systems and activities over and above the scope covered under Items 1 to 30 and shall not be applicable to works already included therein.</p>	Nos	20

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PACKAGE-A: Overhauling of HP, IP, LP Turbines, TDBFP, MDBFP, Generator, Exciter, CEP, Heaters, Condenser, other Aux Equipment's and Piping works at 1x500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.			
Item No	Work description	UOM	Item Qty
41	Painting Application: Surface preparation and painting of equipment, piping, pipe supports, valves, and structural steel members including cleaning of surfaces to remove dirt, oil, grease, rust, and loose paint; application of one coat of approved primer and two coats of approved paint; including touch-up painting.	SQM	2000
43	P91 & P22 Piping Welding Joints: Carrying out cutting, fit-up, welding, grinding, preheating, inter-pass temperature control, post weld heat treatment (PWHT) assistance, and completion of P91 and P22 alloy steel pipe-to-pipe, pipe-to-fitting, pipe-to-valve, and pipe-to-equipment welding joints as per approved WPS/PQR, applicable codes, drawings, and specifications, including edge preparation, alignment, consumables handling, weld defect rectification, NDT coordination, documentation, and all labour, tools & tackles, welding consumables, supervision, PPEs, and safety requirements necessary for obtaining acceptable weld quality and clearance by Engineer-in-Charge (EIC). Note: 1. Induction Heating Machines shall be provided by BHEL at free of charges. 2. Required P91 & P22 filler wires & electrodes shall be provided by BHEL at free of cost.	Inch Dia	500

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PACKAGE-B: Commissioning, Steam blowing, Synchronization & Stabilization of TG at 1X500 MWe PROTOTYPE FAST BREEDER REACTOR (PFBR) BHAVINI KALPAKKAM NUCLEAR POWER PROJECT, TAMILNADU as per the tender specification.			
Item No	Work description	UOM	Item Qty
31	<p>O&M Support: O&M assistance for three months from the date of synchronization. Experienced supervisor: 01 no Safety supervisor – 01 no Main fitter & supporting team – 10 nos Above minimum manpower to be deployed in all 03 shifts along with required tools and general consumables.</p>	Months	3
42	<p>Steam Blowing Works: Execution of steam blowing/chemical cleaning/ alkali flushing/water flushing and associated commissioning activities including fabrication, erection, operation, maintenance, servicing, dismantling, and restoration of temporary piping systems, valves, fittings, pumps, tanks, supports, removal and reassembly of valve/NRV internals, installation of hydro test devices, leak rectification, operation assistance, return of temporary materials to BHEL stores, housekeeping, and completion of all related works with required labour, supervision, consumables, tools & tackles, PPEs, and safety arrangements as per approved procedures and instructions of Engineer-in-Charge (EIC).</p> <ul style="list-style-type: none"> • Approx Tonnage of Temporary Piping: 65 MT • Temporary piping materials, valves, fittings, tanks, and chemicals shall be supplied by BHEL free of cost unless otherwise specified. • Contractor scope includes fabrication, servicing, erection, operation, maintenance, dismantling, and return of temporary materials to BHEL stores. 	Lump Sum	1

Note:

1. The scope under this specification is only indicative and not exhaustive. However, any activity covered under the normal course of overhauling, Pre-commissioning, commissioning, synchronization & stabilization works, but not mentioned in the scope, shall be deemed to be within the scope. Based on the condition and requirement at site, any of the activities or part thereof mentioned in the scope are to be repeated without any extra cost to BHEL.
2. Post overhaul and synchronization of the unit, observation for 72 hrs at stable load and attending all defects, if any, is included within the scope of work.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME-IA PART – I CHAPTER - X

GENERAL

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.10.1.0 Successful Bidder is requested to furnish the following at PSSR-HQ Chennai immediately after release of Letter of Intent (LOI)

- i) Security Deposit
- ii) Unqualified Acceptance for LOI, Detailed LOI / Work Order.
- iii) Rs.160/- Stamp Paper for preparation of Contract Agreement.

1.10.1.1 Successful Bidder is requested to furnish the proof of documents for the following at the respective PSSR- Site

- i) PF Regn No.
- ii) Labour License No.
- iii) Workmen Insurance Policy No.

1.10.1.2 In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following.

1.10.1.3 PROVIDENT FUND

1.10.1.3.1 The contractor is required to extend the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within *one* month from the date of issue of the letter of intent. In case you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

1.10.1.3.2 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

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1.10.1.4 OTHER STATUTORY REQUIREMENTS

1.10.1.4.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no. along with the first running bill.

1.10.1.4.2 The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

1.10.1.4.3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of “Non- compliance of Sec 21 or non-payment of wages” to the workmen before the expiry of wage period by the contractor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

1.10.1.4.4 The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act 1948 (if applicable) to BHEL along with the Final Bill.

1.10.1.4.5 In case of any dispute pending before the appropriate authority under ID Act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

1.10.1.4.6 In case of any dispute prolonged / pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

1.10.1.5 DEPLOYMENT OF SKILLED / SEMI-SKILLED TRADESMEN

The following clause is applicable in case the contract value / contract price is Rs. Five crores and above.

The contractor shall, at all stages of work deploy skilled / semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training Institute / National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi-skilled workers required in each trade at any stage of work. The contractor

TECHNICAL CONDITIONS OF CONTRACT (TCC)

shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 160 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

1.10.1.6 Site Visit by the Bidder

1.10.1.6.1 The bidder shall, prior to submitting his tender for the work, visit, examine and acquire full knowledge & information and necessary conditions prevailing at the site and its surroundings of the plant premises together with all statutory, obligatory, mandatory requirements of various authorities about the site of works at his own expense, and obtain and ascertain for himself on his own responsibility that may be for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.

1.10.1.6.2 The bidder shall satisfy themselves about the following factors:

- i). Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.
- ii). Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.
- iii). Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.
- iv). Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.
- v). Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.
- vi). The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.
- vii). The type of equipment and facilities needed, for and in the performance of the work;
- viii). The extent of lead and lift required for the work in complete form over the entire duration of the contract, and
- ix). All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work

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or the cost thereof under this contract.

- 1.10.1.6.3 The bidder should note that information, if any, in regard to the local conditions, as contained in these tender documents, has been given to tenderer merely for guidance and is not warranted to be complete.
- 1.10.1.6.4 A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not, and no extra charges consequent on any misunderstanding or otherwise shall be allowed.
- 1.10.1.6.5 The bidder and any of his personnel or agents will be granted permission by the Site-In-Charge or his authorized nominee, on receipt of formal application in respect thereof a week in advance of the proposed date of inspection of site, to enter upon his premises and lands for purpose of such inspection, but only on the express condition that the tenderer (and his personnel and agents) will relieve and indemnify the Employer (and his personnel and agents) from and against all liability in respect thereof and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused which, but for the exercise of such permission, would not have arisen.
- 1.10.1.6.6 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequately trained, qualified and experienced supervisory staff and skilled personnel.
- 1.10.1.6.7 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.
- 1.10.1.6.8 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost.
- 1.10.1.6.9 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.
- 1.10.1.6.10 The contractor shall carry out additional tests, if any, which the Engineer feels necessary because of site conditions and also to meet system specification.
- 1.10.1.6.11 The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co- operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
- 1.10.1.6.12 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 1.10.1.6.13 Wherever Construction sequences are furnished by BHEL, the contractor
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shall follow the same sequence. Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.

1.10.1.6.14 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.

1.10.1.6.15 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.

1.10.1.6.16 Contractor shall retain all T&P / Testing instrument / Material handling equipment's etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.

1.10.1.6.17 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment toolsetc.

1.10.1.6.18 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.

1.10.1.6.19 Contractor has to work in close co-ordination with other agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and Construction program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

1.10.1.6.20 The contractor must obtain the signature and permission of the security personnel of the customer / BHEL for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside. Surplus materials including steel item brought at site by the contractors with proper documentation and Gate pass, shall be allowed to taken out of the project premises after completion of relevant works, on certification by BHEL in charge.

1.10.1.6.21 Contractor shall remove all scrap materials periodically generated from his

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working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

1.10.1.6.22 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge.

1.10.1.6.23 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

1.10.1.6.24 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.

1.10.1.6.25 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on latest ISO 9001 Standards.

1.10.1.6.26 Sometimes, it may be required to re-schedule the activities to enable other agencies to commence/ continue the work so as to keep the overall project schedule. 1.10.1.6.27 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

1.10.1.6.28 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

1.10.1.6.29 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

1.10.1.6.29 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.

1.10.1.6.30 If any item not covered but requires being executed, same shall be carried out by the contractor. Equivalent or proportional unit rate shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.

1.10.1.6.31 The contractor's work shall not hinder other work, either underground

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or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors. Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

1.10.1.6.32 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess draws at the rate prescribed by manufacturing units.

1.10.1.6.33 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like Boiler, piping, Turbine, Generator erection, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments coming under this scope.

1.10.1.6.34 For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

1.10.1.7 RECORDS TO BE MAINTAINED AT SITE:

Record of Quantity of FREE/Chargeable items issued by BHEL must be maintained during contract execution. Also reconciliation statement to be prepared at regular intervals.

The under mentioned Records/ Log-books/ Registers applicable to be maintained.

- (i) Hindrance Register
- (ii) Site Order Book.
- (iii) Test Check of measurements.
- (iv) Steel & Cement Supply and Consumption Daily Register
- (v) Records of Test reports of Field tests.
- (vi) Records of manufacture's test certificates.
- (vii) Records of disposal of scraps generated during and after the work completion.

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1.10.2 **SITE INSPECTION**

1.10.2.6 The Owner or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the Owner or his authorized agents without any extra cost to the Owner or his authorized agents. No cost whatsoever such duplication of inspection of work be entertained.

1.10.2.7 BHEL / Owner will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by Owner / BHEL.

1.10.2.8 The contractor shall maintain at site a joint protocol for recording actual measurement of work carried out at site, inspection and witnessing of various tests conducted by the contractor.

1.10.2.9 Field Quality Assurance (FQA) Formats: -

It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL and Owner as token of their acceptance. Payment to the contractor will be inked with the submission of these FQA log sheets.

1.10.2.10 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.

1.10.2.11 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor

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VOLUME-IA PART – I CHAPTER - XI

MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

Scope involves overhauling, testing and commissioning of the already erected items. However, if any new items are to be erected for the completion of the system, the same shall be executed by the Contractor as per the rates mentioned in the BOQ. The scope of the work for these items will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.11.1.0	COLLECTION OF BHEL SCOPE OF SUPPLY MATERIALS
1.11.1.1	BHEL/Customer shall issue materials from their stores at site. The contractor shall collect such materials from BHEL/Customer stores and transport to site of work at their cost.
1.11.1.2	The contractor shall inspect such materials as soon as received by the contractor and shall bring to the attention of the Engineer-in-Charge any shortage / damage or other defects noticed before taking over the materials. Materials once taken over will be deemed to have been received in good condition and in correct quantities except for intrinsic defects which cannot be observed by visual and dimensional inspection and weighing.
1.11.1.3	Upon receipt by the contractor the responsibility for any loss, damage and / or misuse of such materials shall rest with the contractor.
1.11.1.4	All materials issued by BHEL/Customer shall be properly stored and systematic records of receipts, issue and disposal will be maintained. Periodic inventory shall be made available to BHEL Engineer-in-Charge.
1.11.1.5	All materials issued by BHEL/Customer shall be utilized as directed by Engineer-in-Charge or most economically in the absence of such direction. The contractor shall be responsible for the return of all surplus material to BHEL Stores, as determined by the Engineer-in-Charge.
1.11.1.6	If the materials issued by BHEL/Customer are lost, damaged or unaccounted, the cost of such items shall be recovered from payments to the contractor. However, the contractor shall raise FIR and inform BHEL all details.
1.11.2.0	STORAGE
1.11.2.1	Materials shall be stacked neatly, preserved and stored in the contractor's shed/ work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area/ site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.
1.11.2.2	The equipment should be preferably in its original package and should not be unpacked until it absolutely necessary for its installation. The equipment should be best protected in its cases. It should be arranged away from walls.
1.11.2.3	The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damp, sinking and to circulate air under the stored equipment. This will also help in lifting the packing with fork lift truck.

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1.11.2.4	Periodic inspection of silica gel placed inside the equipment is necessary. It has to be replaced or regenerated when de-colorization takes place. BHEL shall supply the material and contractor shall replace.
1.11.2.5	Due care should be taken to ensure that the equipment is not exposed to fumes, gases etc. which can affect electrical contacts of relays and terminal boards.
1.11.2.6	The storage room and the equipment should be checked at regular interval of three months to ensure protection from termites, mold growth, condensation of water etc. which can damage the equipment.
1.11.2.7	Contractor shall keep BHEL informed about such problem and try to rectify the problem at their risk and cost.
1.11.2.8	All the instrument, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site.
1.11.2.9	Packing material shall be retained if the cubicle is to be repacked after inspection
1.11.2.11	Sub-Assemblies: a. All sub-assemblies should be kept in a separate place where it is easily accessible. b. Sub-assemblies should have a protective cover in case it is stored without wooden packing / case to prevent accumulation of dust. Silica gel packets should also be kept along with it. c. Sub-assemblies should not be stacked one above the other.
1.11.2.12	Loose items (wherever applicable): The loose items supplied for the main equipment fall into various categories like tools, modules, prefabricated cables, console inserts, recorders, modules and display units, printers, sensors and transducers, PCs, monitors, cable glands, cable ducts, frames etc. and are to be categorized accordingly and stored separately with proper identification.
1.11.2.13	Sometimes it may become necessary for the contractor to handle certain unrequired components at Customer's / BHEL's stores in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.
1.11.2.14	The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting / storage of the components at site.
1.11.2.15	NIL
1.11.2.16	The contractor shall take delivery of item, materials and consumables from the storage yard / stores / sheds of BHEL / customer which are within a radius of 5 km, after getting approval of engineer / customer in the prescribed indent forms of BHEL / customer. He shall also plan for safe custody, watch and ward of equipment after it has been handed over to them till they are fully erected, tested and commissioned.
1.11.2.17	Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation/location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipment from

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	<p>customer stores / storage yard also. Contractor's Quoted / Accepted rate shall be inclusive of the same.</p> <p>Required cranes, tractors, trailer or trucks / slings / tools and tackles / labour including operators, Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.</p>
1.11.2.18	<p>The equipment / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer, so as to avoid damage / loss of such equipment at site.</p>

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VOLUME-IA PART – I CHAPTER - XII

TESTING, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

The scope of work will comprise of following but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.12.1 The Contactor shall carry out all the required tests and pre- commissioning and commissioning activities required for their successful and reliable operation as per BHEL / Customer / customers' consultant specification.
- 1.12.2 Lube oil, seal oil, governing oil, pipelines to Steam turbine, Generator, Pumps, etc. shall be oil flushed. Contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected has been erected by the contractor or not. Decisions of BHEL Engineer in this regard will be final and binding on the contractor.
- 1.12.3 Cleaning of oil tank as per instructions of BHEL Engineer before and after oil flushing is the responsibility of the contractor.
- 1.12.4 Pre-commissioning of oil lines includes oil flushing of the pipelines till the entire system and the pipelines are accepted as satisfactorily cleaned after inspection of sediments centrifuge bowl for sediments and laboratory tests of the oil samples taken from the system. After declaration of complete oil flushing of system, oil tank, coolers & the system shall be completely drained, thoroughly cleaned and refilled with fresh oil for putting the system in operation. The contractor shall provide requisite Man-power like skilled / semi-skilled workmen in three shifts during oil flushing as a part of this contract without any extra charges. Before commissioning of oil system the pipelines should be hydraulically tested using the hydraulic test pump to the required pressure.
- 1.12.5 After acid cleaning / pickling of lubricating system (including oil piping, oil tank and other fittings) of rotating machines, oil flushing of lubricating systems as per instructions of BHEL Engineer shall be carried out. Cleaning of all tanks of lubricating oil system of ST, STG and rotating machineries before and after oil flushing is in the scope of work.
- 1.12.6 The Contractor shall carry out the air tightness test on generator stator to the satisfaction of BHEL Engineers. The necessary arrangements for testing with dry clean air shall be made by the contractor. Also, the contractor has to arrange the mercury manometer and mercury at his cost.
- 1.12.7 The contractor shall assist to carry out the following tests in generator within the quoted value:
 - a. High voltage test of bushings

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- b. Measurement of DC resistance of rotor and stator.
 - c. Impedance test of rotor.
 - d. Measurement of IR values of stator – rotor – RTD Thermocouples etc.
- 1.12.8 The contractor shall carryout kerosene test of all the bearing housing of turbine, generator, pumps & other equipments and do the repair work if any. The contractor at his cost shall also arrange kerosene.
- 1.12.9 All shaft journals and bearings of all the equipments under the scope of this tender shall be periodically inspected and preservation shall be done as per BHEL Engineer's instructions / BHEL quality instruction manuals.
- 1.12.10 All bearings, shaft journals, shafts, and other rotating parts shall be thoroughly cleaned and lubricated as per the recommendations of BHEL Engineers before commissioning / starting.
- 1.12.11 The contractor shall carry out the trial run of motors including checking the direction of rotation in the uncoupled condition checking aligning and coupling the motor to the respective driven equipment. Before starting the motor, IR values of insulation shall be recorded and if found necessary the contractor shall dry out to improve the IR value at no extra cost.
- 1.12.12 Commissioning of the set involves trial runs of all the equipment erected, blowing of steam lines, flushing of all the lines by air, oil or steam as the case may be, servicing of all equipment like dampers, actuators valves etc and any other works incidental to commissioning. Contractor shall provide required workers along with supervisors with all the requisite tools round the clock for all these works which shall form part of the work to be done.
- 1.12.13 Steam blowing of system piping if required will involve laying of temporary pipe lines, valves, etc and dismantling & restoration of piping. The required steam shall be provided at a central point by BHEL.
- 1.12.14 Temp piping for Steam blowing / Chemical cleaning / oil flushing for the piping erected under the scope of work is to be carried out by the contractor within the quoted rate.
- 1.12.15 All items / materials (including Chemicals) required for conducting hydraulic test, chemical cleaning, steam blowing, Flushing, effluent disposal etc., will be supplied by BHEL / its customer at free of cost. However, fabrication, servicing, erection, dismantling and returning of the same to stores are the responsibility of the contractor who is erecting the equipment / piping. The contractor may note that no separate payment

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shall be released for any temporary works that are to be carried out for conducting pre-commissioning and commissioning tests. Contractors are advised to include expenses on temporary works along with the rates being quoted by them. Broadly the work on temporary systems will be as under.

- 1.12.16 Transportation of materials from stores, Erection, dismantling and handing over to BHEL Stores of all temporary piping including valves, tanks, effluent pumps, electrical control panel and cabling along with insulation and supports are to be carried out as part of work. Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities.
- 1.12.17 Contractor shall lay the temporary pipelines with fittings, blinds / lugs / caps of piping, accessories and erect & commission pumps, tanks and other installations as instructed by BHEL, Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing/ water washing / oil flushing etc., of piping and other equipment's which are within the scope of work and also other piping's / lines which are integral to the chemical cleaning / HT / Steam blowing system / circuit erected by other agencies. Necessary, materials for this work will be provided by BHEL at free of charges. Temporary piping, fittings, accessories, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL.
- 1.12.18 Overhauling / cleaning / revisioning / servicing of valves, pumps, fittings in temporary system and acid cleaning tanks for recommissioning activities / operation like water flushing / steam blowing / washing / oil flushing / passivation / chemical cleaning etc. and also over hauling / revisioning of the pumps and equipment's prior to the above operations / activities will also be carried out. The contractor shall also to carry out the repairs in the temporary piping and equipments for the aboveoperations / activities. All the chemicals will be supplied by BHEL free of cost.
- 1.12.19 Steam blowing lines for Oil piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding have to be arranged by the contractor at the rates specifically quoted / accepted for this work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.
- 1.12.20 All thermo well points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded. Necessary blanks will be provided by BHEL.
- 1.12.21 After Hydraulic Test/Steam Blowing, the strainer elements are fixed. During trial operation, if required the strainers are removed for inspection of derbies & cleaning. Contractor has to carry out the work as part of his

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work without any extra cost.

- 1.12.22 For conducting Hydro test / steam blowing of MSL, HRH LP BP & CRH Lines, ESV, IV & LP BP Valves & CRH, NRV, internals are to be removed and after Hydro Test / steam blowing the internals are to re-assembled. Hydro Test / steam blow devices are to be fixed. These activities shall be carried out by the contractor as instructed by BHEL without any additional cost.
- 1.12.23 Chemical cleaning (Acid cleaning of piping, alkali flushing etc) will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves, and installation of temporary tanks for chemical and for mixing. Necessary temporary access platforms to mixing tank are to be made by the contractor. The dissolving tank, neutralizing tank etc. required for acid pickling will have to be fabricated by the contractor within the quoted rate. All the chemicals and the required raw materials will be provided by BHEL free of cost.
- 1.12.24 Chemicals for chemical cleaning will be provided by BHEL and handling of chemicals & other consumables and other connected activities has to be carried out by the contractor at their cost. All other consumable would have to be provided by the contractor.
- 1.12.25 All chemicals for acid pickling / cleaning / trial run, will be arranged by BHEL free of cost. Required manpower shall be provided by the contractor for handling, filling, emptying and re-filling etc., as part of the work without any extra cost, till the unit is handed over. Transportation of all the above shall be arranged by the contractor from BHEL store / yard to work site and returning of the empty barrels / drums to stores at his cost. Care should be taken to avoid any spillage / wastage.
- 1.12.26 Transportation of chemicals from customer's / BHEL's stores, mixing and filling up of chemicals during pre-commissioning, commissioning and post commissioning is included in the scope of this contract. Transport of chemicals for various activities / processes and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.
- 1.12.27 After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/ specification.
- 1.12.28 Transportation of oil / lubricant drums from customer's / BHEL's stores. Filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning, commissioning activities and

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related processes and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of the contractor.

- 1.12.29 Assistance for calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting to actuators coming under various groups shall be provided by contractor within the quoted rates.
- 1.12.30 Contractor to provide necessary commissioning assistance from pre-commissioning stage onwards and up to continuous operation of the unit & handing over to customer. The category of personnel shall be as per site requirement and to meet the various pre-commissioning and commissioning programmes made to achieve the schedule agreed with customer.
- 1.12.31 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.
- 1.12.32 It shall be the responsibility of the contractor to provide following category of workers in sufficient numbers along with supervisors including necessary equipment, consumables, hand tools, etc. for commissioning activities till handing over of the Unit to customer. The rate quoted shall include all these contingencies also.
- a) Fitters, Millwright Fitters & Pipe fitters
 - b) HP & Structural Welders
 - c) Riggers
 - d) Gas cutters & Grinders
 - e) Unskilled workers
 - f) Electricians
 - g) Any other category of workers as may be required.
 - h) Supervisors
- 1.12.33 Further in addition to the above, contractor has to arrange the following manpower (indicative only) exclusively for each unit for assisting BHEL commissioning engineers during commissioning, stabilization and trial operation period. This manpower will be directly reporting to BHEL commissioning engineers only.
- a) 1 No of Engineer per shift for three shifts
 - b) 2 No of Supervisor per shift for three shifts
 - c) 2 Nos of Fitter per shift for three shifts
 - d) 6 Nos of Helpers per shift for three shifts
 - e) 1 Nos of Electrician per shift for three shifts

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The log sheets for above manpower has to be maintained by contractor duly signed by BHEL Commissioning engineers and is required to submit along with RA Bills towards release of payment for commissioning activities/milestones.

- 1.12.34 It shall be specifically noted that the contractor and employees of the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers / customer officials. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including engineers / supervisors.
- 1.12.35 It is the responsibility of the contractor to provide necessary manpower, tools, tackles and consumable till the completion of work under these specifications including for trial operation, even if commissioning of Unit and the other equipment's is delayed due to reasons not attributable to the contractor.
- 1.12.36 Contractor to provide necessary commissioning assistance from pre-commissioning state onwards and up to continuous operation of the unit & handing over to customer. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programmes made to achieve the schedule agreed with customer.
- 1.12.37 If any equipment / part are required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim. In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost.
- 1.12.38 During commissioning opening / closing of valves, changing of gaskets, attending to leakages, minor modification / rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower and T & Ps in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning the same has to be rectified by the contractor at his cost.
- 1.12.39 During the initial stages of work, trenches for draining water may not be available after Leak test, Hydro test, alkali Flushing or mass flushing. For discharging / emptying the equipment, system and piping, necessary low point drains and temporary piping up to safe location are to be erected by the contractor at his cost. The piping materials will be provided by BHEL at free of charges.
- 1.12.40 The dampers, actuators etc. will have to be cleaned, checked and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as maybe necessary.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.12.41 The valves will have to be cleaned, checked, lapped or overhauled in full or in parts before erection, after chemical cleaning, during commissioning. Any special tools required for lapping only will be arranged by BHEL.
- 1.12.42 The contractor shall carry out cleaning and servicing of valves and valve actuators, if required, prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.
- 1.12.43 Overhauling, Cleaning, Servicing of tanks, pumps, equipments, barring gear, valves, governing system during erection and commissioning stages are in the scope of work. Gaskets, packing for replacement will be provided by BHEL free of cost.
- 1.12.44 TG bearing filters are to be cleaned, as and when required during flushing / commissioning by the contractor at his cost till the unit is handed over to customer.
- 1.12.45 Replacing / changing mechanical / other seals, removal and cleaning / replacing of filters etc. during pre-commissioning / commissioning stage is within the scope of work.
- 1.12.46 Replacing / Cleaning and servicing of all the filters / strainers of the erected equipment's during pre-commissioning / commissioning stage, in the system shall be done by the contractor within the accepted price. Frequent cleaning of the Suction Strainers / Basket filters / Bucket filters and other strainers may be required during various commissioning / pre-commissioning period like stem blowing / oil flushing etc., for which sufficient manpower for round the clock to be arranged by the contractor within the quoted rate.
- 1.12.47 Contractor may have to replace old / damaged gaskets / packing etc. in the equipment's / components and the same shall be carried out by contractor as per requirement. Gaskets / packing required for replacement will be provided free of cost by BHEL.
- 1.12.48 Contractor shall cut / open insulation works if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the insulation works after inspection is over.
- 1.12.49 All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests / activities may not have been listed in these specifications. Specialized test equipment, if any, shall be provided by BHEL/ its client free of hire charges. However, contractor has to take proper care of the equipment issued to him.

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- 1.12.50 The contractor shall carryout any other test not listed in the tender but as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.
- 1.12.51 The contractor shall carryout the required tests on the equipments and the pipelines such as gas tightness test / air tightness test, kerosene test, hydrostatic testing of the equipment / piping etc., and rectify all the defects caused due to contractor's fault at his own cost. Compressedair for pneumatic testing is to be arranged by contractor.
- 1.12.52 For gas tightness test of gas system of stator, the contractor has to arrange Mercury Mono-meter at his cost.
- 1.12.53 All the tests at various stages shall be repeated till all the equipment satisfy the requirement of BHEL / Customer. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing at his cost.
- 1.12.54 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves pressure gauges etc. required for the test.
- 1.12.55 Hanger adjustment / re-adjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.
- 1.12.56 In case any erection defect is detected during various tests / operations trial runs such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. If any readjustment and realignments are necessary, the same shall be done as per BHEL Engineer's instructions. If any part needs repairs rectification and replacement the same shall be done by the contractor at no extra cost. The parts to be replaced shall be provided by BHEL free of cost. If insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.
- 1.12.57 During commissioning, opening / closing of valves, changing of gaskets, packings, re-erection, Re-alignment of rotating and other equipment, attending to leakage, filling of oil to the meters / equipment and adjustments of erected equipment may arise. The finally accepted price / rates shall also include all such work.
- 1.12.58 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
- 1.12.59 The contractor shall make all necessary arrangements including making of temporary closures / dummy on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at

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no extra cost.

- 1.12.60 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.
- 1.12.61 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL. Contractor shall cut steel blanks from steel provided within quoted rate. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities / scars of cutting weld filled and ground as per BHEL Engineer's instructions. Seal welding of thermo-wells and blanks of Temperature Element are to be removed by grinding only after steam blowing.
- 1.12.62 All pressure parts and Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall make necessary arrangements and other services to carry out the required tests as per the instructions and directions of the BHEL Engineers.
- 1.12.63 The pumps, pipes, tanks required for chemical cleaning shall be spared at BHEL stores on "as is where is basis" condition. All necessary repairs / overhauls alone are in the scope of the contractor at no extra cost. All the materials shall be returned to stores after use in good condition. Necessary spares will be given by BHEL.
- 1.12.64 Temporary blinds/lugs/caps, piping and associated equipments like tanks, pumps etc required for oil flushing / alkali cleaning / acid cleaning of piping & other equipments during erection & pre-commissioning shall be erected by contractor within the quoted rate.
- 1.12.65 During the stages of pre-commissioning / commissioning / post commissioning, if any part of the ST, STG, and auxiliaries need, repair / rectification / rework / replacement, the same shall be done expeditiously and promptly by the contractor.
- 1.12.66 Necessary scaffolding and approaches for carrying out / conducting all the tests / commissioning activities shall also be within the scope of the contract.
- 1.12.67 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part of commissioning assistance till handing over of sets to customer.
- 1.12.68 Cleaning of the Suction Strainers for all CEPs / BFPs is in the scope of this

TECHNICAL CONDITIONS OF CONTRACT (TCC)

contract irrespective of whether the erection of the same is in the scope of this contractor or in the other contractor scope. Sufficient manpower for round the clock cleaning and as and when required has to be arranged by the contractor within the quoted rate.

- 1.12.69 It shall be the responsibility of contractor to attend all punch points post commissioning and resolve the deficiency as may be necessary for handing over the unit to BHEL/Client.

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VOLUME-IA PART – I CHAPTER - XIII PROGRESS OF WORK

The scope of work will comprise of following but not limited to the following:

PROGRESS AND MONITORING OF WORK

- 1.13.1 Refer forms F -14 to F-18 of volume I D of volume -I book-II. Plan and review will be done as per the formats.
- 1.13.2 The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.
- 1.13.3 It is the responsibility of the contractor to provide all relevant information on a regular basis regarding progress of work, labour availability, equipment deployment, testing, etc.
- 1.13.4 Contractor is required to draw mutually agreed monthly work programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.
- 1.13.5 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.
- 1.13.6 The contractor shall submit quarterly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.
- 1.13.7 The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.13.8 The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard. No report would be considered as no shortage of materials.
- 1.13.9 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.
- 1.13.10 Tenderers have to furnish a list of Tools and Plants including cranes, Tractor/ Trailers etc., which they propose to deploy for this work.
- 1.13.11 During the course of work if the progress is found unsatisfactory or if it is found that the skilled workmen like Riggers, operators, technicians and Helpers employed are not sufficient, BHEL will induct required additional workmen to improve the progress and recover them from

TECHNICAL CONDITIONS OF CONTRACT (TCC)

contractor's bill, all charges incurred on this account including all expenses together with BHEL overheads.

- 1.13.12** It is the responsibility of the contractor to provide all relevant information on a regular basis regarding construction progress, labour availability, equipment deployment, testing, etc.
- 1.13.13** The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.
- 1.13.14** The contractor to reflect actual progress achieved during the month and will be submitted to BHEL, so that slippages can be observed and necessary action taken in order to ensure that the situation does not get out of control will update the construction schedule forming part of this contract each month.
- 1.13.15** The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials, T&Ps, etc., inside the site premises. Without the Entry Gate Pass these materials, T&Ps, etc., will not be allowed to be taken outside.
- 1.13.16** Monthly Plan and review will be done as per the Format provided in Form-14 (Any revision in the format during the contract will also be applicable).
- 1.13.17** The contractor shall submit any other details like Site organization chart, Progress photographs, Safety implementation report, pending materials and any other documents/reports required from BHEL for the activities planned during the subsequent month, etc. as sought by BHEL Engineer.
- 1.13.18 Site Data Digitalization: Daily Activity Log, M-Book and Subcontracting Billing Module:**
- a) Daily Activity Log, M-Book and Subcontracting Billing Module.
 - b) Login ID and Password shall be provided by respective package manager.
 - c) Contractor by clicking 'Daily Work Photos', shall upload area wise photos on daily basis.
 - d) Contractor by clicking 'Daily Activity Log', shall update site activities on daily basis.
 - e) Contractor by clicking 'Measurement Book', shall enter Measurement Book in Format and BOQ.
 - f) Contractor shall raise their RA Bills along with supporting documents (such as Quality and HR Document – Vetted by Customer Etc.) and checklist through SDD portal only.
 - g) Contractor shall comply the system requirement.
 - h) Refer Vendor Manual for further details.
 - i) Agency shall extend all support towards inputs for IPMS system for project monitoring and control.

Note: The contractor shall be required to provide all facilities including manpower for the aforementioned activities, without any cost implications to the BHEL.

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VOLUME-IA PART – I CHAPTER - XIV

ENTRY OF CONTRACTOR'S PERSONNEL AND VEHICLES

1.14.1 Considering the present security scenario around the world and in India, all the Contractors dealing with BHAVINI is requested to adhere to the following security Guidelines:

1. For the initial entry of the contractor's officials /workforce into BHAVINI, a temporary entry permit will be issued for a period of 03 days, on due recommendation of the contractor and approval of Engineer in Charge. The format for application of three-day pass is given in annexure I. This three-day pass is ONLY for completing the official formalities of appointment at site and attending Safety induction Training. Before the expiry of the three-day pass, Photo pass have to be obtained, since the three-day pass is non-renewable. Similarly, 14 days pass shall be issued for facilitating to complete the Police Verification formalities to make permanent photo ID pass. **If police verification certificate (PVC) not obtained before the expiry of 14 days pass 28 days pass shall be permitted, on production of proof for submission of PVC. If PVC delayed further, temporary photo pass shall be extended up to three months, maximum of one month at a time. The format is given in Annexure III B.**
2. The photo passes issued will be valid up to the work order or up to the extended contract period. The format for the temporary pass for contractors is enclosed in Annexure III A.
3. For obtaining photo pass with permission for accessing BHAVINI gate / NICB gate, Police Verification Certificate of the individual shall accompany with the Photo pass application form. These passes will be identified with yellow colour.
4. Biometric photo passes shall be issued for entering BHAVINI premises. The contractor shall ensure that all his workforce are punching during entry and exit from BHAVINI plant site so as to have proper head count of the personnel inside the plant site.
5. Display of identity card is mandatory within BHAVINI site. The contractor is advised to instruct all the personnel working under him to always keep the identity card with him and display the same. It should be ensured that the workforce is not leaving his / her identity card at site rest room / changeroom.
6. The contractor is advised to instruct his work force to restrict their movement within their allotted place of work. It should be ensured at all times that the workforce working under him is not entering other work areas.
7. Any loss of the identity card has to be brought to the notice of the HR section through engineer in charge. FIR has to be made for the loss of identity card by the contractor. For any a loss of photo passes / card, a penalty of Rs.1000/- will be levied and the same will be deducted from and the contractor's bill.

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8. Vehicles engaged by Contractors will be allowed inside BHAVINI Plant Site only after obtaining Vehicle pass. The vehicle pass issued have to be pasted on the left side of front windshield of the Vehicle. RC book, valid insurance certificate and valid driving license of the driver should accompany with the vehicle pass application form. The format for vehicles pass is given in annexure –III.
9. Mobile phones are prohibited inside BHAVINI Plant site. However top officials of contractors may be permitted after obtaining written approval from the Competent Authority. In any case, mobile phones with CAMERA will not be allowed.
10. The Contract personnel should not bring any electronic item or other equipment unless otherwise specific authorization for the same is given by the engineer in charge, in view of work exigencies.
11. The drawings issued to the contractor (if any) shall never be taken out of the plant site. The contractor is advised to keep an inward / outward register for the drawings received from BHAVINI. Immediately after the completion of the work, the drawings related to the finished work shall be returned to the engineer in charge without fail.
12. The Contractor is not allowed to take any material outside the plant site, If in case any material has to be taken out (for testing etc), it can be done with a valid pass indicating the name of the person carrying the material, purpose of movement etc with due authorization of the engineer in charge.
13. For the movement of electronic items, specific mention should be made in the gate pass that they do not contain any classified documents and this has to be verified by Engineer-in-charge.
14. All contractors shall adhere to the information Security Policy of BHAVINI, should ensure integrity and confidentiality of BHAVINI's intellectual information and should not indulge in violation of intellectual property rights.
15. The contractor is advised to give prior intimation to the security office for loading of materials at plant site so that security person will be witnessing the loading before the materials are taken out with due authorization.
16. One month before the completion of the contract, the contractor is advised to take necessary action for disposing his pass and passes of his casual laborers to the security officer immediately after the contract period. The contractors have to get No Objection Certificate from HR for fulfilling the security instructions then only work completion certificate will be issued by the engineer in charge.
17. The Contractor is advised to instruct his workforce to follow all the safety and security rules of the plant site.

In addition to the above, the contractor is advised to strictly follow the instruction issued to them (through circulars) on security related issues time to time.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.142 The construction site is within the purview of authorized security force. The contractor shall follow at site all security rules as may be framed by the Corporation from time to time regarding removal/movement of materials and equipment from site, issue of biometry RFID identity cards, control of entry of personnel and all similar matters. Contractor shall also follow all rules and regulations applicable to the area being declared / pronounced from time to time by the authorities or state authority having sensitive structures within the vicinity of the site. Nothing extra will be payable on account of stoppage/hindrance of the work.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

	भारतीय नाभिकीय विद्युत निगम लिमिटेड BHARATIYA NABHIKIYA VIDYUT NIGAM LIMITED (भारत सरकार का उद्यम / A Government of India Enterprise) कल्पाक्कम/ Kalpakkam - 603 102 कांचीपुरम जिला (तमिलनाडु)/ Kancheepuram Dt.(TN)	S-8 Rev.00
TEMPORARY PERMIT TO ENTER BHAVINI (FOR CONTRACTORS/LABOURS / FTA)		
Name of Applicant		Passport Size Photo
Designation		
Entry required for (Please tick appropriate box)	MAIN GATE ONLY <input type="checkbox"/> MAIN GATE & NICB <input type="checkbox"/>	
Place of Work		
DOB (DD/MM/YY) & Age		
Father's Name		
Gender	Male/Female	
Aadhaar No.		
Address		
Contact Landline/Mobile No.		Email ID :
ID marks		Signature of Applicant (Contractor/Labours/FTA)
Further information, if any		
COMPANY DETAILS		
Name and address of the Company		Signature and seal of Contractor
Name of work		
Work Order/PO No.		
WO/PO validity		
Requested by	Forwarded by	Approved by
Signature	Signature and Seal of EIC/OIC	Signature and Seal of Section/Group Head
SAFETY SECTION AUTHORITY		
Training attended date :		Signature and seal of Safety section

- Note:** 1. Upload this form in VMS along with Work order, self-attested Aadhaar Card, Proof for submission of PVC application to Police, Notarized Affidavit/PVC in PDF format only.
 2. No hard copy need to be submitted to CISF

TECHNICAL CONDITIONS OF CONTRACT (TCC)

S-10
Rev.00

AFFIDAVIT

The following persons belonging to my company are well known to me personally and his/her integrity and character are very good.

Contractor Detail:

Work Order No.	
Name of work	
Period of contract	

Sl. No.	Name S/Shri/Smt./Ms.	Aadhaar No.	Mother Tongue	Belonging to which state	Mobile No.

1.	This affidavit is made for requesting entry pass for	14 days	Yes / No		
		28 days	Yes / No	Date of submission of PVC to police:	
		Extension, if beyond the above period and upto three months (Maximum of one month at a time)	1 st Extension	Yes / No	
			2 nd Extension	Yes / No	
3 rd Extension	Yes / No				
Note: Notarized affidavit required					

Note: Strike out whichever is not applicable.

Signature & Seal of EIC/OIC

Contractor's Signature with Seal

Recommended by Section Head

Approval by Director

Dy. / Asst., Commandant,
CISF Unit, BHAVINI.

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VOLUME-IA PART – I CHAPTER - XV SAFETY

- 1.15.1** In addition to the HSE Obligations and HSE Plan for Site operations by Subcontractors (HSE14 Rev. 02) specified elsewhere in the tender specifications, the contractor will comply with the following:
- i. The clauses listed in this chapter
 - ii. Any other conditions specified by the customer BHAVINI.
- Stringent of the condition(s) stipulated in the above reference shall be applicable to the contractor.
- 1.15.2** The contractor shall provide and maintain all lights, fencing, guards, warning signs and caution board and similar items as required ensuring safe working conditions at work site.
- 1.15.3** Contractor shall comply with the instructions given by the BHEL/BHAVINI safety officer regarding safety precautions, protection measures and housekeeping etc.
- 1.15.4** The contractor shall provide proper access and working platforms for all place of work as per laid down standards or as advised by BHEL/Customer.
- 1.15.5** The contractor shall ensure that all floor openings in his work are guarded/barricaded during the course of work and at the end of each day's work.
- 1.15.6** The Contractor shall meet statutory requirements as well as regulatory requirements applicable to the project, in general, and BHAVINI in particular, especially the requirements as per Factory Act-1948 (amended in 1987), safety guidelines for Job Hazard Analysis (JHA) & notifications on Industrial & Fire safety.
- 1.15.7** The contractors' safety professionals shall be well aware about Acts, Rules connected with Industrial Safety and practices particularly applicable to the project and to that effect they have to undergo an assessment at the project within 15 days of their placement at the project at the cost of the contractor and then only he/she would be given permanent entry pass to plant and considered in the required strength of the safety professionals.
- 1.15.8** Workers in general shall not be deployed at work for more than 10 hrs/day and in no case more than 12 hrs/day.
- 1.15.9** All PPE procured and provided to workers shall conform to relevant Indian Standards and should be maintained in healthy condition by suitable storage, maintenance and inspection.
- 1.15.10** The contractor shall be held responsible for non-compliance of any of the safety measures, injuries, fatalities and compensation arising out of such situations or accidents. Penalty if any on this account levied by the customer will be recovered from the contractor's bills.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.15.11 Employees Safety & Workmen Compensation:

Contractor shall be responsible for safety of all his employees during execution of the contract work. As per Workmen's Compensation Act, 1923 (Amended in 2000), the contractor will ensure the payment of compensation to his employees in case of an accident as early as possible within the time frame permitted by the law of land.

1.15.12 Safety organization of the contractor

- i. Every contractor shall have an Industrial safety organization having qualified safety professionals as enumerated below prior to the execution of job at project. The minimum numbers of safety professionals and their qualifications shall be as per Health, Safety & Environment plan for site operations by Subcontractors (HSEP 14 Rev.02).
- i. The above is the minimum requirement of safety professionals. BHEL/BHAVINI, if required, can ask for more safety professionals depending upon nature of jobs being executed by the contractor.
- ii. Contractor's safety professionals shall report to BHEL's safety incharge at plant site. However, administrative control and management of safety in the contract work would be the responsibility of the contractor. Verification of safety professional qualification/competence shall be carried out time to time at site by BHEL/BHAVINI. In case contractor fails to employ the required safety professionals, the additional/required safety professionals may be deployed by BHEL and actual expenses incurred plus 5% overheads shall be recovered from the contractor. The cost incurred plus 5% overheads towards this shall be deducted from contractor's bill.
- iv. If the required safety professionals are not employed by the contractor, BHEL/BHAVINI may deploy such safety professionals and the cost incurred towards this plus 5% overheads shall be recovered from the contractor and any other penalties levied by BHAVINI in this regard shall be deducted from the contractor's bills.

1.15.13 Job Supervision at site

- i. The contractor must ensure adequate job supervision through educated, qualified and experienced supervisors - at least one supervisor for each hazardous job activity to ensure safety during work execution. Similarly, there should be adequate on-site engineering support ensuring coverage of at least one experienced engineer for every ten supervisors and part thereof.
- ii. In case, the contractor is unable to arrange required work supervisors and engineers for work technical support, BHEL/BHAVINI may deploy such personnel and the cost incurred towards this plus 5% overheads shall be recovered from the contractor and any other penalties levied by BHAVINI in this regard shall be deducted from the contractor's bills.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.15.14 Training requirements

- i. The contractor site-in-charge should arrange induction safety training of four hours duration to all workmen prior to engaging them to work and refresher training on monthly basis covering 20% of the workman in a month with 100% coverage within 6 months. This training should be given with necessary Audio, Visual, Posters aids and as per syllabus approved by BHAVINI safety group the training should be in the language understandable to workmen. This training shall include mock trials of wearing of helmet, use of safety belt and it's hooking up to an independent lifeline etc. The safety-training instructor must certify the workmen for having understood safety aspects and use of PPEs successfully in mockup trial. To ensure proper understanding of safety instructions and safety training, the contractor shall employ literate (at least able to read safety instructions) workers only. In exceptional cases of not meeting literacy requirement the workers shall be imparted supplementary training.
- ii. The job supervisors and the engineers will have to undergo detailed safety training of at least three days' duration at the plant in safety supervision and accident prevention techniques. This training would at the cost of the contractor and then only he/she would be given permanent entry pass to plant.
- iii. **Contractor must note that in case the industrial safety induction training as per above clause is not conducted within 3 days his workmen shall not get plant entry pass.**

1.15.15 Requirements and specification of PPEs Tools and Tackles

- i. Contractor must keep adequate stock of ISI certified (or of relevant international standards) personal protective equipment (PPE), safe working tools and safe working appliances like platforms and access ladders, guard railing etc. corresponding to his scope of work and shall ensure these are used during the job for safe execution of the work. These PPE, Tools and Appliances must be inspected quarterly. Contractor on demand by BHEL/BHAVINI Authorities shall produce the record of such inspections.
- ii. All implements being used for height work like scaffold, access stairs/ladders, platform, railings etc. should be of ISI marked material meeting requirements of AEFR-1996 and should be certified by contractor safety professional prior to its safe use and to the effect that each implement should have display showing it can be safely used. If any workman is found using sub-standard or damaged PPE, tools & appliance, or any unsafe condition/practices is observed, contractor can be penalized as per the charges levied by BHAVINI.

1.15.16 Work Practices

- i. The Pre Job Briefing, prior to taking up the work, will be carried out by contractor Safety Engineer/Supervisor to all workers using plant guidelines. The Contractor shall make arrangements for adequate and qualified supervision using checklists during the execution of jobs. The contractor shall ensure that all his workmen must take safety permit for each high-risk job as per project procedure.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

If any hazardous work is found without safety work permit/ JHA/ safe working procedure, contractor can be penalized as per the charges levied by BHAVINI.

- i. Contractor working at height of more than 2.5 meter above stable floor or ground floor must acquire height pass as per procedure including the worker's medical fitness certificate by certifying surgeon (having MBBS qualification) and worker's height qualification etc. If in any height work, the worker is found working without having height pass, contractor can be penalized as per the charges levied by BHAVINI.
- ii. Contractor shall ensure safe movement of man and material as well as vehicles in site premises as per rules/regulations applicable at or issued by plant. In case of violation of the rules/regulation contractor can be penalized as per the charges levied by BHAVINI. The decision of the BHEL/BHAVINI Engineer-in-charge, with regards to levying penalty in case above work practices are not ensured shall be final and binding.

1.15.17 Safety Plan

Contractor at his cost shall perform following tasks for the jobs having high risk as identified by BHEL/BHAVINI Safety Group:

- i. Prepare Safe Working Procedures and ensure its implementation in field.
- ii. Carry out Job Hazard Analyses (JHA) and implement in field.
- iii. Based on JHA, the safe working procedures should be modified especially to include checklists as necessary checkpoints for job safety supervision.
- iv. Worker(s) must be trained based on the safe working procedure and explained about DOs & DON'Ts prior to assigning him the job.
- v. The workers must adhere to the safe working procedure for the job.
- vi. Contractor shall ensure that all Tools, Appliances, erecting equipment and their safe use by the contractor work force shall be meeting Indian standards. The contractor must ensure that necessary authorization exist with workmen prior to their deployment on a particular appliance/tool/equipment. The workmen would be required to acquire additional authorization for crane operation, crane signaling, blasting operation, welding and cutting operation, electrical work etc. and then only workmen shall be deployed for such job. He shall maintain all record of tools and equipment for their healthiness and safe use with a copy to BHEL/BHAVINI safety group.
- vii. Employing of any sub-contractor by the main contractor shall be with concurrence of plant authorities & Engineer-In-Charge as per applicable procedure of the plant. The main contractor shall ensure that all safety requirements/conditions are effectively communicated to and well understood by his sub-contractor. The main contractor should ensure safety training & availabilities of required PPEs and he will be responsible for the safety of the workmen of his sub-contractor.

1.15.18 Above clauses should be read in conjunction with relevant clauses elsewhere in the tender conditions and stringent of the condition shall be followed.

1.15.19 If the contractor fails to meet the safety requirements as stipulated under this chapter and mentioned elsewhere in the tender conditions, then penalty as levied by BHAVINI will be recovered from the contractor's RA bills.

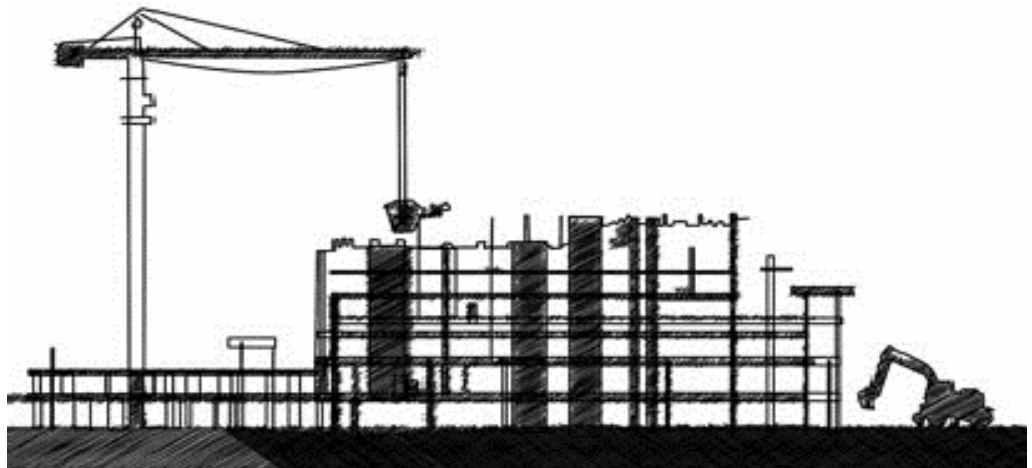
TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME – IA - TECHNICAL CONDITIONS OF CONTRACT – PART II – TECHNICAL SPECIFICATION



HSEP14

Health, Safety & Environment Plan for Site Operations by Subcontractors



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SECTION A

CRITICAL RESOURCES FOR HSE IMPLEMENTATION

1. SHARING OF OPERATING COSTS OF FACILITIES

TABLE A.1

SN	FACILITY
1	Ambulance with 24 hr. First Aid Trained Driver (Specs in Annexure A)
2	Operation of Medical center, Nurses, Medical Consumables etc. (Specs in Annexure A)
3	Training Center Consumables
4	Water sprinkling for dust suppression
	(Others:)

Note:

- i. Responsibility of operation of above facilities shall rest with BHEL
- ii. Operating cost of the above shall be deducted from subcontractors on 'proportional to contract' value basis. Sample deduction table enclosed as Annexure A.1
- iii. "Contract value" defined above & subsequently in the document shall be considered as "Awarded contract value".
- iv. No overhead cost/ enabling cost of BHEL shall be levied on the contractors for common facilities.
- v. These running costs shall be recovered from all the available subcontractors at site for the complete operational duration of the site
- vi. No overheads shall be charged on shared operating costs

2. RESOURCES TO BE PROVIDED SOLELY BY THE SUBCONTRACTOR

TABLE A.2

SN	ITEM	SPECIFICATIONS
1.	HSE DISPLAYS, Posters and signage	Annexure B
2.	HSE Tools/ Equipment/ Devices	Annexure C
3.	Rest Sheds for Workers	Annexure D
4.	Labor Colony	Annexure E
5.	Toilets (Latrines & Urinals) - in Site and Labor Colony	Annexure F
6.	Fire Extinguishers	Annexure G

Note:

In case subcontractor fails to provide the required resources, same will be procured and deployed by BHEL with applicable overhead on total procurement cost

3. ESTABLISHMENT OF COMMON FACILITIES

In green field projects BHEL shall arrange and provide the following facilities which shall be used by all subcontractors for their employees and workers. These shall be

- i. Medical Centre
- ii. Safety park with facilities of audio-visual training & vertigo test center.
- iii. No cost shall be deducted from the subcontractors for the structure part only.
- iv. The running cost with basic inputs already mentioned at Point 1 above shall be shared by all contractors.
- v. The sub-contractors shall be required to ensure participation in trainings, medical checkup and vertigo test as per the guidelines laid in this document and required as per statutory HSE requirements.

- vi. However, in projects where in these facilities are not provided by BHEL, subcontractors shall ensure the training, medical/ vertigo test of all workers at site in consultation and guidance of BHEL HSE team at site in line with provisions of this document.
- vii. The overall onus of compliance to HSE practices pertaining to training, medical checkup including vertigo test shall lie on the subcontractor only.

4. CRITICAL REQUIREMENTS W.R.T. EQUIPMENT & PPES

- i. Conventional Hydra crane with carriage in front shall not be permitted. Pick & carry tyre mounted Front Cabin mobile crane (FX or TRX/ NextGen series of 'ESCORT" or equivalent make) shall only be permitted.
- ii. Any Heavy equipment (cranes, winch machines, etc.) shall be deployed only after pre-safety Inspection by safety dept. Valid AMCs/ Fitness/ other statutory clearances as per local rules shall be required to be submitted before mobilizing the equipment at site.
- iii. All other Hand tools and power tools should not be older than 5 years.
- iv. For Chimney passenger lift, winch to have double drum rope for passenger and double safety devices must be used. Winch should not more than 3 years old and winch rope must be inspected with valid certificate from competent authority within 6 months and should meet the IS standard 9507 provision of OLR and push back button arrangement or dead man switch.
- v. Gate pass for all the lifting T&Ps and construction machinery/ equipment shall be made after obtaining written acceptance (Pre-entry Safety Clearance) from BHEL Site Safety Department after physical verification and checking all requisite documents/ compliance to Safety norms
- vi. All motor vehicles should have valid registration certificate, insurance, Pollution under control (PUC) and fitness certificate as per Motor Vehicle Act 2020. The certificates should be pasted in the glass from inside.
- vii. PPEs shall be from reputed manufactures viz. 3M, Udyogi, Karam, Frontier, Freedom, Honeywell, Liberty, Bata, Nomex, Acme, Unicare, Life Gear or equivalent. In case Subcontractor recommends any other name the same can be approved at site level by the Construction manager & Site HSE
- viii. For height work, where fall could result in death or disability, a secondary means of fall protection (Safety Net, Retractable Fall Arrestor etc.) shall be mandatorily provided by the subcontractor, failing which, a penalty of INR 10000 per case will be imposed. In addition, there should be constant supervision for such critical height work. Any non-erection activities at height eg. Housekeeping etc. shall also fall under the category of height work
- ix. **Scaffold Tagging**

Scaffolds being erected, modified or dismantled must be tagged as suitable for use. Tagging shall be done with standard tag holder. Scaffolding tag should be certified by scaffolding inspector having valid certificate.

- **GREEN** scaffold tag- shall be fixed when scaffold is complete and safe for use, signed and dated by the scaffolding competent person daily.
- **RED** scaffold tag – to be fixed if scaffold is in some way defective and cannot be used or is still under erection.
- **YELLOW** scaffold tag – to be fixed if scaffold is in under construction/ maintenance.



FIG. A.4.1 SAMPLE SCAFFOLD TAGS AND TAG HOLDER

x. **T&P Color Coding:**

- a. Inspections and tests shall be documented by means of color coding which shall verify that inspections or testing are current and that all receptacles, portable Power tools, Lifting Tools & Tackles have been inspected and tested as required. The color codes used on the project shall be:

GREEN	BLUE	YELLOW	PURPLE
January	April	July	October
February	May	August	November
March	June	September	December

TABLE. A.4.2: T&P COLOR CODES

- b. The cycle of colors shall be Quarterly as a minimum or as decided by BHEL. The color code tape / Sticker shall be clearly visible to designate the period for which the inspections and tests were conducted.
- c. Following the initial inspection, the equipment must be color-coded quarterly as per color-coding instructions that will be issued by the subcontractor.
- d. Fire extinguisher with the current month color-coding inspection sticker must be provided and secured in the platform.
- e. All slings shall be regularly inspected in accordance with the requirement of the project for frequent and periodic inspections and discard immediately if they fail to meet the minimum requirements of the project.
- f. The Subcontractor’s HSE Officer shall ensure that all PPE is inspected prior to its issue. He is to ensure all subcontractor personnel are using safe and proper PPE equipment. Regular

inspections on the PPE shall be carried out and personnel not adhering to those inspections shall be removed immediately from the site.

- g. A Ten (10) day interval period shall be given into each monthly color code change. During this Ten (10) day period either color shall be acceptable.

xi. **T&P Tagging:**

All deployed Wire Rope Slings, Chain Pulley Blocks, Hooks, slings etc. shall be Tagged using aluminum or any other metal tag with punching.

5. HSE PERSONNEL TO BE PROVIDED SOLELY BY THE SUBCONTRACTOR

5.1. NUMBERS OF HSE PERSONNEL (APPLICABLE FOR EACH WORK SHIFT)

Number of HSE Officers and Supervisors shall be in proportion to number of workers as per Table A.6 below

TABLE A.5

No. of Workers	No. of HSE Supervisors	No. of HSE Officers
Up to 100	1	1
101 to 250	2	1
251 to 500	4	1
501 to 1000	6	2
1000 to 2000	6+ One additional supervisor up to every additional 250 workers	3
2000-3000	10+ One additional supervisor up to every additional 250 workers	4
3000-4000	14+ One additional supervisor up to every additional 250 workers	5

5.1.1. DEPLOYMENT PLAN

- i. Above requirement is for every shift for each unit.
- ii. The dynamic deployment plan of Safety manpower at various locations containing names, areas, time periods, shifts etc. shall be submitted to BHEL for approval by subcontractor
- iii. BHEL may modify the deployment plan based on nature and volume of jobs, Risks and hazards associated etc.
- iv. For less than 20 workers HSE Officer is not mandatory. In case the number of workers exceed 20 for 3 consecutive months, HSE Officer is to be engaged. The HSE Officer shall be deployed for a minimum period of 6 months even if the number of workers fall below 20 in any month subsequent to deployment. If within that 6-month period, the number of workers is more than 20 for at least 3 months, the deployment duration of HSE Officer will extend further 6 months after completion of previous 6-month period.
- v. For Site Material Management/ Handling (Loading/ Unloading) contracts, 1 no. HSE Officer shall be required irrespective of the total manpower deployed.
- vi. HSE Officers/Supervisors of all the vendors may be required to report directly to BHEL HSE Officer at site & shall comprise as a total team for handling all HSE issues. However, each safety officer/ agency shall be individually responsible for the safe execution of work in their respective areas.

5.2. QUALIFICATION & EXPERIENCE REQUIREMENTS OF HSE PERSONNEL

5.2.1. HSE OFFICER

First HSE Officer to be mandatorily as per Option I as under and shall be designated Senior HSE Officer. In case of non-availability of HSE Officers with Option I configuration, the subsequent HSE Officers can be as per Option II below with recorded reasons and approval of Site Construction Manager of BHEL. All these deviations should be reported to Region HSE and PSHQ HSE.

A. Option I

- i. possesses a recognized degree in any branch of engineering or technology or architecture and had a practical experience of working in a building or other construction work in a supervisory capacity for a period of not less than two years or possesses a recognized diploma in any branch of engineering or technology and has had practical experience of building or other construction work in a supervisory capacity for a period of not less than five years;
- ii. possesses a recognized degree or diploma in industrial safety with at least one paper in construction safety (as an elective subject/ part thereof);
- iii. has adequate knowledge of the language spoken by majority of building workers from the construction site in which he is to be appointed.

B. Option II:

Graduation Degree in Science with Physics & Chemistry and degree or diploma in Industrial Safety (All Degrees/ Diploma from any Indian institutes recognized by AICTE or State Council of Technical Education of any Indian State) with practical experience of working in a building, plant or other construction works (as HSE Officer, in line with Indian Factories Act, 1958 or BOCW Act, 1996) for a period of not less than five years

Note:

- i. HSE Officer as per Option II shall be valid only on availability of Senior HSE Officer as per Option I at site.
- ii. In case of resignation of the Senior HSE Officer, the same has to be replaced within 15 days else all subsequent HSE Officers as per Option II (in case of multiple HSE Officers with a single agency) shall not be considered as valid.
- iii. The penalty shall be deducted considering non-availability of any HSE Officer at site.

5.2.2. HSE SUPERVISOR: EITHER OF X OR Y BELOW

X. Recognized Degree in any branch of Engineering OR Diploma in any branch of engineering with at least one-year construction experience

OR

Y. A recognized graduation Degree in Science (with Physics & Chemistry) or a recognized diploma in Engg. or Tech.

Additional requirements for option (Y) above

- i. Trained in fire-fighting as well as in safety / occupational health related subjects, with:
- ii. Minimum Two years of practical experience in construction work environment or in the field of safety and

Note:

- i. Option a above is by default, b is under special approval from Site HSE & Construction manager
- ii. In both cases the candidate should possess requisite skills to deal with construction & fire safety related day-to-day issues.

5.3. HSE IN-CHARGE

In case there is more than one HSE Officer with any subcontractor, one of them, who is senior most by experience & meets qualification as per option 1 as mentioned in clause 2.1 A above (in HSE discipline), may be designated as HSE In-charge who will be the nodal point of contact on HSE matters.

5.4. SUPPORTING STAFF TO HSE TEAM

- i. Supporting Staff shall include scaffolders, scaffolding inspectors, riggers, skilled and unskilled manpower
- ii. Subcontractor shall provide adequate number of workers as and when required, in order to attend and comply to Safety observations raised by BHEL/ Customer.

5.5. AVAILABILITY AND PENALTY FOR NON-DEPLOYMENT

- i. The subcontractor shall submit the certificates of qualification & experience of HSE manpower before deployment for BHEL to assess suitability as per requirement detailed in this document
- ii. In case of rejection, subcontractor shall arrange additional candidates and submit resume to BHEL. Penalties will be applicable during the period of non-deployment in such cases as well.
- iii. Subcontractor shall ensure physical availability of safety personnel at the place of specific work locations.
- iv. The Subcontractor shall deploy the HSE Officers as per the site's requirement. Non-deployment shall lead to stoppage of the work and final decision shall rest with Site HSE & Construction manager.
- v. The Subcontractor shall prepare an organization chart identifying the areas of operations, responsibilities and reporting structure of all safety personnel for each shift and submit the same to BHEL.
- vi. The subcontractor shall deploy sufficient HSE Officers, supervisors, as per numbers & qualifications mandated in this Section since mobilization of first batch of manpower and add more in proportion to the added strength in work force. Any delay in deployment will attract a penalty at following rates:

Non-deployment of HSE Officer –	Rs. 75,000 per man-month
Non-deployment of HSE Supervisor –	Rs. 50,000 per man-month

- vii. Penalty shall be collected for the period of non-availability of safety personnel after allowing a grace period of 15 days for finding a replacement. The same shall be deducted on pro-rata basis till the required manpower is deployed.
- viii. In case of abnormal delay & frequent rejections of candidates proposed by the subcontractor, BHEL shall exercise the right to deploy the safety manpower & deduct the amount from subcontractor's running bill with applicable overheads. In such cases also, the provision of logistics, transportation, food and other logistical support to the HSE personnel shall be in the scope of subcontractor in addition to the salary. After deployment of manpower by BHEL, the penalty for non-deployment specified above shall not be applicable.

6. COMPETENCY OF OPERATORS/ DRIVERS OF CRANE, WINCH, LIFTING/ CONSTRUCTION EQUIPMENT ETC.

- i. The Operators/ Drivers of crane, winch, construction/ lifting equipment etc. shall be experienced and have valid driving license for the class of vehicle / machinery as applicable (like Crane/ Forklift/ Rig, Construction equipment driving license etc.).
- ii. Minimum HMV driving license is required for all heavy equipment/ heavy vehicle (trailer/ Hyva /dumper /TM) operators at site.
- iii. The subcontractor shall certify competence of these persons in writing as and when they are posted at site.
- iv. Crane, Winch, Construction & lifting equipment operator should have certificate on subject course or experience certificate in employer letterhead.
- v. Where state is providing license for operating crane, tractor and other construction vehicles, same to be ensured.

Note: In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act,1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above, the same shall be followed.

7. In case of any stringent requirement of BHEL's customer over and above the specifications mentioned in current document, the same shall also be required to be complied at site by subcontractor.

8. REFERENCES

The Safety Rules for Construction & Erection as outlined hereunder, while setting out a broad parameter of safety norms, are not exhaustive. The subcontractor and his agencies are advised to refer to the following statutory provisions as amended from time to time for details and strict compliance therewith.

8.1. FOR GREENFIELD PROJECTS

- a) Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996 (briefly referred to as BOCW Act),
- b) Building and other construction workers (regulation of employment and conditions of service) Central Rules, 1998 (briefly referred to as BOCW Rules) as adopted by the various State Governments,

8.2. FOR EXPANSION, MODIFICATION, ALTERATION AND, OR CONSTRUCTION ACTIVITY WITHIN AN EXISTING PLANT OPERATING AS PER APPROVED SITE PLAN UNDER THE FACTORIES ACT

- a) Factories Act, 1948,
- b) Factories Rules, as adopted by the various State Governments
- c) BOCW Act
- d) BOCW Rules
- e) In case a new act/ statutory guideline/ modification/ consolidation of acts is implemented the same shall be required to be adhered by the subcontractor.
- f) The latest amendment of the above-mentioned acts/ rules shall be followed at site.

9. BHEL POWER SECTOR HSE MANAGEMENT SYSTEM

The Systems and procedures of BHEL Power Sector HSE Management System shall be implemented by the subcontractor, including:

- HSE PROCEDURE FOR REGISTER OF OHS HAZARDS AND RISKS
- HSE PROCEDURE FOR REGISTER OF ENVIRONMENTAL ASPECTS AND IMPACTS
- HSE PROCEDURE FOR REGISTER OF REGULATIONS
- HSE PROCEDURE FOR TRAINING AND AWARENESS
- HSE PROCEDURE FOR EMERGENCY PREPAREDNESS AND RESPONSE PLAN
- HSE PROCEDURE FOR PERMIT TO WORK
- HSE INSPECTION AND OTHER FORMATS

Note:

- i. BHEL reserves the right to revise/ update these systems and procedure as per requirement to address any changing HSE needs
- ii. BHEL will provide hard / soft copies of applicable HSE Procedures, Work Permits, Operational Control Procedures, Inspection/ Other Formats etc. that are necessary for ensuring safe work to the successful bidder at Site. It is the responsibility of the subcontractor to ensure availability of these documents before commencing work at site.
- iii. The subcontractor can get soft copies of these documents from respective Region SCT/ HSE for reference. The signed hard copies of the same shall not be required to be submitted along with tender document
- iv. Subcontractor shall use the Digital (Web & App-Based) HSE management Software Systems provided by BHEL whenever provided. In case not provided, hard copy systems will continue to be used. All information technology resources (Computers, mobile phones, mobile data, internet access etc.) for the use of such systems shall be ensured by the subcontractor.

10. CLEARANCE OF MONTHLY RUNNING BILLS SUBJECT TO SAFETY COMPLIANCE

- i. The monthly running Bills of the subcontractor shall be released subject to compliance to HSE requirements as per checklist in Annexure H
- ii. BHEL site HSE Head and Package In-charge shall be authorized to issue the clearance
- iii. Site Construction Manager of BHEL shall be the final authority on the matter.

11. HSE PERFORMANCE EVALUATION

- i. Subcontractor shall be assessed on monthly basis for HSE Compliance by BHEL Safety In-charge at site.
- ii. The HSE evaluation shall be based on HSE Performance Evaluation System of BHEL covering the contractual, statutory and regulatory requirements of HSE.
- iii. BHEL shall reserve the right to use these performance scores for evaluating bidder's capacity for future tenders
- iv. If safety record of the subcontractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the subcontractor may be considered by BHEL after completion of the job, provided the execution performance is satisfactory.

12. HSE PENALTIES

- i. Nonconformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the subcontractor for every instance of violation noticed.
- ii. As per contractual provision HSE penalties shall be imposed on subcontractors for non-compliance on HSE requirement as per following format.
- iii. Following are the applicable penalties for various Safety violations:

Sub: MEMO for Penalty for non-compliances in Safety

Following lapse (tick marked) was observed and penalty (in Rs.) is imposed as stated at the bottom of this memo. It is requested that such occurrences be please avoided in future.

S. No	Nature of Non - Compliance	Penalty (in INR)	Remarks
A. System Violations			
1	Working without valid Work Permit/ HIRA/ Method Statement / JSA	2000	Per case
2	Controls as per Work Permit/ HIRA/MS/JSA not ensured	2000	Per case
3	Reported Safety Violations Not Closed within Stipulated Time	1000-10000	Per case
4	Absence of required Subcontractor Officials (Site Head, HS Head) in Safety Reviews/Meetings	5000	Per case
5	Not providing required PPEs (Safety Harness, Lifeline, Safety Net, Fall arrestor, Safety Helmet, Gloves, Shoes etc.) for the work by subcontractor	2000	Per case
B. Competency/ Training/ Induction Violations			

1	Incompetent personnel deployed for specialized jobs like height work, hot work, rigging, vehicle operation etc. (without valid license/ certificate etc.)	3000	Per case
2	Work without induction training & medical check	2000	Per case
3	Height Work without Vertigo Test and height work training	2000	Per case
C. PPE Violations – Height Work			
1	Not wearing/ hooking Double Lanyard Safety Harness while working at height (> 1.2 meters) or not anchoring to lifeline	1000	Per case
2	Not Providing Lifeline for height work	3000	
3	Unsafe platforms – without Top, Mid Rails and Toe-Guards for Height Work	3000	
4	Not providing secondary means of fall protection for height work (Safety Nets, Retractable Fall Arrestors etc.)	3000	Per case
D. PPE Violations – General			
1	Not wearing safety helmet	1000	Per case
2	Wearing of helmets without chin straps	1000	Per case
3	Not Wearing safety shoes	500	Per case
4	Not wearing gloves	500	Per case
6	Not using grinding goggles/ face shield during grinding/ cutting	2000	Per case
E. Electrical Safety Violations			
1	Broken/ exposed wires/ cables	2000	Per case per day
2	Electrical plug not used for connection/ hand machines	1000	Per case per day
3	Not using proper ELCBs for electrical equipment	2000	Per case per day
4	Improper earthing of welding & Other electrical machines (Lack of double earthing, improper/ untested earth pit etc.)	2000	Per case per day
5	Not using 24 V supply for lighting in confined spaces	2000	Per case
6	Cables haphazard/ blocking way/ not organized properly	1000	Per case per day
F. Lifting & Rigging Violations			
1	Using Sling/ Chain Pulley Block and other Small T&Ps without proper, traceable Tag and Test Certificate	2000	Per T&P per day
2	Using damaged slings or not slinging properly	2000	Per T&P per day
3	Use of lifting equipment without having valid Test certificate	5000	Per equipment per seven days
4	Lifting hooks used without latches	2000	Per hook per day
5	Not effectively barricading area below lifting activity	5000	Per case
6	Using untrained/ unqualified rigger	5000	Per case
G. Housekeeping			
1	Non-removal of scrap from platforms	5000	Per Event Per location per 7 days
2	Not conducting scheduled housekeeping drives	5000	Per drive
H. Hot Work Safety Violations			
1	Gas cutting without flash back arrestor at both ends	5000	Per machine per incidence
2	Gas cutting at height without fire blanket	2000	Per event

3	Not keeping gas cylinders vertically	2000	Per event
4	Lifting cylinders without cage or rolling of cylinders	2000	Per incidence
5	Leakage in gas cylinder	2000	Per incidence
I. Vehicle Safety/ Operation			
1	Not having valid driving license for the type of vehicle/ T&P	2000	Per driver per incidence
2	Two-wheeler entry in construction area	2000	Per vehicle
3	Using Hydra for material movement at site in unsafe manner	2000	Per case
4	Using Two Hydra in Tandem for material movement without proper precautions as per OCP	2000	Per case
5	Vehicles, Hydras, Cranes, Dumpers and Earth Movers not having automatic back horns linked to gear	2000	Per Equipment per day
6	Not providing proper hard barricades around excavations/ unpermitted areas	5000	Per location per day
7	Not using guide rope while transporting material using Hydra or Cranes	2000	Per event
8	Over speeding	5000	Per case
9	Using Conventional Hydra crane	50000	Per day /crane
J. Accidents/ Incidents/ Near Misses			
1	Non-reporting of Near Miss/ Incident	20000	Per case
2	Major Accident – Worker unable to resume work within 48 hrs	100000	Per incident
3	Fatal Accident	500000	Per incident
K. Miscellaneous			
1.	Not providing the facility (drinking water, rest shed, labor colony etc. as per the specifications/ requirement)	5000	Per month per violation
2.	Not nominating the required number of workers for training as per plan	5000	Per incidence
3.	Lack of proper arrangement for disposal of sewage/ waste water/ effluents etc.	10000	Per incidence

Details (if any) related to non- compliance (Name of persons, Nature of deficiency, etc.):

Penalty Amount:

1. Rate as per above chart
2. No. of Persons/ machine/ event/ labor
3. No. of times the same error is repeated: Repetition factor
4. Total Penalty= 1. X 2. X 3. =

Witnessed by:

(Sub- Subcontractor representative)
representative)

(BHEL

Signature

Name

- Distribution: 1 Copy: to Sub- subcontractor Site In-charge,
1 Copy to Site Construction Manager (BHEL)
1 Copy to Site Finance

Note:

- i. In case the amount of penalty imposed by BHEL’s Client on BHEL for Safety violation/ incident due to or in the area of the subcontractor is more than those indicated above, same shall be imposed back-to-back on the subcontractor. However, in case such an amount is less than the specified above, penalty amount indicated above shall be imposed on the subcontractor.
- ii. For same violation only one penalty (higher of the two mentioned below) shall be applicable
 - a. Penalty imposed by BHEL’s Customer over BHEL.
 - b. Penalty as indicated in current document.
- iii. For repeated violation for the same equipment/ location, the penalty would be double of the previous penalty. Date of “Repeated violation” will be counted from subsequent days.
- iv. For repeated fatal incident in the same Unit incremental penalty shall be imposed: The subcontractor will pay 2 times the previously paid penalty in case there is repeated major/ fatal incident under the same subcontractor for the same package in the same unit.
- v. Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above.
- vi. If principal customer/statutory and regulatory bodies impose some penalty on HSE due to the non-compliance of the subcontractor the same shall be passed on to them.
- vii. The penalty amount shall be recovered by BHEL Finance department from subcontractors from the RA/Final bill.

13. PUNITIVE ACTIONS FOR “CRITICAL SAFETY VIOLATIONS”:

“Critical Safety Violations” include:

- i. Not wearing required PPEs when provided and not following safe work procedure
- ii. Taking unnecessary risks especially in height work, hot work, radiation work, lifting activity
- iii. Coming to work under influence of sedatives like alcohol, drugs etc.
- iv. Coming to work without ID Card/ Gate Pass (if provided)
- v. Intimidating/ threatening at work
- vi. Using cell phones during height work, hot work, lifting activity, driving.

In case any worker carries out any of the critical safety violations as above, BHEL reserves the right to enforce punitive action in following manner:

First Offence:	1 Punch on Gate Pass/ Induction Card/ ID Card etc. and 1-hour HSE Training. With one day off from duty
Second Offence:	2 Punches and 2-hours HSE Training with one day off from duty

Third Offence:	3 Punches and the worker will be dismissed. Gate pass to be confiscated
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In case any employee of subcontractor carries out any of the critical safety violations as above, subcontractor Site In-charge shall issue warning letter to concerned employee with copy to BHEL

Note:

- i. For above violations, guilt of the worker/ employee has to be established through appropriate evidences and records maintained.
- ii. If worker/ employee has not been given the required PPEs and safety equipment by the agency and/or not facilitated by the agency to follow safety rules, he/ she will not be considered liable but the agency will be penalized as per penalty provision in this document. In such cases, the subcontractor shall not pass the penalty over to the worker/ employee through wage deduction etc.
- iii. These critical safety violations and their consequences shall be shared with all workers and employees during induction and other training programs/ meetings, toolbox talks etc.
- iv. Gate Pass shall have provision of Tagging as indicated above
- v. The appellate authority (only for final dismissal) in this case shall be the BHEL Site In-charge whose decision shall be final on the matter and binding on all parties.

14. LEGAL IMPLICATIONS

Any legal Costs incurred by BHEL, on account of accidents taking place in the activities of the subcontractor, shall be debited to the subcontractor on actual cost basis.

For any accident occurring at site to any worker/ employee of the subcontractor leading to legal implications to BHEL Employee/ Management shall be safeguarded by BHEL legal department. All legal expenses incurred by BHEL on this account shall be recovered from the subcontractor. The accident also includes fire, loss of property or life at site.

15. HSE REVIEW MEETING

- i. Subcontractor Site In-charge and HSE In-charge shall attend the HSE Review Meeting as and when called by BHEL.

The indicative agenda points are given below:

- a) Implementation of earlier MOM points
- b) Compliance Status of HSE Observations
- c) Incidents & Near Misses, their Root Causes and Actions Taken
- d) HSE performance review
- e) HSE inspection findings
- f) HSE audit and CAPA
- g) HSE training
- h) Health check-up camp
- i) HSE planning for the erection and commissioning and installation activities in the coming month

- j) HSE reward and promotional activities
- ii. MOM on the discussion along with HSE observations will be circulated to the subcontractor for action.
- iii. The subcontractor shall close the observations to the satisfaction of BHEL within stipulated time frame

16. OTHER REQUIREMENTS

- i. If the subcontractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps and the cost shall be debited to the subcontractor with applicable overheads.
- ii. If the subcontractor succeeds in carrying out its job in time without any fatal or disabling injury incident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the subcontractor suitably for the performance.
- iii. In case of any damage to property due to lapses by the subcontractor, BHEL shall have the right to recover the cost of such damages from the subcontractor after holding an appropriate enquiry.
- iv. The subcontractor shall take all measures at the sites of the work to protect all persons from incidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding of law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the subcontractor be paid to compromise any claim by any such person, should such claim proceeding be filed against BHEL, the subcontractor hereby agrees to indemnify BHEL against the same.
- v. The subcontractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
- vi. The subcontractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard.
- vii. BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the subcontractor shall adhere to such instructions.
- viii. BHEL may prohibit the use of any construction machinery, which according to the organization is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.

17. MEMORANDUM OF UNDERSTANDING:

After award of work, subcontractors are required to enter into a memorandum of understanding as given below:

Memorandum of Understanding

BHEL, Power Sector Region is committed to Health, Safety and Environment Policy (HSE Policy).

M/s.....do hereby also commit to comply with the same HSE Policy while executing the Contract Number _____

M/s.....have gone through and understood all the HSE requirements of the contract including HSE manpower, tools & equipment, systems & procedures, and agree to fulfill the same as a minimum. Any additional resources and support required for ensuring fulfillment of HSE Objectives shall be provided by subcontractor at no extra cost.

M/s..... agree that in case they fail to comply to the HSE requirements as stipulated in the contract, BHEL shall have the right to implement the same and the cost shall be recovered from the subcontractor with applicable overheads.

M/s..... shall ensure that safe work practices as per the HSE plan. Spirit and content therein shall be imbibed in all workers and supervisors for compliance.

In addition to this, M/s.....shall comply to all applicable statutory and regulatory requirements which are in force in the place of project and any special requirement specified in the contract document of the principal customer.

M/s.....shall co-operate in HSE audits/inspections conducted by BHEL /customer/ third party and ensure to close any non-conformity observed/reported within prescribed time limit.

M/s..... agree that the subcontractor shall seek HSE clearance as per BHEL format before each RA bill as mentioned in clause no. 9. The penalty amounts for not providing Safety manpower and various Safety violations have also been reviewed and agreed.

M/s..... agree to share the HSE Costs (running costs) of common facilities created by BHEL on proportional to contract value basis as calculated at Site by BHEL.

Signed by authorized representative of M/s -----

Name :

Place & Date:

SECTION B

OPERATIONAL REQUIREMENTS

1. PURPOSE:

- 1.1. The purpose of this HSE Plan is to provide for the systematic identification, evaluation, prevention and control of general workplace hazards, specific job hazards, potential hazards and environmental impacts that may arise from foreseeable conditions during installation and servicing of industrial projects and power plants.
- 1.2. This document shall be followed by BHEL's subcontractors at all installation and servicing sites. In case customer specific documents are to be implemented, this document will be followed in conjunction with customer specific documents in complementary manner.
- 1.3. Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy wherein the relevant statutory guidelines supersedes this document, the same shall be followed.
- 1.4. In case there's any specific HSE requirement from BHEL's Client, not explicitly indicated in this document the same shall be required to be fulfilled as per the decision of BHEL Site construction manager.

2. SCOPE:

The document is applicable to BHEL's Subcontractors at all installation / servicing activities of BHEL Power Sector as per the relevant contractual obligations

3. OBJECTIVES AND TARGETS:

- i. To achieve "Zero Incident at Site"
- ii. 100% compliance to all legal/statutory requirements related to EHS.
- iii. 100% Health, Safety and Environmental Induction training attendance for all workers.
- iv. 100% High Risk activities to be carried out only after approved Method Statement, HIRA / Aspect-Impact / JSA / OCP and Permit to Work are implemented.
- v. 100% PPEs compliance in high and medium risk activities.
- vi. 100% incident reporting, recording and reviewing for corrective actions.
- vii. Regular Safety Reviews to assess HSE program compliance and closure of any recognized gaps to improve safety management and incident prevention
- viii. Prevent injury and ill health of all workers at site ('Workers' refers to all personnel including managerial, supervisory, professional, technical, clerical and other workers including contract laborers)
- ix. Prevent pollution to environment
- x. Ensure the Health and Safety of all persons at work site is not adversely affected by the work.
- xi. Ensure protection of environment of the work site.
- xii. Comply at all times with the relevant statutory and contractual HSE requirements.
- xiii. Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- xiv. Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.

- xv. Provide all personnel with adequate information, instruction, training and supervision on the safety aspect of their work.
- xvi. Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- xvii. Establish effective communication on HSE matters with all relevant parties involved in the Project works.
- xviii. Ensure that all work planning considers all persons that may be affected by the work.
- xix. Ensure fitness testing of all T&Ps/Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent person.
- xx. Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
- xxi. Ensure continual improvements in HSE performance.
- xxii. Ensure conservation of resources and reduction of wastage.
- xxiii. Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause.
- xxiv. Ensure timely implementation of correction, corrective action and preventive action.
The subcontractor shall also comply with HSE Targets stipulated by BHEL from time to time.

4. BHEL HEALTH, SAFETY & ENVIRONMENT POLICY:

In BHEL, Health, Safety and Environment (HSE) responsibilities are driven by our commitment to protect our employees and people we work with, community and environment. BHEL believes in zero tolerance for unsafe work/non-conformance to safety and in minimizing environmental footprint associated with all its business activities. We commit to continually improve our HSE performance by:

- ❖ Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- ❖ Ensuring compliance with applicable legislation, regulations and BHEL systems.
- ❖ Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- ❖ Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination/ substitution/reduction/control.
- ❖ Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.
- ❖ Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, subcontractors and suppliers on HSE issues.
- ❖ Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.
- ❖ Communicating this policy within BHEL and making it available to interested parties.

Chairman & Managing Director/ BHEL

5. ILLUSTRATIVE RESPONSIBILITIES OF SUBCONTRACTOR EMPLOYEES

5.1 HSE - A LINE RESPONSIBILITY

- i. HSE is a "Line Responsibility".
- ii. The term "Line" includes management, Executives, Supervisors, Foremen, and Workers who are part of the workforce. Line is to be fully involved in HSE Planning & Implementation with the aid and advice of HSE organization.
- iii. "Line", having control of resources and manpower is responsible for overall implementation of HSE Systems and closure of HSE observations.

5.2 SITE IN -CHARGE:

- i. Shall sign Memorandum of Understanding (MoU)
- ii. Shall ensure availability of all necessary resources required for implementation of HSE at Site
- iii. Shall engage qualified HSE Officer(s) and supervisors (s)
- iv. Shall adhere to the rules and regulations mentioned in this code, practice very strictly in area of work in consultation with concerned engineer and the safety coordinator.
- v. Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
- vi. Shall not engage any employee below 18 years.
- vii. Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job.
- viii. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent person.
- ix. Shall ensure closure of all HSE non-conformities reported by BHEL or observed during internal inspection by providing appropriate resources in a timely manner.
- x. Shall ensure the implementation of provisions of applicable acts and rules pertaining to HSE.
- xi. Shall ensure availability of updated (Hazard Identification and Risk Assessment) Register for the area of activity
- xii. Shall ensure availability of Method Statements & Job Safety Analysis for all hazardous activities
- xiii. Shall ensure necessary controls to minimize risk in all applicable hazardous activities including Height Work, Hot Work, Lifting & Rigging, Confined Space, Maintenance, excavation, Radiography, Loading/ Unloading, Drilling/ Blasting etc.
- xiv. Shall ensure implementation of HSE requirements mentioned in this document and as specified in the BHEL HSE management System including training, inspection, awareness, reporting etc.
- xv. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- xvi. Shall ensure a secondary means of fall protection (Safety Net, Retractable Fall Arrestor etc.) for preventing fall from height
- xvii. Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.

- xviii. Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of BHEL.
- xix. Shall ensure that Horseplay is strictly forbidden.
- xx. Shall ensure that adequate illumination is arranged during night work.
- xxi. Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
- xxii. Shall ensure display of adequate signage/posters on HSE.
- xxiii. Shall ensure that mobile phone is not used by workers while working.
- xxiv. Shall ensure conductance of HSE audit, mock drill, medical camps, induction training and training on HSE at site.
- xxv. Shall ensure full co-operation during HSE audits.
- xxvi. Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
- xxvii. Shall ensure good housekeeping.
- xxviii. Shall ensure adequate valid fire extinguishers are provided at the work site.
- xxix. Shall ensure availability of sufficient number of toilets (preferably bio-toilets) /restrooms and adequate drinking water at work site and labor colony.
- xxx. Shall ensure adequate emergency preparedness.
- xxxi. Shall be member of site HSE committee and attend all meetings of the committee
- xxxii. Power source for hand lamps shall be maximum of 24 v.
- xxxiii. Temporary fencing should be done for open edges if Hand – railings and Toe-guards are not available
- xxxiv. To record all incidents including near miss and report to BHEL and to ensure analysis & corrective actions for the same
- xxxv. Shall conduct weekly Safety Walks in the work area and record the findings.
- xxxvi. Construction of Canteen at Site, Office Infrastructure: Printer, PC, Fire Extinguishers etc.
- xxxvii. Shall analysis HSE Performance regularly in work area and take steps to improve the same
- xxxviii. Shall ensure stoppage of work in case of unacceptable Safety hazards

5.3 HSE OFFICER:

- i. Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
- ii. Facilitate inclusion of safety elements into Work Method Statement and creation of Job Safety Analysis (JSA)
- iii. (HSE Head) To prepare deployment plan of HSE personnel for all shifts, so as to ensure constant supervision of all areas. The plan to be submitted to BHEL
- iv. Highlight the requirements of safety through Tool-box / other meetings.
- v. Help concerned HOS to prepare Job Specific instructions/ JSA for critical jobs.
- vi. Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
- vii. Advice & co-ordinate for implementation of HSE Systems & Procedures.
- viii. To stop work in case of any critical safety violation until the violation is cleared
- ix. Convene HSE meeting & minute the proceeding for circulation & follow-up action.

- x. Plan procurement of PPE & Safety devices and inspect their healthiness.
- xi. Report to BHEL on all matters pertaining to status of safety and promotional program at site level.
- xii. Facilitate administration of First Aid
- xiii. Facilitate screening of workmen and safety induction.
- xiv. Conduct fire Drill and facilitate emergency preparedness
- xv. Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.
- xvi. Apprise BHEL on safety related problems.
- xvii. Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- xviii. Recommend to Site In charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.
- xix. To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.
- xx. Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.
- xxi. Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters.

5.4 HSE SUPERVISOR:

- i. All requirements as per 5.1
- ii. To monitor allotted area for Safety violations, take required action and inform the concerned Safety Supervisor / Officer
- iii. To assist HSE Officer

5.5 PACKAGE IN-CHARGES, ENGINEERS & ALL EMPLOYEES:

- i. To be aware of, get involved in and ensure implementation of all HSE related Systems and Procedures including but not limited to:
 - a. BHEL HSE Management System including HSE Procedures and OCPs, HIRA, JSA etc.
 - b. Work Permit System
 - c. Emergency Preparedness Response Plans
 - d. Contractual HSE requirements
 - e. Legal Requirements
 - f. Penalty System
 - g. Training requirements
- ii. To ensure that the persons engaged in respective area follow the safety rules like using appropriate PPEs.
- iii. To develop Method Statements and ensure availability of Job Safety Analysis for all activities in scope
- iv. To ensure that the reported HSE non-conformities in the work area are resolved immediately before resuming work
- v. To record all incidents including near miss and report to BHEL.

- vi. To adopt safe working practices at all times and act as role model for Safety
- vii. To take immediate corrective action actions in case any non-conformity is observed on product / process / system with respect to Occupational Health, Safety and Environment.
- viii. In case any particular activity / work has extremely high consequential risk or high environmental impact, same shall be brought to the notice of BHEL Package In-charge before starting the work.
- ix. To interfere/ stop work as & when identified unsafe.
- x. To maintain & promote improved level of house-keeping all the time at site.
- xi. To support/co-operate with audit team members as & when safety audits are carried out.
- xii. To involve in investigation, if any incident occurs in his work area.
- xiii. To participate in safety promotional programs
- xiv. To attend the safety committee meeting, if member/invitee
- xv. To ensure that only fit T&Ps and qualified persons are engaged for all activities.
- xvi. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- xvii. Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- xviii. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent authorities.

6. HSE PLANNING BY SUBCONTRACTOR:

6.1 HAZARD ANALYSIS & RISK ASSESSMENT (HIRA), METHOD STATEMENT (MS) & JOB SAFETY ANALYSIS (JSA):

- i. Subcontractor shall identify all OHS Hazards and Risks applicable to all activities in scope and plan & implement the required control measures. HIRA Register shall be maintained.
- ii. Subcontractor shall develop Method Statements & Job Safety Analysis documents for all hazardous activities in scope and ensure the required control measures. Job Safety Analysis is to be attached along with any Work Permit request

6.2 REGISTER OF REGULATIONS:

Subcontractor shall prepare a register of applicable rules and regulations in the scope and plan to ensure compliance.

HIRA Register, Method Statements, Job Safety Analysis and Register of Regulations are dynamic documents and shall be revised (as applicable):

- i. At fixed frequency of 3 months
- ii. Addition/ deletion/ modification of a process/ activity
- iii. After an accident/ incident
- iv. After any change in applicable rules/ regulations/ laws.

6.3 MONTHLY HSE PLAN COVERING THE FOLLOWING AS A MINIMUM SHALL BE PREPARED AND SUBMITTED TO BHEL FOR APPROVAL:

- i. HSE Trainings covering all activities/ hazards/ workers
- ii. HSE Inspection Plan covering all areas/ activities/ equipment/ hazards
- iii. HSE Activities: Safety walks, Awards, housekeeping, reviews etc.

Note: Online/ App-based system shall be used for HSE Planning and Implementation/ Update whenever provided by BHEL otherwise Hard-copy based system shall continue

6.4 MONTHLY HSE PLANNING & REVIEW OF HSE ACTIVITIES ALONG WITH BHEL:

Monthly planning and review of HSE activities shall be carried out by subcontractor as per provided **format** jointly along with BHEL

7. MOBILIZATION OF MACHINERY/EQUIPMENT/TOOLS BY SUBCONTRACTOR:

- i. Subcontractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the subcontractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.
- ii. As a measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and complies with legislative and owner requirement, inspection shall be arranged by in-house competent authority for acceptance as applicable. Inspection by Third Party competent person shall be arranged:
 - a. Before first time use at site
 - b. After carrying out any modification
 - c. After repairs subsequent to involvement in any accident/ incident
- iii. As a further measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and comply with legislative and owner requirement, inspection as per provided format shall be arranged by in-house expert / competent authority (preferable) for acceptance. The equipment considered for this purpose shall include all those in the T&P list in the tender document.

8. MOBILIZATION OF MANPOWER BY SUBCONTRACTOR:

- i. As a measure to ensure that manpower being mobilized to the construction site is fit and competent for safe working, screening arrangement shall be made by the sub-subcontractor to ensure competency and fitness through following measures:
 - a) **Medical Checkup:** Examination of medical fitness shall be conducted through qualified medical professional for all workers to be deployed as per provided **format**. For height workers, vertigo (height phobia) test to be carried out as qualification criteria as per Annexure K and recorded in provided **format**.

- b) **Induction Training:** Induction training of all workers to be ensured as per **provided procedure and format**. Training evaluation to be carried out and training to be repeated if not passed
- c) Only on successfully meeting above criteria, permanent gate passes to be issued
- ii. The subcontractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by a registered medical practitioner.
- iii. The subcontractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job.
- iv. Ensure that the regulatory requirements of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
- v. Appropriate accommodation to be arranged for all workmen in hygienic condition.
- vi. Cost of contractual, statutory and regulatory requirements like Training, medical checks, PPEs etc. shall not be transferred to the workers and such activities shall be considered as part of the job.

9. PROVISION OF PERSONAL PROTECTIVE EQUIPMENT (PPEs):

- i. Personnel Protective Equipment (PPEs), shall be provided by the subcontractor to all workers as per requirement of the job.
- ii. The choice of PPEs to ensure multiple (at least more than 1) means of protection against any hazard. All applicable safety precautions for a job shall be ensured notwithstanding the duration or perceived importance of the task.
- iii. The applicability of PPEs shall be as per the concept of Hierarchy of controls, i.e.:
- iv. Elimination->Substitution->EngineeringControls->AdministrativeControls-PPEs
- v. Relying solely on PPEs without ensuring necessary controls to be strictly avoided.
- vi. The following matrix recommends usage of minimum PPEs against the respective job.

Activity	Type of Protection						Remarks, if any
	Hand	Eye	Ear	Body	Respiratory	Others	
Gas Welding & Cutting	LG	WG	-	LA	*SCBA/ OLBA	-	* for confined space
Electric Arc Welding	LG	HMWS	-	LA	*SCBA/ OLBA	-	* for confined space
Rigging	CG	SG	-				--
Working at Height	-	SG	-	DLFBH	-	*FAS	* for vertical columns
Grinding & Chipping	CG	FS / SG	-	LA	-	-	--
Working in High Noise	-	-	EP / EM	-	-	-	--
Handling of Cement Concrete	RG	SG	-	-	DM	-	

Blasting	CG	SG	EP*	-	-	-	* at noise area
Excavation	CG	SG	-	-	DM	-	*Gum boot in place of Safety shoe for foot
Chemical Handling	PVCG	CSG	-	PVCA	-	-	*Full body rubber suit with hood
Electrical and C&I	ERG*	SG	-	-	-	-	*For high voltages
Sand/shot blasting	CG	-	EP/ EM	CA	SAMH	-	

ABBREVIATIONS: FS: Face Shield, CSG: Chemical splash goggles, HMWS: Helmet mounted welder's shield, GB: gum boot, DLFBH: Double lanyard full body harness, SG: Safety goggles, DM: Dust mask, SAMH L Supplied air mask/hood, EP/EM: Ear plug/Ear Muff, CG: Cotton hand gloves, LG: Leather hand gloves, LA: Leather apron, RG: Rubber gloves, PVCG: PVC Gloves, PVCA: PVC Apron, SCBA: Self-contained breathing apparatus, WG: Welding goggles, ERG: Electrical Rubber Gloves. OLBA: Online breathing apparatus

The list is not exhaustive. Additional PPEs to ensure Safe Work may need to be deployed as per the requirement of the task at no additional cost.

- vii. The PPEs shall conform to the relevant standards as below (illustrative list) and bear ISI mark.

RELEVANT IS-CODES FOR PERSONAL PROTECTION

PPEs	IS Codes
Industrial Safety Helmets.	IS: 2925 – 1984
Rubber gloves for electrical purposes.	IS: 4770 – 1968
Industrial Safety Gloves (Leather & Cotton Gloves).	IS: 6994 – 1973 (Part-I)
Leather safety boots and shoes.	IS: 1989 – 1986 (Part-I-II)
Industrial and Safety rubber knee boots.	IS: 5557 – 1969
Code of practice for selections care and repair of Safety footwear.	IS: 6519 – 1971
Leather Safety footwear having direct molding sole.	IS: 11226 – 1985
Eye protectors.	IS: 5983 – 1978
Ear protectors.	IS: 9167 – 1979
Eye & Face protection during welding	IS: 1179-1967
Industrial Safety Belts and Harness	IS: 3521 – 1983
Guide for selection of industrial Safety equipment for body protection	IS:8519 -1977
Respiratory Protective Devices	IS:9473-2002,14166-1994,14746-1999

- viii. Where workers are employed in sewers and manholes, which are in use, the subcontractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent incident to the public

- ix. All the personnel and visitors shall mandatorily use safety helmet (with company logo), safety shoe and reflective vests, in addition to any other PPEs as deemed appropriate for the area of work/ visit.
- x. Following Color scheme for Helmets shall be followed:
 - a. Workmen: Yellow
 - b. Safety staff: Green or white with green band
 - c. Electrician: Red
 - d. Others including visitors: White
 - e. For height workers, special marking on helmets besides indication on Gate Pass/ ID Card
- xi. The subcontractor shall maintain register for issue and receipt of PPEs.
- xii. All the PPEs shall be checked for quality before issue and the same shall be periodically re-checked. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be replaced.
- xiii. The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front.
- xiv. The body harnesses shall be serial numbered.

10. ARRANGEMENT OF INFRASTRUCTURE:

10.1 DRINKING WATER:

- i. Drinking water shall be provided and maintained at suitable places at different elevations such that minimum quantity of 5 liters is available for each worker during the day.
- ii. Drinking water tank shall be so installed so as to be available within 200 meters of each working area
- iii. Container should be labeled as “Drinking Water” in languages understood by the workers
- iv. Cleaning of the container shall be ensured at least once in a week. Mild cleaning detergents as used for cleaning vessels shall be applied and scrubbers (3M or equivalent) shall be used for removing scales and deposits on the inside surface. The tank shall be thoroughly cleaned with potable water only before it is refilled (also applicable to labor colony).
- v. Suitability of water source for drinking to be tested as per IS10500 at least once in six months.

10.2 WASHING FACILITIES:

- i. In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
- ii. Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition and dully illuminated for night use.
- iii. Water suitable for washing and not for drinking shall be clearly indicated as “Not for Drinking” in language understood by workers.
- iv. Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.

10.3 LATRINES AND URINALS:

- i. Latrines and urinals shall be provided in every work place as indicated in Section A
- ii. Urinals shall also be provided at different elevations.
- iii. They shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times, by appointing designated person.
- iv. Separate facilities shall be provided for the use of male and female worker if any.

10.4 PROVISION OF REST SHEDS FOR WORKERS DURING REST PERIOD:

Proper Rest Shed (s) with shelter shall be provided for rest during break so as to accommodate all workers as indicated in Section A

10.5 MEDICAL FACILITIES:

10.5.1 GENERAL

- i. Provision of Medical Center, Ambulance etc. shall be as per Section A of this document
- ii. Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste – Management and Handling Rules, 1998)
- iii. Every injury shall be treated, recorded and reported.
- iv. All First Aid injuries shall be recorded as per provided Format
- v. List of qualified first aiders and their contact numbers to be displayed at conspicuous places.

10.5.2 FIRST AIDER/ FIRST AID BOX

- i. The first aider along with facilities should be available at a point nearest to the work location wherein majority of the workers are working.
- ii. The subcontractor shall provide necessary first aid facilities as per schedule III of BOCW. At every work place first aid facilities shall be provided and maintained.
- iii. The first aid box shall be kept by first aider who shall always be readily available during the working hours of the work place. His name and contact no to be displayed on the box.
- iv. The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time.
- v. The first aid box shall be distinctly marked with a Green Cross on white background.
- vi. Details of contents of first aid box is given in Annexure J
- vii. A slip of contents shall be pasted on the First Aid Box with following details
- viii. Monthly inspection of First Aid Box shall be carried out by the owner as per provided format
- ix. The subcontractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

10.5.3 HEALTH CHECK UP

The persons engaged at the site shall undergo health check-up as per provided format before induction. In addition, the persons engaged in the following works shall undergo health check-up at least once in a year:

- i. Height workers
- ii. Drivers/crane operators/riggers
- iii. Confined space workers
- iv. Shot/sand blaster
- v. Welding and NDE personnel

10.5.4 HEIGHT PHOBIA/ VERTIGO TEST:

- i. The persons engaged in working at heights (above 2 meters) to be assessed for Vertigo and associated conditions and recorded as per provided format. Suggested Vertigo Test Procedure is given in Annexure K
- ii. Such workers are to be allowed only on successful completion of test, otherwise shall be allocated ground-based jobs.
- iii. IDs / Height passes shall be issued to such workers, besides special markings on helmets for easy identification.

10.5.5 PROVISION OF CANTEEN FACILITY:

- i. Canteen facilities shall be provided for the workmen of the project inside the project site where worker strength is 250 or more.
- ii. Proper cleaning and hygienic condition shall be maintained.
- iii. Proper care should be taken to prevent biological contamination.
- iv. Adequate drinking water should be available at canteen.
- v. Fire extinguisher shall be provided inside canteen.
- vi. Regular health check-up and medication to the canteen workers shall be ensured as per applicable regulations.
- vii. Canteen waste to be disposed of in hygienic manner

10.6 PROVISION OF ACCOMMODATION/LABOR COLONY FOR WORKFORCE:

- i. Proper accommodation for workforce to be provided in line with minimum requirements indicated in Section A
- ii. Labor colony shall be inspected each week by HSE Officer and report submitted to BHEL as per provided format

10.7 PEST CONTROL:

Regular pest control should be carried out at all offices, mainly laboratories, canteen, labor colony and stores.

10.8 SCRAPYARD:

- i. In consultation with customer, scrapyard shall be developed to store metal scrap, wooden scrap, waste, hazardous waste.
- ii. Scrap/Waste shall be segregated as Bio-degradable and non-bio-degradable and stored separately.

10.9 ILLUMINATION:

- i. The subcontractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations at dark places and during night hours at the work spot as well as at the pre-assembly area.
- ii. Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
- iii. Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
- iv. Emergency lighting provision for night work shall be made to minimize danger in case of main supply failure.
- v. Adequate and suitable light shall be provided at all work places & their approaches including passage ways as per IS: 3646 (Part-II).

SUITABLE ILLUMINATION LEVELS FOR VARIOUS AREAS SHALL BE DECIDED BASED ON BROAD GUIDELINES INDICATED BELOW:

S. No.	Location	Lux Level (lumens/sqm)
A. Construction Site		
1	Outdoor areas like store yards, entrance and exit roads	20
2	Platforms	50
3	Entrances, corridors and stairs	100
4	General illumination of work area	150
5	Rough work like fabrication, assembly of major items	150
6	Medium work like assembly of small machined parts	300
7	Fine work like precision assembly, precision measurements etc.	700
8	Sheet metal works	200
9	Electrical and instrument labs	450
B. Office		
1	Outdoor area like entrance and exit roads	20
2	Entrance halls	150
3	Corridors and lift cars	70
4	Lift landing	150
5	Stairs	100
6	Office rooms, conference rooms, library reading tables	300
7	Drawing table	450
8	Manual telephone exchange	200

- vi. Illuminations shall be inspected on weekly basis as per provided **format** using a calibrated lux meter.

11. HSE TRAINING & AWARENESS:

11.1 TRAINING PLAN:

- i. All training programs to be carried out in a planned manner. Monthly/ Annual Training Calendar to be submitted to BHEL for approval and shall cover HSE Training requirements of all activities, workers, hazards applicable to the area(s) of work.
- ii. Subcontractor shall nominate workers as per the schedule of specific training plan, failing which, penalty shall be imposed.
- iii. Training records of all workers along with attendance, signatures, faculty details etc. shall be maintained in soft/ hard copy as per provided **formats**.
- iv. Each labor should undergo at least 0.5% of total man-hours worked in HSE training.

11.2 HSE INDUCTION TRAINING

- i. All persons entering into project site shall be given HSE induction training by the HSE officer of BHEL /subcontractor before being assigned to work.
- ii. The induction training shall be imparted through audio-visual medium (Classroom specialized training), and shall be minimum of 1 Complete Day.
- iii. Evaluation to be carried out after training and training shall be repeated in case of failure.
- iv. Safety Induction Card shall be printed by Subcontractor and provided to all trained workers. A Safety induction book shall also be printed and issued to each worker after induction training (Format for the same may be provided by BHEL).
- v. Induction training subjects shall include but not limited to:
 - a. Briefing of the Project details.
 - b. Safety objectives and targets.
 - c. Site HSE rules.
 - d. Critical Safety Violations and consequences
 - e. Site HSE hazards and aspects.
 - f. First aid facility.
 - g. Emergency Contact No.
 - h. Incident & Near Miss reporting.
 - i. Fire prevention and emergency response.
 - j. Rules to be followed in the labor colony (if applicable)
 - k. Accident case studies
- vi. General:
 - a. Proper safety wear & gear must be issued to all the workers being registered for the induction (i.e., Shoes/Helmets/Goggles/Leg guard/Apron etc.)
 - b. They must arrive fully dressed in safety wear & gear to attend the induction.
 - c. Any one failing to conform to this safety wear& gear requirement shall not qualify to attend.

- d. On completing attending subcontractor's in-house HSE induction, each employee shall sign an induction training form to declare that he had understood the content and shall abide to follow and comply with safe work practices.
- e. They may only then be qualified to be issued with a personal I.D. card, for access to the work site subject to clearing the medical fitness test.

SAFETY INDUCTED	
Name :	
Date :	
Sign By Trainer :	

ABOVE STICKER SHALL BE PASTED ON HELMET OF WORKERS AFTER SAFETY INDUCTION TRAINING

11.3 JOB-SPECIFIC SKILL BASED HSE TRAINING

The contracting agency shall also impart job specific skill-based safety training to all its employees (Minimum one day) on various related safety topics using internal/external safety professionals/consultants as per the matrix given below. Record of such trainings and attendance particulars shall be maintained in a register for ready reference to statutory authorities/engineer-in charge as per provided format.

TRAINING MATRIX

Name of topic	Executives	Supervisors	Skilled Workmen	Other Workers
Safety Induction	Y	Y	Y	Y
Accident_ Causes, factors, cost	Y	Y	Y	-
Industrial hazards & Accident Prevention	Y	Y	Y	-
Investigating, reporting, records	Y	Y	-	-
Personal Protective Equipment	-	Y	Y	Y
Construction Safety & Role of Supervisory personnel	-	Y	-	-
Permit to Work (PTW)	-	Y	Y	y
Statutory Provisions (BOCW Act/Rules, Factories Act 1948 etc.)	Y	Y	y	y
Material handling	-	y	Y	Y
Emergency Management	Y	Y	Y	-
Electrical Safety	-	Y	Y	-
Fire safety	Y	Y	Y	Y
First Aid & CPR (cardio pulmonary resuscitation)	-	Y	Y	Y (Selected)
Safety in Welding & Cutting	-	-	Y	-
Safety Audit	Y	Y	-	-
Safety in Lifting Tools & Tackles	-	Y	Y	y

Safety in Working at height	-	Y	Y	Y
Safety in Confined space work	-	Y	Y	Y
Defensive Driving	-	Y*	Y*	Y*

*for construction vehicle operators, helpers & crane operators

Y=YES

Note:

- i. Subcontractor shall prepare a training plan/ matrix covering all hazards and implement the same after approval of BHEL.
- ii. It is to be ensured that every worker undergoes Job-Specific training once every 3 months.
- iii. Records of training programmes along with attendance shall be maintained by the subcontractor
- iv. Each worker to be issued a Card indicating the types of trainings undergone.

11.4 HSE TOOL-BOX TALK:

- i. HSE tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups prior to the start of work and shall be randomly attended by subcontractor engineers/ officials. The agenda shall consist of the following:
 - a. Details of the job being intended for immediate execution.
 - b. The relevant hazards and risks involved in executing the job and their control and mitigating measures.
 - c. Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
 - d. Recent non-compliances observed.
 - e. Appreciation of good work done by any person.
 - f. Any doubt clearing session at the end.
- ii. Tool box talk to be conducted before start of work in every shift.
- iii. During toolbox talk, visual check-up of workers regarding health, any signs of fatigue, intoxication etc. shall be conducted and any suspected workers to be acted upon.
- iv. Record of Tool box talk shall be maintained as per provided **format**

11.5 TRAINING ON HEIGHT WORK:

- i. Training on height work shall be imparted to all workers working at height by in-house/external faculty at least once every 3 months.
- ii. For Height Workers Separate pass shall be provided by the subcontractor.
- iii. The training shall be of minimum 2-hour duration, through audio-visual medium and followed by evaluation. In case of poor scoring, training shall be repeated.
- iv. The training shall include following topics:
 - a. Proper use of PPEs – safety harness, lanyard, fall arrester, retractable fall arrester, life line, safety nets etc.
 - b. Provision of secondary means of fall protection

- c. Safe climbing through monkey ladders.
- d. Inspection of PPEs.
- e. Medical fitness requirements.
- f. Mock drill on rescue at height.
- g. Dos & Don'ts during height work.
- h. Accident case Studies

11.6 RE-INDUCTION TRAINING

The induction training shall be repeated for every worker after at least 1 year and shall be a pre-requisite for renewal of Gate Pass/ ID card.

11.7 PENALTY TRAINING

The personnel involved in Safety Violations/ Incidents shall mandatorily undertake penalty training pertaining to the violation/ incident. Penalty training shall be at least half-day duration.

11.8 HSE PROMOTION-SIGNAGE, POSTERS, COMPETITION, AWARDS ETC.:

- i. HSE Displays shall be installed as indicated in Section A
- ii. Contracting agencies shall arrange for display of safety hoardings depicting suitable safety cartoons/messages/ cautionary notices at appropriate places of project site to remind the workers to perform their duties safely.
- iii. Apart from safety hoardings, each agency should maintain a safety bulletin board at all their work locations. Such safety bulletin boards should depict the activities being planned for the day, good practices, permit details etc.
- iv. Safety suggestion boxes shall be kept at each subcontractor's office at site for obtaining safety suggestions from the workers. Best suggestions should be implemented and may be rewarded suitably to encourage the workers for safety.
- v. Safety awareness campaigns, competitions, plays, movie shows, songs etc. to be organized for workers at Site and Labor colony from time to time to enhance Safety Awareness

11.9 HSE REWARDS & INCENTIVE SCHEME

Subcontractor shall implement a reward & incentive scheme for workers & supervisors displaying adherence to safety principles. Such workers shall be felicitated in a monthly function, attended by Subcontractor top management and BHEL representatives. Suitable gift shall be given to such workers for encouragement.

11.10 HSE AWARENESS PROGRAM FOR OFFICIALS:

Subcontractor shall arrange monthly HSE awareness program on different topics including medical awareness for all engineers/ supervisors / officials working at site. This program can be part of progress/ safety review meetings.

12. HSE COMMUNICATION AND PARTICIPATION:

12.1 HSE INCIDENT REPORTING, INVESTIGATION & CORRECTIVE ACTION:

- i. All incidents (near misses, property damage, first-aid cases, minor, major and fatal incidents) shall be reported to BHEL as they happen immediately through SMS and Hard/Soft copy as per provided format
- ii. All incidents including near miss, minor, major and fatal incidents shall be recorded
- iii. All incidents shall be investigated for Root Causes and corrective actions ensured to prevent recurrence shall be implemented.
- iv. Work shall be put on hold in the area till corrective actions are verified by BHEL
- v. The Root Cause Analyses and Corrective actions taken shall be recorded

12.2 HSE EVENT REPORTING:

- i. Important HSE events like HSE training, Medical camp etc. organized at site shall be reported to BHEL site management in detail with photographs for publication in different in-house magazines
- ii. Celebration of important days like National Safety Day, World Environment Day etc. shall also be reported as mentioned above.

12.3 MONTHLY HSE REPORTING:

- i. All routine and non-routine HSE activities shall be reported to BHEL on monthly basis by the subcontractor as per provided format. The reporting medium can be hard/soft as per BHEL requirement.
- ii. The period of reporting shall be 25th of the preceding month to 24th of the present month and shall be submitted by the end of the calendar month.
- iii. Report shall include good quality images of HSE Activities

12.4 DAILY HSE ACTIVITY REPORTING:

Daily HSE activities shall be reported by subcontractor to BHEL as per provided format

12.5 HSE SUGGESTIONS:

All workers and employees shall be encouraged to provide suggestions for improvement in Health, Safety & Environment performance at site. The suggestions shall be recorded in a "Suggestions Register" as per provided format. Suggestions found suitable for implementation shall be implemented and recognition / reward to be given to the submitter.

Suggestion Register to be placed at Site and Labor Colony and shall be reviewed on periodic basis

12.6 CLIENT COMMUNICATION:

All HSE related communication from BHEL, customer / external statutory and regulatory agencies to be handled on priority. Same to be recorded and issues to be resolved in expeditious manner

13. SAFETY DURING WORK EXECUTION:

Safety during work execution shall be ensured by following appropriate Safety Rules, providing adequate resources, deploying competent and trained manpower, regular training & inspection and non-conformity resolution. Main aspects are indicated as under:

13.1 OPERATIONAL CONTROL PROCEDURES:

In order to reduce the risk associated with hazardous activities, applicable OCPs (Operational control procedures) will be followed by subcontractor as per BHEL instructions, outcomes of Hazard Analysis & other requirements. This will be done as part of normal scope of work. Illustrative list of reference OCPs is given below.

TABLE 13.1 ILLUSTRATIVE LIST OF REFERENCE OCPs

No.	Topic	No.	Topic	No.	Topic
0	General Safety	22	Steam blowing	44	Material preservation
1	Handling of chemicals	23	Working in confined area	45	Electro-resistance heating
2	Electrical safety	24	Operation of passenger lift, material hoists & cages	46	Blasting
3	Energy conservation	25	Vehicle/ Crane maintenance	47	Transformer charging
4	Welding and gas cutting operation	26	Radiography	48	Handling of battery system
5	Fire safety	27	Waste disposal	49	DG set
6	Use of hand tools	28	Handling & storage of mineral wool	50	Sanitary maintenance
7	First aid	29	Working at night	51	Piling rig operation
8	Food safety at canteen	30	Computer operation	52	Passivation
9	Use of cranes	31	Storage in open yard	53	EDTA Cleaning
10	Storage and handling of gas cylinders	32	Drilling, reaming and grinding(machining)	54	Chemical cleaning of Pre boiler system
11	Manual arc welding	33	Stress relieving	55	Boiler Light up
12	Use of helmets	34	Hydraulic test	56	Rolling and Synchronization
13	Good house keeping	35	Trial run of rotary equipment	57	Loading of Unit

14	Safe excavation	36	Batching	58	Air compressor
15	Working at height	37	Cable laying/tray work	59	Hydra Operation
16	Filling of hydrogen in cylinder	38	Spray insulation	60	Duct Pre-assembly
17	Illumination	39	Compressor operation	61	Resumption of construction activities after lockdown and prevention of coronavirus infection during site operations
18	Handling and erection of heavy metals	40	Gas distribution test		
19	Acid cleaning	41	Cleaning of Hot well / Deaerator		
20	Oil flushing	42	Electrical maintenance	61A	Prevention of Covid-19 infection in labour colony
21	Alkali boil out	43	O&M of control of AC plant & system	62	Truss/ Structure fit-up and alignment

- a. The reference OCPs shall be suitably modified by subcontractor as per specific requirements to control the hazards.
- b. In case any other OCP is found to be applicable during the execution of work at site, then subcontractor will prepare and follow those as well.

13.2 WORK PERMIT SYSTEM:

- i. The following activities shall be carried out by the subcontractor strictly after obtaining Permit to Work from BHEL
 - a) Height working
 - b) Hot working
 - c) Confined space Work
 - d) Excavation more than 2-meter depth
 - e) Radiography
 - f) Heavy / Complex / Critical Lifting Activity
 - g) Night / Holiday Work
 - h) Material Loading / Unloading
 - i) Grating, Safety Net, Safety Facility Removal
 - j) Live Electrical Maintenance etc. - Lockout / Tagout
 - k) Beam / truss/ duct/ structure alignment
- ii. The Work Permit Formats shall be provided by BHEL at Site. It is the responsibility of the subcontractor to ensure their availability
- iii. The above list is not exhaustive. BHEL reserves right to introduce additional Permits or modify requirements for usage of existing Permits. The conditions for using the Permit are specified in the Format (General Requirements).
- iv. Where customer is having separate Work Permit System the same shall be followed in conjunction / merged to ensure all activities and checks are covered in all systems.
- v. Details of working Group to be attached along with work permit request.

- vi. All the Permits along with JSA/HIRA must be initiated by Agency Execution Team
- vii. Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work with Job Hazard Analysis.
- viii. All Permit signatories (including subcontractor's package in-charge and HSE Officer) shall physically visit the work area and check that all the safety control measures necessary for the activity are in place. Only then the permit shall be issued.
- ix. Signatory shall physically visit the area of work and ensure all required safeguards before signing the Permit
- x. Signatory shall periodically visit the area to confirm the availability of required safeguards throughout the currency of the permit
- xi. In case any Permit requirement is not available, work will be stopped till it is made available
- xii. Permit holder shall implement and maintain all control measures during the period of permit. The permit will be closed after completion of the work.
- xiii. Online Work Permit System shall be used whenever provided by BHEL, otherwise hard copy shall be used

13.3 ACTIVITY-SPECIFIC PRECAUTIONS/ CONTROLS

Detailed HSE precautions for various activities undertaken at Site by the subcontractors are specified in **Annexure I**. Same are to be ensured by the Sub-subcontractor while carrying out respective activities at Site

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14. ENVIRONMENTAL CONTROL & SOCIAL RESPONSIBILITY

- i. Environment protection has always been given prime importance by BHEL. Environmental damage is a major concern of the principal subcontractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life. Banned substances like asbestos and Chlorofluorocarbons such as carbon tetrachloride and trichloroethylene shall not be used. Waste disposal shall be done in accordance with the guidelines laid down in the project specification.
- ii. Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per Material Safety Data Sheet (MSDS).
- iii. In the event of any spillage, the principle is to recover as much material as possible before it enters drainage system and to take all possible action to prevent spilled materials from running off the site. The subcontractor shall use appropriate MSDS for clean-up technique
- iv. All subcontractors shall be responsible for the cleanliness of their own areas
- v. Regular dust suppression using sprinklers shall be carried out in respective area
- vi. The subcontractors shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the subcontractor anticipates the generation of excessive noise levels from his operations the subcontractor shall inform to Construction Manager of BHEL accordingly so that reasonable & practicable precautions can be taken to protect other persons who may be affected.
- vii. It is imperative on the part of the subcontractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, enhancing good relation with local populace etc.
- viii. The subcontractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.

15. HOUSEKEEPING

- i. Keeping the work area and access roads clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the subcontractor. Such cleanings have to be done by subcontractor within quoted rate, on daily basis.
- ii. If such activity is not carried out by subcontractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from subcontractor's bill. Such decisions of BHEL shall be binding on the subcontractor
- iii. Dedicated Housekeeping gangs shall be deployed, who shall be provided all required PPEs and safety training
- iv. Mass housekeeping shall be carried out for half a day in a week
- v. Proper housekeeping to be maintained at work place and the following are to be taken care of on daily basis.
- vi. All surplus earth and debris are removed/disposed off from the working areas to identified locations.
- vii. Unused/Surplus cables, steel items and steel scrap lying scattered at different places/elevation within the working areas are removed to identified locations.
- viii. All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations.
- ix. Sufficient waste bins shall be provided at different work places for easy collection of scrap/waste. Scrap chute shall be installed to remove scrap from high locations.
- x. Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances.
- xi. Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.
- xii. Labor camp area shall be kept clear and materials like pipes, steel, sand, concrete, chips and bricks, etc. shall not be allowed in the camp to obstruct free movement of men and machineries.
- xiii. Fabricated steel structures, pipes & piping materials shall be stacked properly.
- xiv. No parking of trucks/trolleys, cranes and trailers etc. shall be allowed in the camp, which may obstruct the traffic movement as well as below LT/HT power line.
- xv. Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.

16. WASTE MANAGEMENT

- i. Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained.
- ii. Details of E-Waste, Hazardous Waste, biomedical waste etc. and their disposal plan, shall be submitted to BHEL every 6 months as per provided **formats**.

16.1 BINS AT WORK PLACE

- i. Sufficient rubbish bins shall be provided close to workplaces.
- ii. Bins should be painted yellow and numbered.
- iii. Sufficient nos. of drip trays shall be provided to collect oil and grease.
- iv. Sufficient qty. of broomsticks with handle shall be provided.
- v. Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

16.2 STORAGE AND COLLECTION

- i. Different types of rubbish/waste should be collected and stored separately.
- ii. Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
- iii. Rubbish should not be left or allowed to accumulate on construction and other work places.
- iv. Do not burn construction rubbish near working site.

16.3 SEGREGATION

- i. Earmark the scrap area for different types of waste.
- ii. Store wastes away from building.
- iii. Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
- iv. Clinical and first aid waste stored and incinerated separately.

16.4 DISPOSAL

- i. Sufficient containers and scrap disposal area should be allocated.
- ii. All scrap bin and containers should be conveniently located.
- iii. Provide self-closing containers for flammable/spontaneously combustible material.
- iv. Keep drainage channels free from choking.
- v. Make schedule for collection and disposal of waste.

16.5 WARNING AND SIGNS

- i. Appropriate sign to be displayed at scrap storage area
- ii. No toxic, corrosive or flammable substance to be discarded into public sewage system.
- iii. Waste disposal shall be in accordance with best practice.
- iv. Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

17. TRAFFIC MANAGEMENT SYSTEM

17.1 SAFE WORKPLACE TRANSPORT SYSTEM

- i. Traffic routes in a work place shall be suitable for the persons or vehicles using them. This shall be sufficient in number and of sufficient size. This shall reflect the suitability of traffic routes for vehicles and pedestrians.

- ii. Where vehicles and pedestrians use the same traffic routes there shall be sufficient space between them. Where necessary all traffic routes must be suitably indicated. Pedestrians or vehicles must be able to use traffic routes without endangering those at work. There must be sufficient separation of traffic routes from doors, gates and pedestrian traffic routes.
- iii. For internal traffic, lines marked on roads / access routes and between buildings shall clearly indicate where vehicles are to pass.
- iv. Temporary obstacles shall be brought to the attention of drivers by warning signs or hazard cones.
- v. Speed limits shall be clearly displayed for each kind of vehicle.
- vi. Speed ramps preceded by a warning signs or marker are necessary.
- vii. The traffic route should be wide enough to allow vehicles to pass and re-pass oncoming or parked traffic and it may be advisable to introduce on-way system or parking restrictions.
- viii. Safest route shall be provided between places where vehicles have to call or deliver.
- ix. Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse
- x. Safe areas shall be provided for loading and unloading.
- xi. Avoid sharp or blind bends. If this is not possible hazards should be indicated e.g. blind corner.
- xii. Ensure road crossings are minimum and clearly signed.
- xiii. Entrance and gateways shall be wide enough to accommodate a second vehicle without causing obstruction.
- xiv. Set sensible speed limits which are clearly sign posted.
- xv. Where necessary ramps should be used to retard speed. This shall be preceded by a warning sign or mark on the road.
- xvi. Forklift trucks shall not pass over road hump unless of a type capable of doing so.
- xvii. Overhead electric cable, pipes containing flammable hazardous chemical shall be shielded by using goal posts height gauge posts or barriers.
- xviii. Road traffic signs shall be provided on prominent locations for prevention of incidents and hazards and for quick guidance and warning to employees and public. Safety signs shall be displayed as per the project working requirement and guideline of the state in which project is done. Vehicles hired or used shall not be parked within the 15m radius of any working area. Any vehicle, that is required to be at the immediate/near the vicinity, shall be approved by the person in-charge of the site.

17.2 TRAFFIC ROUTE FOR PEDESTRIANS

- i. Where traffic routes are used by both pedestrians and vehicles road shall be wide enough to allow vehicles and pedestrians safely.
- ii. Separate routes shall be provided for pedestrians to keep them away from vehicles. Provide suitable barriers/guard at entrances/exit and the corners or buildings.
- iii. Where pedestrian and vehicle routes cross, appropriate crossing shall be provided.

- iv. Where crowd is likely to use roadway e.g. at the end of shift, stop vehicles from using them at such times.
- v. Provide high visibility clothing for people permitted in delivery area.

17.3 WORK VEHICLE

Work vehicle shall be as safe stable efficient and roadworthy as private vehicles on public roads. Site management shall ensure that drivers are suitably trained. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

- i. A high level of stability.
- ii. A safe means of access/egress.
- iii. Suitable and effective service and parking brakes.
- iv. Windscreens with wipers and external mirrors giving optimum all round visibility.
- v. Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
- vi. Provision of seat belts.
- vii. Guards on dangerous parts.
- viii. Driver protection - to prevent injury from overturning and from falling objects/materials.
- ix. Driver protection from adverse weather.
- x. No vehicle shall be parked below HT/LT power lines.
- xi. Valid Pollution Under Control certification for all vehicles
- xii. Wheel stopper shall be use during the parking of vehicle
- xiii. Helper to be deployed in each vehicle as per site requirement.

17.4 DAILY CHECK BY DRIVER

- 1. There should also be daily safety checks containing below mentioned points by the driver before the vehicle is used.

Brakes	Mirrors	Warning signals
Tires	Windscreen waters	Specific safety systems i.e. controls & interlocks
Steering	Wipers	

- 2. Management should ensure that drivers carry out these checks.

17.5 TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES

- i. All drivers shall hold a valid driving License for the class of vehicle to be driven and be registered as an authorized BHEL driver with the Administration Department.
- ii. Securing of the load shall be by established and approved methods, i.e. chains with patented tightening equipment for steel/heavy loads. Sharp corners on loads shall be avoided when employing ropes for securing.
- iii. All overhangs shall be made clearly visible and restricted to acceptable limits
- iv. Load shall be checked before moving off and after traveling a suitable distance.
- v. On no account is construction site to be blocked by parked vehicles Drivers of vehicles shall only stop or park in the areas designate by the stringing foreman.

- vi. Warning signs shall be displayed during transportation of material.
- vii. All vehicles used by BHEL shall be in worthy condition and in conformance to the Land Transport requirement.
- viii. Wheel stopper shall be use during the parking of vehicle
- ix. Helper to be deployed in each vehicle as per site requirement.

17.6 MAINTENANCE

All Vehicles used for transportation of man and material shall undergo scheduled inspections on frequent intervals to secure safe operation. Such inspections shall be conducted in particular for steering, brakes, lights, horn, doors etc. Site management shall ensure that work equipment is maintained in an efficient, working order and in good repair. Inspections and services carried out at regular intervals of time and or mileage. No maintenance shall be carried below HT/LT power lines.


18. EMERGENCY PREPAREDNESS AND RESPONSE

- i. Emergency preparedness and response capability of site shall be developed as per Emergency Preparedness and Response plan issued by BHEL
- ii. Availability of adequate number of first aiders and fire warden shall be ensured with BHEL and its subcontractors
- iii. All the subcontractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Subcontractor should nominate his supervisor to coordinate and implement the safety measures.
- iv. Assembly point shall be earmarked and access to the same from different location shall be shown
- v. Fire exit shall be identified and pathway shall be clear for emergency escape.
- vi. Appropriate type and number of fire extinguisher shall be deployed as per Fire extinguisher deployment plan and validity shall be ensured periodically through inspection
- vii. Adequate number of first aid boxes shall be strategically placed at different work places to cater emergency need. Holder of the first aid box shall be identified on the box itself who will have the responsibility to maintain the same.
- viii. First aid center shall be developed at site with trained medical personnel and ambulance
- ix. Emergency contact numbers (format given in EPRP) of the site shall be displayed at prominent locations.
- x. Tie up with fire brigade shall be done in case customer is not having fire station.
- xi. Tie up with hospital shall be done in case customer is not having hospital.
- xii. Disaster Management group shall be formed at site
- xiii. Mock drill shall be arranged at regular intervals. Monthly report of the above to be given to BHEL HSE Officer as per prescribed BHEL formats
- xiv. Mock drill shall be conducted on different emergencies periodically to find out gaps in emergency preparedness and taking necessary corrective action

19. HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSE requirements. The subcontractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test as applicable, to enable inspection agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.

Online/ App-based HSE Inspection system shall be used for inspection whenever provided by BHEL otherwise Hard-copy based system shall continue

	<input type="checkbox"/> OK	<input type="checkbox"/> NOT OK
Contractor Name:		
Equipment Identification No :		
Inspection Date :		
Next Inspection Date :		
Inspected By :		

Every Inspected Equipment shall display above sticker

19.1 INSPECTION PLAN

Subcontractor shall prepare an inspection plan covering all areas/ activities/ equipment/ hazards and implement the same after getting approval of BHEL. Responsibility to ensure coverage of all areas/ activities rests with the subcontractor.

All Inspections shall be witnessed by BHEL – only then they shall be considered as valid

19.2 INSPECTION REPORTS

Monthly inspection reports as per plan shall be submitted to BHEL HSE Head

19.3 NON-CONFORMANCES

Any non-conformances identified during inspection observed shall be addressed on priority.

The responsibility of resolution shall rest with the Subcontractor Site In-charge

In case immediate closure of non-conformities is not possible:

- a. work to be halted in the area
- b. non-conformance to be generated and submitted to responsible person and BHEL
- c. non-conformance to be resolved through responsible agency / person

Only after closure of non-conformances, work to be allowed to resume

19.4 DAILY HSE CHECKS

Both the Site Supervisors and HSE Officer of Subcontractor are to conduct daily site Safety inspection around work activities and premises to ensure that work methods and the sites

are maintained to an acceptable standard. The following are to form the common subjects of a daily safety inspection:

- i. Personal Safety wears & gear compliance.
- ii. Complying with site safety rules and permit-to-work (PTW).
- iii. Positions and postures of workers.
- iv. Use of tools and equipment etc. by the workers.

The inspection should be carried out just when work starts in beginning of the day, during peak activities period of the day and just before the day’s work ends.

19.5 INDICATIVE LIST OF INSPECTIONS AND PERIODICITIES

Indicative list & periodicity of Inspections is given as under. It is the responsibility of the subcontractor to develop an inspection plan covering all areas & activities in the scope.

SL. No.	Format Name	Frequency of check (if applicable)
01	Inspection of First Aid Box	Weekly
02	Inspection of PPE	Weekly
03	Inspection of T&Ps	Monthly
04	Inspection of Cranes	Monthly
05	Inspection of Winches	Monthly
06	Inspection on Height Working	Weekly
07	Inspection on Welding & Gas Cutting	Monthly
08	Inspection on Electrical Installation	Monthly
09	Inspection on Elevator	Weekly
10	Inspection of Excavation	Weekly
11	Inspection of Labor Colony	Monthly
12	Inspection of Illumination Levels	Weekly

The checklists shall be provided by BHEL at Site. It is the responsibility of the subcontractor to ensure their availability before start of work

19.5.1 INSPECTION OF PPE

- i. PPEs shall be inspected by HSE officer at random once in a week as per provided **format** for its compliance to standard and compliance to use and any adverse observation shall be recorded in the PPE register.
- ii. The applicable PPEs for carrying out particular activities are listed below.

19.5.2 INSPECTION OF TOOLS & PLANTS (T&Ps)

- i. A master list of T&Ps shall be maintained by each subcontractor in provided **format**.
- ii. All T&Ps being used at site shall be inspected by HSE officer once in a month as per provided **format** for its healthiness and maintenance.
- iii. The T&Ps which require third party inspection shall be checked for its validity during inspection. The third-party test certificate should be accompanied with a copy of the concerned competent person’s valid qualification record.

- iv. BHEL shall be given advance intimation of Third-Party Inspection. BHEL shall associate with Inspection as per discretion.
- v. The validity of T&P shall be monitored as per provided **format**

19.5.3 INSPECTION OF CRANES AND WINCHES

- i. Cranes and winches shall be inspected by the operator through a daily checklist for its safe condition (as provided by the equipment manufacturer) before first use of the day.
- ii. Cranes and Winches shall be inspected by HSE officer once in a month as per provided **format** for healthiness, maintenance and validity of third-party inspection.
- iii. The date of third-party inspection and next due date shall be painted on cranes and winches.
- iv. The operators/drivers shall be authorized by sub-subcontractor based on their competency and experience and shall carry the I-card.
- v. The operator should be above 18 years of age and should be in possession of driving license of HMV man & goods), vision test certificate and should have minimum qualification so that he can read the instructions and check list.

19.5.4 INSPECTION OF HEIGHT WORKING

- i. Any activity carried out at more than 2 m height is classified as height work.
- ii. Inspection of height working shall be conducted daily by Supervisors before start of work to ensure safe working condition including provision of
 - a. Fall arrestor
 - b. Lifelines – connected to rigid & independent structure
 - c. Safety nets deployed below all height work activities
 - d. Fencing and barricading
 - e. Warning signage
 - f. Covering of opening
 - g. Proper scaffolding with access and egress.
 - h. Illumination
- iii. For full duration of height work, constant supervision to be maintained by dedicated HSE personnel
- iv. Inspection on height working shall be conducted once in a week by HSE officer as per provided **format**.
- v. Medical fitness of height worker shall be ensured.
- vi. Height working shall not be allowed during adverse weather.

19.5.5 INSPECTION OF WELDING AND GAS CUTTING OPERATION

- i. Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
- ii. Gas cylinders shall be kept upright.
- iii. Use of Flash back arrestor shall be ensured at both ends.

- iv. Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per provided **format**.
- v. Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
- vi. Availability of fire extinguisher at vicinity shall be ensured.

19.5.6 INSPECTION OF ELECTRICAL INSTALLATION / APPLIANCES

- i. Ensure proper earthing in electrical installation
- ii. Use ELCB at electrical booth
- iii. Electrical installation shall be properly covered at top where required
- iv. Use appropriate PPEs while working
- v. Use portable electrical light < 24 V in confined space and potentially wet area.
- vi. Inspection shall be carried out as per provided **format**.

19.5.7 INSPECTION OF ELEVATOR

- i. Elevators shall be inspected by concerned supervisors once in a week as per provided **format**
- ii. All elevators shall be inspected by competent person and validity shall be ensured.
- iii. The date of third-party inspection and next due date shall be painted on elevator.

19.5.8 INSPECTION OF EXCAVATION

Excavation activities shall be inspected as per provided **format**

19.5.9 INTERNAL/ EXTERNAL HSE AUDITS/INSPECTIONS

- i. All non-conformities and observations on HSE identified during internal or external HSE audit shall be disposed of by site in a time bound manner and reported back the implementation status.
- ii. Corrective action and Preventive action on HSE issues raised by certification body issued by BHEL shall be implemented by site and reported to Site management.

20. TERMS AND DEFINITIONS:

1. Incident

Work- related or natural event(s) in which an injury, or ill health (regardless of severity), damage to property or fatality occurred, or could have occurred.

2. Near Miss:

An incident where no ill health, injury, damage or other loss occurs, but it had a potential to cause, is referred to as "Near-Miss".

3. Man-Hours Worked:

The total number of man hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labors. Man-hours worked shall be calculated from the payroll or time clock recorded including overtime. When this is not feasible, the same shall be estimated by multiplying the total man-days worked for the

period covered by the number of hours worked per day. The total number of workdays for a period is the sum of the number of men at work on each day of period. If the daily hours vary from department to department separate estimate shall be made for each department and the result added together.

4. First Aid Cases:

First aids are not essentially all reportable cases, where the injured person is given medical treatment and discharged immediately for reporting on duty, without counting any lost time.

5. Lost Time Injury:

Any work injury which renders the injured person unable to perform his regular job or an alternative restricted work assignment on the next scheduled work day after the day on which the injury occurred.

6. Medical Cases:

Medical cases come under non-reportable cases, where owing to illness or other reason the employee was absent from work and seeks Medical treatment.

7. Type of Incidents & Their Reporting:

The three categories of Incident are as follows:

8. Non-Reportable Cases:

An incident, where the injured person is given medical help and discharged for work without counting any lost time.

9. Reportable Cases:

In this case the injured person is disable for 48 hours or more and is not able to perform his duty.

10. Injury Cases:

These are covered under the heading of non-reportable cases. In these cases, the incident caused injury to the person, but he still continues his duty.

11. Total Reportable Frequency Rate

Frequency rate is the number of Reportable Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula read as:

$$\text{Number of Reportable LTI} \times 1,000,000 / \text{Total Man Hours Worked}$$

12. Severity Rate:

Severity rate is the Number of days lost due to Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula reads as:

$$\text{Days lost due to LTI} \times 1,000,000 / \text{Total Man Hours Worked}$$

13. Incidence Rate:

Incidence Rate is the Number of LTI per one thousand manpower deployed. Mathematically, the formula reads as:

$$\text{Number of LTI} \times 1000 / \text{Average number of manpower deployed}$$

14. HIRA:

Hazard Identification and Risk Assessment (HIRA) is a process of identifying Hazards in work area and then assessing them properly

15. Method Statement:

A method statement is prepared by the Execution/ Engineering Department detailing the steps, equipment, competencies and safety precautions required for carrying out any activity

16. Job Safety Analysis:

A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown.

17. Safety Walk:

It's conducted periodically by an official - it's a walk through a portion or whole of a site as a HSE officer who notes down HSE observations, speak to concerned workmen and supervisor on observation, get the same corrected with personal follow up- this sends out a strong message on Management's commitment to safety.

18. Heavy & Complex Lifting:

A heavy and complex lifting activity includes:

1. Lifting above 20 Tons
2. Tandem Lifting using multiple cranes
Total load exceeding 75% of capacity of crane. Depending up the condition of cranes, hydra cranes, winch machines & other lifting accessories
3. Lift of unusual difficulty or geometry or rigging
4. Lift over operating units
5. Any other lift as decided by site HSE / Erection

19. Safety Committee:

As per the BOCW, Safety Committee shall be constituted if there are more than five hundred or more construction workers are employed at any site. As per the Factories Act, 1948 it is for 250 workers. It shall be represented by equal number of representatives of employer and construction workers.

20. Night Work:

Work conducted after sunset when only a fraction of total manpower is available





ANNEXURES



ANNEXURE A

Medical Centre & Ambulance

A. Medical Centre

1. Paramedical staff
 - a. When < 500 workers, 1 Trained Male Nurse (round the clock deployment)
 - b. When >=500 workers*:
 - i. Registered Medical Practitioner (Qualified MBBS) to be deployed for at least 8 hours in a day, 5 days per week
 - ii. 2 Trained Male Nurses (round the clock deployment)
 2. All articles as per Schedule IV of BOCW Central Rules, 1998 to be made available in the Medical Centre (given under for convenience)
 3. Basic Facilities/ Requirements to be provided as per location eg. Refrigerator, Air Conditioner, Anti Venom Serums etc.
 4. Tie-ups with speciality hospitals to be ensured for referring serious patients
- * In case the number of workers is envisaged to exceed 500, a medical practitioner is to be engaged.

SCHEDULE IV (BOCW CENTRAL RULES, 1998) ARTICLES FOR AMBULANCE ROOM [SEE RULE 226 (C)]

- i. A glazed sink with hot and cold water always available.
- ii. A table with a smooth top at least 180 cm x 105 cm.
- iii. Means for sterilising instruments.
- iv. A couch.
- v. Two stretchers.
- vi. Two buckets or containers with close fitting lids.
- vii. Two rubber hot water bags
- viii. A kettle and spirit stove or other suitable means of boiling water.
- ix. Twelve plain wooden splints 900 cm x 100 cm x 6 cm.
- x. Twelve plain wooden splints 350 cm x 75 cm x 6 cm.
- xi. Six plain wooden splints 250 cm x 50 cm x 12 cm.
- xii. Six woollen blankets.
- xiii. Three pairs of artery forceps.
- xiv. One bottle of spiritus annemia aremations (120 ml).
- xv. Smelling salt (60 gm).
- xvi. Two medium size sponges.
- xvii. Six hand towels.
- xviii. Four kidney trays.
- xix. Four cakes of toilet, preferably antiseptic soap.
- xx. Two glass tumblers and tow wine glasses.
- xxi. Two clinical thermometers.
- xxii. Two tea spoons.
- xxiii. Two graduated (120 ml) measuring glasses.
- xxiv. Two minimum measuring glasses.
- xxv. One wash bottle (1000 cc) for washing eyes.
- xxvi. one bottle (one litre) carbolic lotion 1 to 20.
- xxvii. Three chairs.
- xxviii. One screen.
- xxix. One electric hand torch.
- xxx. Four first-aid boxes or cupboards stocked to the standards prescribed in
- xxxi. An adequate supply of tetanus toxide.
- xxxii. Injections—morphia, pethidine, atrophine, adrenaline, coramine, novocaine (6 each).
- xxxiii. Cramine liquid (60 ml).
- xxxiv. Tablets—antihistaminic antispasmodic (25 each).
- xxxv. Syringes with needles—2 cc, 5 cc, 10 cc and 500 cc.

- xxxvi. Three surgical scissors.
- xxxvii. Two needle holders, big and small.
- xxxviii. Suturing needles and materials.
- xxxix. Three dissecting forceps
 - xl. Three dressing forceps
 - xli. Three scalpels.
 - xlii. One stethoscope and a B. P. apparatus.
- xliii. Rubber bandage—pressure bandage.
- xliv. Oxygen cylinder with necessary attachments.
- xlv. Atropine eye ointments.
- xlvi. I. V. Fluids and sets 10 nos.
- xlvii. Suitable, foot operated, covered, refuse containers.
- xlviii. Adequate number of sterilised, paired, latex hand gloves.

B. Ambulance

1. When number of workers is <500:
If the distance to a major hospital capable of handling critical injuries expected at Site is <= 50 KM from Site, then 1 BLS (Basic Life Support)/ Type B Ambulance otherwise ALS* (Advanced Life Support)/ Type D Ambulance
2. If no. of workers increases to >2000 workers one additional BLS Ambulance to be deployed
3. Minimum Articles as per Schedule V of BOCW Central Rules to be ensured in each Ambulance. (given under for convenience)

*Final call to be taken at Site in consultation with all the contractors

SCHEDULE V (BOCW CENTRAL RULES, 1998) CONTENTS OF AMBULANCE VAN OR CARRIAGE [SEE RULE 227]

The Ambulance Van shall have equipment prescribed as under:

- a) General—a portable stretcher with folding and adjusting devices with the Head of the stretcher capable of being tilted upward. Fixed suction unit with equipment. Fixed oxygen supply with equipment. Pillow with case, sheets, blankets, towels, emergency bag, bed pan, urinal glass.
- b) Safety Equipment—Flaros with life of three thousand minutes, floor lights, flash lights, fire extinguishers (dry power type), insulated guntlets.
- c) Emergency Care Equipment—
 - i. **Resuscitation**—Portable suction unit, portable oxygen unit, bag valve mask, hand operated artificial ventilation unit, airways, mouth gag tracheostomy adapters, short spine board, I.V. FLUIDS with administration unit, B. P. manometer cuff stethoscope.
 - ii. **Immobilisation**—Long and short padded boards, wire ladder splints, triangular bandage—long and short spine boards.
 - iii. **Dressing**—Gauze pads—100 m x 100 mm universal dressing 250 x 1000 mm, roll of aluminium foils—soft roller bandages 150 mm x 5 mm yards adhesive tape in 75 mm roll safety pins, bandage sheets, burn sheets.
 - iv. **Poisoning**—Syrup of Ipecac, activated charcoal pre packeted dose, snake bit kit, drinking water.
 - v. **Emergency Medicines**—As per requirement (under the advice of construction Medical Officer).



ANNEXURE A.1

Sample calculation for deduction of operational cost of facilities

Annexure A.1**Cost Calculation Methodology of Operation of Facilities (Data is indicative only)**

(Period of 48 months is considered - shall be on actual basis)

A. Project Info:

Total time of Project	48 months
Project cost	1000 Crore
No. of packages	10 (A1-A10)

B. Item-wise Calculation:

Item	Nos.	Rate	Unit	Amount
Ambulance with Driver	2		Monthly/Unit	170000
Nurse/First aider	2 X 2 shifts	15000	Per month	30000
Training center one time cost	1	100000	Once	100000
Medical center one time cost	1	200000	Once	200000
Medicines at medical center	1	10000	Monthly	10000
Dust suppression water tank	2	2000	Monthly	4000
Doctor	1	70000	Monthly	70000
Cleaning staff	1	12000	Monthly	12000
Recurring monthly expenditure				296000
Total one-time expenditure				300000

C. Package-wise Deduction Plan for a period of 48 months

Period (In Months)	6	36	6
	For 1-6 months	For 7-42 months	For 43-48 months
Cost to be incurred from contractors	7%	81%	12%
	1.17% per month	2.25% per month	2.00% per month

D. Calculation For One-Time Running Cost

Packages/ Contracts	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10				
Contract Values (in Thousands)	100000	250000	2000000	200000	500000	1500000	1000000	1000000	250000	200000	7000000			
Share of common facilities one time running cost (in Thousands)	4	11	86	9	21	64	43	43	11	9	Individual Pkg value X Total one time running cost / All Pkg award values			
Timeline of work	1-6	1-8	2-48	6-36	7-15	10-48	6-48	7-40	40-48	41-48				
Month Count of work	6	8	47	31	9	39	43	34	9	8				
Deduction per month (in Thousands)	1	1	2	0	2	2	1	1	1	1	Total of One time Running cost (in thousands)	% deduction share of one time running cost per month	Nos. of active packages in month	
Month No.														
1	1	1									2	1%	2	
2	1	1	2								4	1%	3	
3	1	1	2								4	1%	3	
4	1	1	2								4	1%	3	
5	1	1	2								4	1%	3	
6	1	1	2	0			1				5	2%	5	
7		1	2	0	2		1	1			8	3%	6	
8		1	2	0	2		1	1			8	3%	6	
9			2	0	2		1	1			7	2%	5	
10			2	0	2	2	1	1			8	3%	6	
11			2	0	2	2	1	1			8	3%	6	
12			2	0	2	2	1	1			8	3%	6	
13			2	0	2	2	1	1			8	3%	6	
14			2	0	2	2	1	1			8	3%	6	
15			2	0	2	2	1	1			8	3%	6	
16			2	0		2	1	1			6	2%	5	
17			2	0		2	1	1			6	2%	5	
18			2	0		2	1	1			6	2%	5	
19			2	0		2	1	1			6	2%	5	
20			2	0		2	1	1			6	2%	5	
21			2	0		2	1	1			6	2%	5	
22			2	0		2	1	1			6	2%	5	
23			2	0		2	1	1			6	2%	5	
24			2	0		2	1	1			6	2%	5	
25			2	0		2	1	1			6	2%	5	
26			2	0		2	1	1			6	2%	5	
27			2	0		2	1	1			6	2%	5	
28			2	0		2	1	1			6	2%	5	
29			2	0		2	1	1			6	2%	5	
30			2	0		2	1	1			6	2%	5	
31			2	0		2	1	1			6	2%	5	
32			2	0		2	1	1			6	2%	5	
33			2	0		2	1	1			6	2%	5	
34			2	0		2	1	1			6	2%	5	
35			2	0		2	1	1			6	2%	5	
36			2	0		2	1	1			6	2%	5	
37			2			2	1	1			6	2%	4	
38			2			2	1	1			6	2%	4	
39			2			2	1	1			6	2%	4	
40			2			2	1	1	1		7	2%	5	
41			2			2	1		1	1	7	2%	5	
42			2			2	1		1	1	7	2%	5	
43			2			2	1		1	1	7	2%	5	
44			2			2	1		1	1	7	2%	5	
45			2			2	1		1	1	7	2%	5	
46			2			2	1		1	1	7	2%	5	
47			2			2	1		1	1	7	2%	5	
48			2			2	1		1	1	7	2%	5	
Total	4	11	86	9	21	64	43	43	11	9	300	100%		

D. Calculation For Recurring Running Cost

Packages/ Contracts	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10		
Contract Values (in Thousands)	100000	250000	2000000	200000	500000	1500000	1000000	1000000	250000	200000	7000000	
Timeline of work	1-6	1-8	2-48	6-36	7-15	10-48	6-48	7-40	40-48	41-48	Total of Recurring cost (in thousands)	Nos. of active packages in month
	6	8	47	31	9	39	43	34	9	8		
Month No.												
1	85	211									296	2
2	13	31	252								296	3
3	13	31	252								296	3
4	13	31	252								296	3
5	13	31	252								296	3
6	8	21	167	17			83				296	5
7		15	120	12	30		60	60			296	6
8		15	120	12	30		60	60			296	6
9			126	13	31		63	63			296	5
10			95	10	24	72	48	48			296	6
11			95	10	24	72	48	48			296	6
12			95	10	24	72	48	48			296	6
13			95	10	24	72	48	48			296	6
14			95	10	24	72	48	48			296	6
15			95	10	24	72	48	48			296	6
16			104	10		78	52	52			296	5
17			104	10		78	52	52			296	5
18			104	10		78	52	52			296	5
19			104	10		78	52	52			296	5
20			104	10		78	52	52			296	5
21			104	10		78	52	52			296	5
22			104	10		78	52	52			296	5
23			104	10		78	52	52			296	5
24			104	10		78	52	52			296	5
25			104	10		78	52	52			296	5
26			104	10		78	52	52			296	5
27			104	10		78	52	52			296	5
28			104	10		78	52	52			296	5
29			104	10		78	52	52			296	5
30			104	10		78	52	52			296	5
31			104	10		78	52	52			296	5
32			104	10		78	52	52			296	5
33			104	10		78	52	52			296	5
34			104	10		78	52	52			296	5
35			104	10		78	52	52			296	5
36			104	10		78	52	52			296	5
37			108			81	54	54			296	4
38			108			81	54	54			296	4
39			108			81	54	54			296	4
40			103			77	51	51	13		296	5
41			120			90	60		15	12	296	5
42			120			90	60		15	12	296	5
43			120			90	60		15	12	296	5
44			120			90	60		15	12	296	5
45			120			90	60		15	12	296	5
46			120			90	60		15	12	296	5
47			120			90	60		15	12	296	5
48			120			90	60		15	12	296	5
Total	143	388	5676	329	235	3102	2334	1772	132	96	14208	



ANNEXURE B

HSE Displays

A. Types of Displays**1. Based on Content**

SN	Type
1.	HSE Hazards & Precautions Height Work, Housekeeping, Fire Safety, PPEs, Hot Work, Lifting & Rigging Activity, Site-specific Hazards – eg. for Refineries, Nuclear plants etc.; COVID Precautions; Environment Protection etc.
2.	Other Displays, Signage etc. HSE Policy, ISO Certificate, Safety Statistics, Assembly Area Location/ Route, Emergency Contact Numbers, Site Safety Rules & Regulations, Speed Limit, Work in Progress, Lock-Out Tag-Out (LOTO) Boards etc.

2. Based on Mounting

[Type 1]	[Type 2]	[Type 3]
Flex Sign Boards of Wooden Frame – directly mounted on Structures (walls, stairs, railings etc.)	Flex Sign Boards with Wooden Frame – mounted on metallic/ wooden legs – preferably double-sided	Coloured weather-proof Paintings on Walls (after due concurrence of BHEL/ Customer – Type 1 in case of no concurrence/ space)

B. General Requirements:

- Displays should be weather-proof as per installation location, i.e. rain-proof, wind-proof and sun-proof.
- Installation location and size to ensure visibility for the intended viewers (workers and moving personnel)
- Displays to have at least 50% graphical elements preferably (as applicable). Language should be understandable by majority of the workers
- Displays to be relevant to the hazards in the area
- Proper installation to ensure boards don't obstruct activities and should not be prone to fall so as to pose danger
- In case of multiple elevations (eg. Boiler, Power-house etc.), each elevation to have displays for applicable hazards including Height-Work, Housekeeping
- For temporary work locations, posters/ boards may be erected and shifted after task is over
- Minimum size of displays should be A1 unless otherwise specified
- In case of damage, displays shall be reviewed and repaired/ replaced
- In areas where night work is envisaged, fluorescent displays shall be installed and these should comprise of at least 20-30% of total displays
- Total Number of displays to be not less than 1 per 10 workers and are to be dynamically updated based on number of workers

C. Area-wise Displays

Below is list of Area-wise displays that are to be installed at Sites (Numbers, locations may be adjusted for specific requirements)

SN	Area	Suggested Subjects	Minimum Size	Minimum Quantity	Locations
1	Walls/ Foundations/ Cement Structures etc. belonging to the package area	Safety Hazards Prevention and other HSE Awareness content	[Type 3]	As per BHEL assessment from time to time	
2	Site Interior Roads belonging to the package area	At least every 20 meters: 1. Speed Limit Indication, Safe Driving board 2. Boards for hazard awareness	1.As needed [Type 2] 2. A1 or equivalent each [Type 2]	As indicated	Sides of Roads; Height to ensure good visibility
3	Specific Package Areas	<p>A. Common At entry to respective Package/ Work Area, each contractor to put up daily updated board with following for each shift:</p> <ol style="list-style-type: none"> 1. Scope of work and start date 2. Emergency Contact Numbers 3. Emergency Assembly Location, Escape Plan 4. Locations and supervisors of various gangs in the area, 5. Current Work permit Details 6. Safety Supervisor Location assignments - Names, Mobile Nos., Assigned Locations 7. Details (Name, Contact No. etc.) of Package In-charge - Contractor & BHEL 8. Details (Name, Contact No. etc.) of Safety In-charge - Contractor & BHEL 9. LTI Free Man-days & details of last LTI also to be indicated <p>In addition, Area-Specific Displays as indicated in Table 1</p>	A0 [Type 2]	1 per Package Area	Entry/ Ground Level

Table 1
(Area/ Package-wise HSE Display Plan – As applicable)

Prepared By (Subcontractor)				
S. No.	Area	Suggested Minimum No. of Displays & Types	Type	Numbers Installed
1	Boiler	3 per working elevation	[Type 1]	
2	Powerhouse	5 per elevation	[Type 1]	
3	ESP	5 Per Pass	[Type 1]	
4	Buildings	5 per elevation	[Type 1]	
5	Cooling Tower (NDCT/ IDCT/ ACC)	20 per Structure	[Type 1]	
6	Chimney	20 per Structure	[Type 1]	
7	Fabrication Yard	10 per Yard	[Type 2]	
8	Batching Plant	5 per Plant	[Type 1]	
9	Material Storage Yard – Open	20 per Yard	[Type 2]	
10	Material Storage Shed – Semi-Closed/ Closed	10 per Shed	[Type 1]	
11	Electrical Booths	2 per booth + Line diagram, Emergency contact details	[Type 1]	
12	Medical & First Aid Centre	2 per Centre	[Type 1]	
13	Rest Shed	2 per Shed	[Type 1]	
14	Canteen	2 per Canteen	[Type 1]	
15	Drinking Water Area	1 Per Outlet	[Type 1]	
16	Washing Water Area	1 Per Outlet	[Type 1]	
17	Training Centre	10 per room	[Type 1/2]	
18	Assembly Area	5	[Type 1/2]	
19	Stairs	1 per landing elevation	[Type 1]	
20	Cylinder Storage Area	5 + Signage: Type of Gas, Empty, Filled etc.	[Type 1/2]	
21	Labor Colony	Electrical Safety with Distribution Plan/ Line Diagram - 1 COVID Precautions Posters – 5 Safety Awareness Posters – 10 Hygiene awareness posters - 2	[Type 1]	
22	Others	As per requirement	[Type 1/2]	

Date:

Sign (Contractor)

Sign (BHEL)



ANNEXURE C

HSE Tools/ Equipment/ Devices

Following equipment conforming to relevant IS/ISO/BS Codes/ Standards in indicated quantities shall be ensured by subcontractor. This list is tentative, not exhaustive. Quantity and date/ period of deployment shall be as per site requirement.

A. HSE Tools/ Equipment/ Devices

SN	Item
1	Lifelines
2	Retractable Fall Arrestors
3	Safety Nets (10m X 5m) fire proof double mesh
4	Sky Climbers
5	Fire Blanket
6	Honey Bee Removal Suit & Kit
7	Scaffolding Pipes
8	Flashback Arrestors
9	Barricading Tape
10	Binoculars
11	Walkie-Talkies
12	LOTO kit
13	24-Volt light
14	Sand Buckets
15	Hard barricading Pipes
16	Standby Fire kits
17	Hand-held Megaphone
18	Small Public Address System
19	Foldable Stretcher
20	Height Rescue Kit (Non-Motorized)
	(Others:)

B. Test & Measurement Devices

SN	Device
1	ELCB Tester
2	Multi meter (Light cables)
3	Earth Resistance Meter
4	Lux Meter
5	Sound Meter
6	Anemometer
7	Breath Analyzer (Alcohol)
8	Multi-gas dozi-meter/ detector
9	Gas leakage detector / alarm
10	Gas monitor (confined space)
11	Radiation meter & Badges
12	Blood Pressure Monitor
13	Fire detectors
14	Hand held signaling light
	(Others:)



ANNEXURE D

Rest Sheds

1. Determining the Number, Sizes and Locations of Rest Shelters

i. **Numbers:**

The number of rest shelters shall be determined based on maximum number of workers at any one time (across all shifts). Formula is:

W_{max} = Maximum number of workers at any time in the Site

Space per worker = 1.1 sq meter

Total space required, T_{space} = $W_{max} \times 1.1$

Based on total space requirement calculated above, the number of rest sheds can be decided according to availability of locations and concentration of workers – so as to ensure the required space.

ii. **Locations:**

The rest sheds should be so located so as to minimize the distance to be travelled by the workers from their locations of work considering all the practical constraints

iii. **Other:**

The Rest shelter should be fenced so that it cannot be used as parking area.

2. Design & Construction of Rest Sheds

a. **Permanent/ Long duration Rest Sheds**

- i. For locations where, permanent rest sheds can be constructed without possibility of removal for relatively long period of time, a semi-closed shed can be constructed covered with tin roof and supported with well-grouted beams. The floor of the shed to be preferably cemented/ solidified.
- ii. Adequate structural requirements suitable to the local weather (wind/ rain etc.) to be ensured.
- iii. The design of the rest shed to be approved by Civil Engineering Department of BHEL Site before commencing work

b. **Temporary/ Movable/ Portable Rest Sheds**

- i. For locations where, permanent rest sheds cannot be constructed either due to non-availability of permanent location or other reasons, temporary rest shed shall be constructed.
- ii. Temporary rest sheds shall comprise of Tent arrangement carried out by professional agencies

3. Amenities in Rest Sheds

a. **Essential Amenities**

Following amenities shall be essentially ensured in a rest shed:

- i. Hygienic environment with regular cleaning and housekeeping (with records)
- ii. Adequate illumination
- iii. Adequate ventilation/ heating as per weather conditions
- iv. Clean Drinking water source
- v. Hand Washing area
- vi. Toilets & Urinals
- vii. Benches/ mats for sitting/ lying
- viii. Any other essential requirement deemed necessary by the Site
- ix. Dust bins of sufficient quantity/ size that are vacated each day/ as per requirement

b. **Additional/ Optional Amenities**

Following amenities are optional but are recommended to enhance the level of satisfaction of work force:

- i. Hot/ Cold drinks (Tea, Coffee, Glucose etc.) as per requirement
- ii. Snacks
- iii. Fans/ Coolers/ Heating arrangements as per requirement and weather conditions
- iv. A nice, welcoming interior design, music etc.
- v. Water cooler

4. Health & Safety Requirements of Rest Sheds

Use of asbestos in construction is banned and shall not be used.

In addition, following essential Safety features shall be ensured in Rest sheds:

- i. Availability of Fire extinguishers (preferably CO2 type)
- ii. Display of Safety Posters
- iii. Pest/ reptile protection
- iv. Mosquito prevention measures

5. Note:

Any suitable closed spaces/ newly constructed buildings etc. available at project may also be used for the purpose of rest shed with due concurrence of BHEL



ANNEXURE E

Labor Colony

1. These Guidelines suggest minimum requirements. However, additional requirements based on feasibility and circumstances, while adhering to directions of GOI/District Administration/Local Authority guidelines to be considered
2. Norms for social distancing, training/ awareness, face masks, disinfection, sanitization, gate entry, quarantine, medical, action in case of suspect cases of COVID and other communicable diseases etc. to be followed as per Govt. and BHEL guidelines issued from time to time
3. Labor colony to be developed as close to the Site as possible to avoid lengthy commute
4. A "Suggestion Register" shall be made available at the labor colony for residents. The feedback shall be reviewed on weekly basis and acted upon by concerned Contractor. Same shall be reviewed periodically by authorized BHEL Site Official.
5. **Canteens, Latrines & Urinals, Washing Facilities, Creches, Residential Accommodation and other infrastructure/ facilities:**
Numbers/ Quantities and Features of these facilities shall be in line with the following as applicable:
 - a. BOCW Act & State Rules
 - b. The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act & State Rules
 - c. Factories Act & State Rules
 - d. Other Relevant Acts & Rules
6. **Cleanliness & Hygiene/ Housekeeping:**
 - a. Regular cleaning of the labor colony to be ensured.
 - b. Daily cleaning of Sanitary facilities.
 - c. Proper drainage system to prevent water-logging
 - d. Regular fogging to prevent spread of mosquitoes
 - e. Prevention of foul smell through necessary interventions
 - f. Dust suppression as per requirement
 - g. Cutting of Grass at regular intervals and other necessary measures to prevent pests & reptiles
 - h. Stray animals to be banned from labor colony.
 - i. Outside every common facility, eg. Toilet, washroom, food hall/ canteen etc., provision of washbasin with flowing water and soap (preferably liquid soap) to be ensured
7. **Power Supply Layout:**
Electrical supply Layout of Labor Colony shall have the provision of Safety devices like MCBs, ELCBs etc. and to be clearly displayed
8. **Washing & Drinking Water Availability**
 - a. Adequate water to be provided in line with: "Estimation of Water Requirements for Drinking and Domestic Use (Source: National Building Code 2016, BIS)"
 - b. Drinking water tank to be cleaned every week and sticker for the same pasted on the tank
 - c. Drinking water source should be tested as per IS 10500
9. **Waste Disposal:** Separate bins for dry, wet and biomedical waste to be installed. These bins to be evacuated regularly
10. **Training & Awareness/ Displays**
 - a. **HSE Awareness Displays:** Posters/ banners/ boards to be displayed in labor colony. Subjects of displays shall be precautions for applicable hazards at work site.
 - b. **Emergency Contact Numbers** including that of Doctor, Hospital, Labor Colony Supervisor, HSE Officials to be displayed prominently

11. Doctor Visits:

Regular and need-based visits by Doctors to be ensured through tie-ups etc.

12. Inspection & Review: Regular inspection of labor accommodation to be carried out by the Contractor as per prescribed format. Last inspection date, inspector and next due date to be prominently indicated near main gate

13. Provision of a Fair Price shop in the premises to be ensured as per requirement

14. Adequate arrangements to be ensured in case of children/ families



ANNEXURE F

Toilets

Toilets (Latrines and urinals shall be ensured at Site and Labor Colony in accordance with the Inter-State Migrant Workmen Act, 1979 as given below:

LATRINES	URINALS
<p>1. Latrines shall be provided in every establishment on the following scale, namely: -</p> <p>a. Where females are employed, there shall be at least one latrine for every 25 females;</p> <p>b. Where males are employed, there shall be at least one latrine for every 25 males:</p> <p>Provided that where the number of males or females exceeds 190, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 30 thereafter</p> <p>2. Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.</p>	<p>1. There shall be at least one urinal for male workers up to fifty and one for female up to fifty employed at a time:</p> <p>Provided that where the number of male or female workmen, as the case may be, exceeds 500 it shall be sufficient if there is one urinal for every fifty females up to the first 500 and one for every 100 or part thereof thereafter.</p> <p>2. The urinals shall be designed and located so as to ensure privacy.</p>

Important:

- Where workers of both sexes are employed there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers '**For Men Only**', or '**For Women Only**', as the case may be.
- The notice shall also bear the figure of a man or of a woman, as the case may be.
- The latrines and urinals shall be conveniently situated and accessible to workers at all times at the establishment.
- The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.
- Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the public health authorities.
- Water shall be provided by the means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.
- At Site, on ground, **Modular Bio-toilets** as per industry standard specifications and regular professional cleaning shall be ensured. The toilets should be sufficient in number and easily accessible to workers from every work area
- At Site, in various elevations, suitable urinals with proper drainage to be ensured at each elevation in line with IS 2064 (1993). Same to be cleaned regularly



ANNEXURE G

Fire Extinguishers

SN	Type of Fire Risk (Class of Fire)	Extinguishing Medium & Relevant INDIAN STANDARD	Scale of Equipment (Minimum recommended)
1.	CLASS 'A' Fires involving ordinary combustible materials like wood, paper, textiles, rubber etc. (Ordinary hazard or low fire load)	WATER Soda acid type, water type (gas pressure) and water type (constant air pressure) IS: 934 -1976; IS: 940 -1976; IS: 6234 -1971	For every 600 square meter floor area or part, one 9-litre capacity. Minimum 4 numbers per floor or room; should not be required to travel more than 15 meter to reach any extinguisher.
2.	CLASS 'A' (Extra hazard & high fire load)	-do	-do – (Also, consult local fire authority).
3.	CLASS 'A' (Special hazards)	-do	-do – Extra provision For every 100 square meter floor area or part, one 4.5 Kg. CO ₂ ; minimum 2 numbers per room; should not be required to travel more than 10 meter to reach any extinguisher.
4.	CLASS 'B' (Fires in flammable liquids like oils, solvents, petroleum, products, varnishes, paints, etc. where blanketing effect is essential) (Storage and handling in small quantities)	FOAM / CARBON DIOXIDE / DRY CHEMICAL POWDER IS: 933 -1976; IS: 2878 1976; IS: 2171 1976; IS: 4308 -1982	For every 50 square meter floor area or part, 2 numbers 9 -liters foam or 5 kg dry powder; should not be required to travel more than 10 m in the area of storage to reach any extinguisher.
5.	CLASS 'B' (Bulk storage other than in tank form))	-do -	-do- (but minimum 3 numbers per room)
6.	CLASS 'C' (Fires involving gaseous substances under pressure where it is necessary to dilute the burning gas at a very fast rate with an inert gas or powder) (storage and handling of gas cylinders)	CARBON DIOXIDE / DRY CHEM. POWDER. The best way to extinguish such fire is by stopping the flow of fuel gas to the fire. Container is kept cool with water spray. IS: 2878 1976; IS: 2171 -1976; IS: 4308 -1982	For every 100 square meter floor area or part; 2 numbers, 10 kg powder extinguisher or 6 kg CO ₂ ; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher.
7.	CLASS 'D' Fires involving metals like magnesium, aluminum, zinc, potassium etc. where the burning metal is reactive to water and which require special extinguishing media or technique	SPECIAL DRY POWDER IS: 2171 -1976 IS: 4861 -1968	For every 50 square meter floor area or part, 2 nos. 5 kg special dry powder; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher.
8.	MIXED OCCUPANCY (electrical); Generators; Transformers; etc.	CARBON DIOXIDE DRY POWDER, IS: 2878 1976; IS: 2171 -1976	For every 100 square meter floor area or part one 10 kg CO ₂ . Minimum 2 numbers for every location should not be required to travel more than 10 meter to reach an extinguisher.

Note: Due to peculiarities of the power plant construction sites, there would be locations in the construction areas of Boiler, Turbine, Generator, Transformer, etc. where different types of fire risk (classes of fire) may co-exist. Special care shall be taken while selecting and installing portable fire extinguishers for such locations so that all types of fire risk that may co-exist, are adequately covered. Similar special care shall be taken for storage areas.

- a. All Electrical welding booths shall be equipped with appropriate Fire Extinguisher

- b. Appropriate Fire Extinguishers shall be made within easy reach of all welding operations
- c. Fire extinguishers shall be regularly tested and last checked date to be indicated on each. Master list shall be prepared with location and details
- d. Providing appropriate fire-fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
- e. Subcontractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times.
- f. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders.
- g. All other fire safety measures as laid down in the “codes for fire safety at construction site” issued by safety coordinator of BHEL shall be followed.
- h. Non-compliance of the above requirement under fire protection shall in no way relieve the subcontractor of any of his responsibility and liabilities to fire incident occurring either to his materials or equipment or those of others.
- i. Emergency contacts nos. must be displayed at prominent locations
- j. Tarpaulin being inflammable should not be used (instead, only non-infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.



ANNEXURE H

HSE Compliance Certificate

Bill Ref no: _____ Date: _____

NAME OF THE AGENCY: _____ Work-Area/Package: _____

Sl. No.	Description	Remarks
1	<u>HOUSE KEEPING:</u>	
1.1	All working areas at site (specific to the agency) are free from garbage's, scraps & any other undesired non-plant materials. There is no encroachment in safe passage of man, material & T&P to carry out activities safely	
1.2	All the plant materials under the custody of the agency are stacked & stored properly.	
2	<u>GENERAL ILLUMINATION:</u>	
2.1	ALL the working areas at site & office of the agency including passages are having proper & sufficient illumination.	
3	<u>STATUTORY & REGULATORY REQUIREMENT:</u>	
3.1	Sufficient water for drinking & other purposes and sanitation in work area and labour colony are available.	
3.2	Periodical Medical check-up of workers & staff done regularly & report submitted to BHEL	
3.3	Regular EYE testing is done for Crane operators/Welders and data's are available with agency	
3.4	All the T&P, Cranes etc used by the agency are having proper T.Cs & Fitness certificate available from competent authority.	
4	<u>SAFETY COMPLIANCE:</u>	
4.1	Number of Tool box meetings between Safety officers, erection staff & workers of the agency held in this month with location mentioned	
4.2	All precautions & Safety measures including PPE compliances are taken before working at HEIGHT	
4.3	Permit for working at Height is taken & complied accordingly	
4.4	ELCB is used in Construction Power Supply source by the agency & Proper Distribution board and electrical cabling has been used by the agency and regularly checked by electrician & safety officer of the agency	
4.5	Unsafe areas barricaded properly & unsafe opening closed properly	
4.6	Proper Platforms & Hand-rails used In areas earmarked earlier	
4.7	Proper safety signage's, Slogans & Emergency contact phone numbers including FIRE contact nos. are made available by the agency in locations mentioned	
5	Whether any penalty imposed by BHEL towards non-compliance of above points.	

<u>VENDOR'S SIGNATURE</u>	
Erection Engineer	
HSE Officer	
Site-in-Charge	

<u>BHEL'S SIGNATURE</u>	
Erection Engineer	
HSE Officer	
Package-in-Charge	



ANNEXURE I

Activity-Specific Safety Precautions/ Controls

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General

The philosophy of hierarchy of controls as below shall be followed

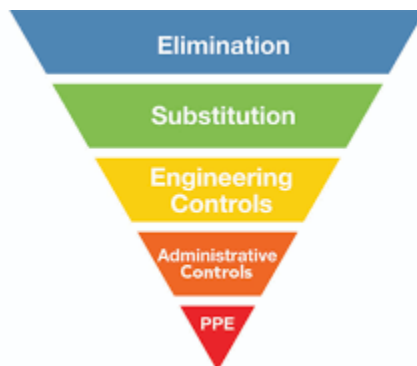


Fig. 1.1

It shall be ensured that there are multiple protections against any accident/ incident. For example, for height work there shall be safe platforms and walkways, Safety Nets and Lifelines for hooking double lanyard Safety harness by workers.

Monitoring and modifying worker behavior shall be part of ensuring safety. All personnel should be competent and trained for the job

Brief Safety guidelines for various hazardous activities are indicated below, besides the mandatory requirements based on Hazard Identification studies, HSE Procedures, Operational Control Procedures, Work Permits, applicable Indian Standard Codes and other provisions detailed in this document. Constant supervision at all times to be maintained by Execution & Safety Team to ensure implementation of these provisions.

1. WORK AT HEIGHT:

- a. All work at height above 2 meter above ground level without complete platforms, handrails and other related fall protection shall require a work permit in the prescribed form. This shall require approval by the competent authority. The HSE officer of sub-contractors shall follow the checklist religiously by physically verifying the condition of the work area before recommending for approval.
- b. Prior to the start of work at elevation, the HSE Officer involved with the work must meet the work supervisor to review the scope of work, and must review all the possible fall hazards and effective safety responses. The evaluation / analysis must be documented and kept on file and on site by the HSE Officer.
- c. Whenever a fall hazard or other exposure exists for working at heights more than 2.0m/6ft, the nature and scope of work will be evaluated for conditions and environmental factors before selecting the appropriate fall protection system (active, passive or a combination of measures, as appropriate).
- d. All Engineering and Administrative Controls including barricading, safe platform, Safety Nets etc. shall be made available at work location. Under no circumstances, there shall be total reliance on PPEs only
- e. **Safety Nets**
 - i. Contractor shall maintain sufficient stock of Safety Nets for deployment
 - ii. Safety Nets as per IS: 11057:1984 should be used extensively for prevention / arrest men and materials falling from height.
 - iii. The safety nets shall be fire resistant, duly tested and shall be of ISI marked.

- iv. Safety Nets shall be deployed below all platforms where height work is envisaged. Duration of work, delay shall be no excuses for non-installation of Safety Net
- f. Reaching beyond barricaded area without lifeline support, moving with support of bracings, walking on beams without support, jumping from one level to another, throwing objects and taking shortcut must be discouraged.
- g. Monkey Ladder shall be fitted with cages. Rope ladder should be discouraged.
- h. In case of pipe-rack, persons should not walk on pipes and walk on platforms only.
- i. In case of roof work, walking ladder/ platform should be provided along with lifeline and/ or fall arrestor.
- j. For chimney or structure painting, both hanging platform and men should be anchored separately to a firm structure along with separate fall arrestor.
- k. The procedures for the safety response to identified fall hazards developed and rescue plans must be reviewed with all individuals exposed to the hazards.
- l. The HSE Officer must establish an inspection process of fall protection systems. Some equipment requires documented inspections by its manufacture on a regular schedule. Such equipment must have evidence of the inspection and re-certification process on it. This information must be reviewed before the equipment is actually used. Individuals must visually inspect the fall protection equipment before each use. Failure to complete this inspection process could result in serious injury or death.
- m. Immediately remove from service any fall protection equipment that is identified as defective, damaged, or has been subjected to an impact. Damaged fall protective equipment must be destroyed to prevent re-use and not be discarded into trash containers, as the worn or damaged equipment could be unintentionally re-used.
- n. Aerial lifting devices, excluding scissor lifts require the use of full body harnesses and lanyards in any elevated position.
- o. Where Height related works are applicable then rescue team (consist of 5- 10 person) shall be identified and trained for potential rescue.

1.1 Personnel fall protection system must include:

a. Safety Harness

All height workers must use Full Body Safety harness with double lanyards with shock absorber (only). The primary lanyard is never unhooked until the secondary lanyard is secure. The design of the working platform should be such that under no circumstances, worker should have both lanyards unhooked while at height.

b. Lanyard

- i. The type of work and the environment conditions determine lanyard and lifeline selection. If welding, chemical cleaning that may damage lanyards, connectors or lifelines, sandblasting, etc., either protect the components or use more appropriate type of system.
- ii. Lanyards and lifelines must incorporate, or be used with, an appropriate deceleration (shock absorbing) device. Deceleration devices include rope grabs, rip-stitch lanyards, specially woven lanyards, tearing, or deforming lanyards, automatic self-retracting lifelines and lanyards which dissipate or limit the energy imposed on the employee during fall arrest.
- iii. Once in use, the system's effectiveness is to be monitored. In some cases, a program for cleaning and maintaining the system may be necessary. Lanyard and lifelines must use locking snap hooks only and under

no circumstances must two lanyard snap hooks be connected.

c. Lifeline

All lifelines in general are to be made of min 12mm dia. steel rope (plastic coated) and tied to columns with 3 clamps at each end. Wherever columns are not available to tie the lifelines, the vertical posts as per the design below are to be provided after carrying out drop load test initially. A load of 240kg to be dropped off the mid-point of lifeline in this test.

d. Lifeline Post

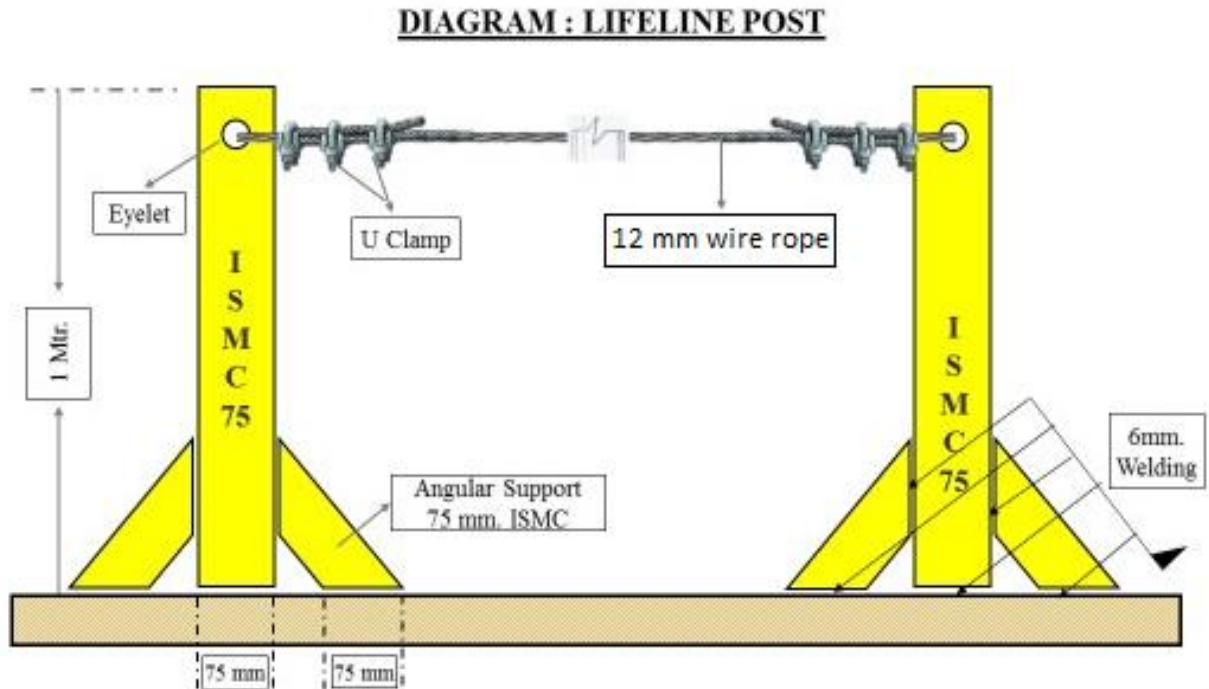


Fig. 2.1 Lifeline Post

- i. The support at vertical post shall be fixed at end-to-end (welded/ bolted). The maximum length of one end to another end shall be 6 meters
- ii. If the length of a lifeline is more than 6 meters, then intermediate vertical post(s) are to be used. Such intermediate post(s) will act as supports and the lifeline rope should simply pass through the eyelets (holes) of such supports without being anchored
- iii. The lifeline need not be wrapped / clamped to any intermediate post
- iv. Such intermediate posts must be used at an interval of every 6 meters
- v. The post(s) in which the original lifeline is to be installed should be capable of sustaining a tensile stress of 2268 Kgs.
- vi. In a horizontal lifeline installation, maximum allowable sagging is 500-600 mm
- vii. For a single spun lifeline, no more than 3(Three Nos.) persons are allowed to work; for more than two workers, another lifeline should be installed
- viii. Horizontal lifeline should be so installed that it does not impede safe movement of workers
- ix. All the installation work must be carried out by competent person with adequate knowledge

1.2 Working Platform

- a. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or

floor level, they shall be closely boarded and shall have adequate width, which shall not be less than 750 mm and be suitably fenced.

b. Precautions against the fall of Materials, Persons and Collapse of Structures:

- i. Every opening in the floor or a building or in a working platform shall be suitably barricaded to prevent the fall of persons by providing suitable fencing or railing whose minimum height shall be 90 cm.
- ii. Adequate precautions should be taken such as the provision of fencing, or barriers to protect any person who might be injured by the fall of materials, or tools or equipment being raised or lowered. Hard barricading shall be made at such places made of scaffolding pipe & clamps covered with reflective net. Cradle may be used for lifting materials - however this shall be made of MS angles and flats only and duly certified by the HSE officer. Operators may also use designed containers for lifting small tools.
- iii. Guardrails (including scaffolding) erected over/adjacent working areas must have the guardrails screened (opening < 0.5), to prevent material from falling outside the platform/decking.
- iv. Guardrails must be able to withstand a 200-pound force exerted in any one direction.
- v. Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.
- vi. All openings through which workers are liable to fall should be kept effectively covered or fenced and indicated in the most appropriate manner.
- vii. Guardrails and toe-board/barricades and sound platform conforming to IS: 4912-1978 and other Indian laws and regulations as depicted below should be provided.

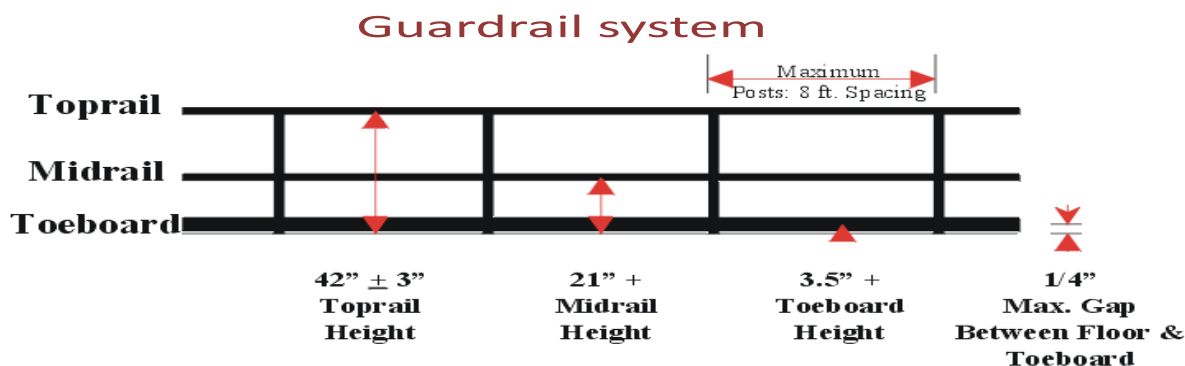


Fig. 2.2 Guard Rail System

- viii. Guardrails shall be provided to protect workers from falling from elevated work places. The rails are generally made of MS pipes of suitable dia. Rebar shall not be used for any handrails, ladder or cover purpose. Wherever the guard-rails and toe-boards cannot be provided:
 - a. adequate safety nets or safety sheets shall be erected and maintained; or
 - b. adequate safety harnesses shall be provided and used and / or
 - c. adequate fall arrestor shall be provided and used.

As mentioned under PPE clause, all these PPEs shall be defect free and regularly inspected for any defect.

The full body safety harness shall have double lanyard only with max 1.8m length.

- ix. The monkey ladders shall have sufficient fall arrestors. Adequate lifelines of 8mm steel wire rope shall be provided across the work area.
- x. The HSE officer shall recommend appropriate PPEs after analyzing hazards and risks involved.

1.3 Scaffolding

All scaffolds shall be conformant to the relevant standards including IS 3696 and IS 4014 as applicable. A sketch of the scaffolds proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use. Only cup lock type scaffoldings will be allowed in site. Where cup lock type scaffolding arrangement is not feasible by the virtue of the location, in that case only pipe and clamp type scaffolding will be allowed.

- a. The scaffolding work must be carried out by a competent person, who shall train the scaffold users on safety aspects
- b. All scaffolds shall be erected / dismantled by scaffolding crew under direct supervision of competent scaffolding supervisors.
- c. All scaffolds shall be capable of supporting 4 times maximum intended load and erected on sound, rigid footing, capable of carrying the maximum intended load without settling or displacement. Bamboo scaffolding is not permitted for use on site.
- d. Each employee on the scaffold shall use an approved safety harness attached to an independent lifeline. The lifeline is to be securely attached to substantial members of the structure (not the scaffold itself) or to securely rigged lines, which shall safely suspend a worker in event of a fall.
- e. Guard rails and toe boards shall be installed on all open sides and ends of platforms more than (2) meters above ground or floor
- f. Scaffold planks must be at least 5 cm x 25 cm (2" x 10") full thickness lumber scaffold grade or better.
- g. Scaffold planks shall not span distances greater than 2.5 meters (8 feet).
- h. Scaffold planks shall extend over end supports not less than 6 inches nor more than 12 inches and be secured to the scaffold. Scaffolding and accessories with defective parts shall be immediately repaired or replaced.
- i. All scaffolding must be a minimum of two planks wide. No one may work from a single plank.
- j. Scaffold planks must be inspected before use. Planks that have been damaged must be removed from the site.
- k. Access ladders must be provided for each scaffold. Climbing the end frames is prohibited unless the design incorporates an approved ladder.
- l. Adequate mudsills or other rigid footing capable of withstanding the maximum intended load must be provided.
- m. Scaffolds more the 6 meters (20 feet) in height must be tied to the building or structure at intervals which do not exceed 4 meters (13 feet) vertically and 6 meters (20 feet) horizontally.
- n. Do not overload scaffolds. Material should be brought up as needed. Scaffolding must not be loaded in excess of its rated capacity.
- o. Barrels, boxes, kegs, blocks or similar unstable object must never be used as work platforms or to support scaffold.
- p. Where persons must work under or pass under a scaffold then a 18 gauge wire mesh screen must be installed between the toe board and guard rail.
- q. Employees exposed to overhead hazards while working on a scaffold will be protected by 5 cm (2") thick planks.
- r. Wooden/bamboo ladders shall not be allowed at any cost. Ladder's rungs shall be fitted /welded

properly. Before every use the rungs should be checked for safe use.

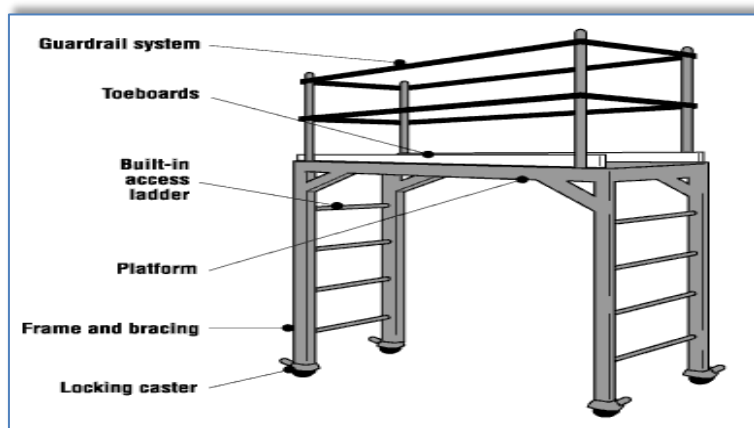
- s. Wooden scaffolds shall not be used in areas where fire / fire products are expected
- t. Ropes made of jute / Plastic and other fire prone material shall not be used to tie up scaffolding components together
- u. The platform should have permanent hand rail and mid rail with Toe board without fail.
- v. All platforms are to be tightly planked for the full width of the scaffold, except as may be necessary for entrance openings. Platforms shall be secured in place.
- w. On suspension scaffolds designed for a working load of 500 pounds, no more than two workers are permitted to work on the scaffold simultaneously. On suspension scaffolds with a working load of 750 pounds, no more than three workers are permitted on the scaffold simultaneously.
- x. **Requirements for different types of Scaffolds:**

A. Suspended Scaffold

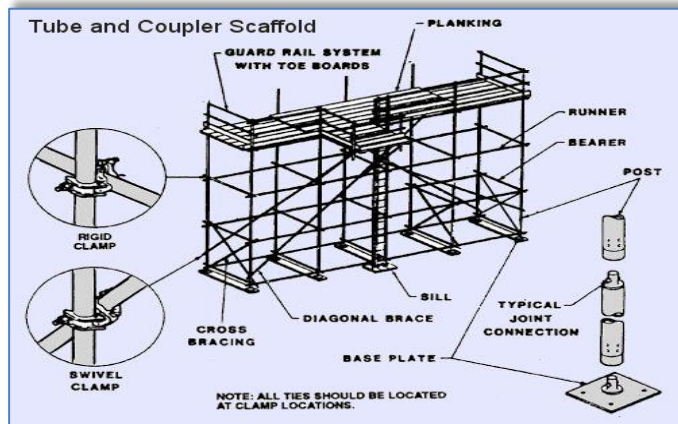
- i. Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.
- ii. Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

B. Rolling Scaffolds

- i. The height of rolling scaffolds shall not exceed three times the minimum base dimension.
- ii. The minimum base dimension of rolling scaffold will be 1.25 meters (4 feet).
- iii. Adequate help must be provided when moving a rolling scaffold.
- iv. Secure or remove all loose materials, equipment and tools before moving a rolling scaffold.
- v. No one is permitted to ride a rolling scaffold when it is being moved. Castor brakes must be locked-on when the scaffold is not being moved.



Rolling Scaffold



Tube & Coupler Scaffold

Fig. 2.3 Types of Scaffolds

1.4 Ladder Safety

A sketch of the ladders proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use

a. Safe Use of Ladders:

- i. Fall protection is required when working on a ladder above 2 meters and when climbing above nearby guardrails.

- ii. Ladders must be inspected prior to use and by a competent person quarterly, with documentation.
- iii. Use portable ladders for height up to 4 M only
- iv. Provide fixed ladders for height above 4 M
- v. Place the ladder at an angle of 75 degrees (approx.) from the horizontal (1:4)
- vi. Extend ladder at least 1 M above the top landing
- vii. Secure top and bottom of the ladder firmly to prevent displacement- anti skid lining at the bottom
- viii. Ensure that the width of the ladder is not less than 300 mm and distance between rungs is not more than 300 mm
- ix. Provide landings of minimum size 600 x 600 mm at intervals not more than 6 M for fixed ladders. Check the ladders daily for any defects
- x. Ensure that the areas around base and top of the ladder are clear. Getting on and off the ladder is more hazardous than using it. Use a mudsill if the ladder is to rest on soft, loose or rough soil
- xi. Do not use ladders of conducting material near power lines, and only use ladders near power line or other energize system with exposed parts if they are confirmed locked-out and de-energized.
- xii. Stand no higher than the fourth rung from the top for carrying out any job standing on a ladder.
- xiii. Never reach out from a ladder to perform work where your belt buckle protrudes past the ladder rung.
- xiv. Always face the ladder while climbing up or down
- xv. Maintain three-point contact while climbing up or down a ladder i.e. two hands and one foot or two feet and one hand on the ladder at all the times.
- xvi. Avoid climbing up or down a ladder while carrying anything in hands. Lift tools, equipment and materials with a rope.
- xvii. Work from portable and extension ladders near guardrail where fall expose exists over the guardrail regardless of height, and above 2.0 mtr. heights from the working/walking surface will require the use of personal fall arrest equipment

2. EXCAVATION & CIVIL WORKS

All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

2.1 Excavation

The following safety measures are to be ensured before and during excavation:

- a. All Excavation activities more than with depth of 1.22 meter or more shall require and Excavation Work Permit
- b. Check for underground utilities like electrical / telephone cables, sewage, water lines and proper care has to be exercised to protect and prevent damage to it.
- c. Electrical cables and service lines to be identified using cable detector/locator device before carrying out the excavation work
- d. Proper and adequate slope is maintained while excavating
- e. Adequate shoring or sheeting is done wherever require to prevent soil sliding
- f. Safe access through ladder or steps for exit & entry to excavation
- g. No material /excavated soil is kept within one meter from the edge
- h. Safe way is planned and provided for movement of HEM /transport equipment near excavation
- i. Safety helmet and shoes/gum boots are provided and worn by the workmen at excavation works

- j. Dewatering arrangement is made where water seepage is prevailed.
- k. Stop blocks are provided to avoid vehicles reversing into the excavated trenches
- l. Danger signs /Caution boards are displayed at work spot
- m. Hard Barricading is provided at excavated pits. It should be made of scaffolding pipe and clamp with reflective nets.
- n. All Excavated area of depth 3mtr or more is to be hard barricaded with pipe.

Soil Type	Height/Depth ratio	Slope Angle
Stable Rock	Vertical	90 deg.
Type A	¾ : 1	53 deg.
Type B	1 : 1	45 deg.
Type C	1½ : 1	34 deg.

Determining Soil Type		
Type	Description	Examples
A	Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot or greater.	Clay, silty clay, sandy clay, clay loam and in some cases: silty clay loam and sandy clay loam.
B	Cohesive soils with unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf.	Angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases silty clay loam and sandy clay loam.
C	Cohesive soils with unconfined compressive strength greater than 0.5 tsf or less.	Granular soils such as gravel, sand and loamy sand; submerged soil or soil from which water is freely seeping; submerged rock that is not stable.

Fig. 3.1 Excavation Reference

2.2 Piling

Ensure the following precautionary measures before starting piling works:

- a. Inspection of piling equipment by responsible person for its condition before initiating piling operation.
- b. Checklist and OCP for piling to be prepared using manufacturer’s instructions and used
- c. Testing and its certification wire rope, slings, D-shackles, chain pulley blocks using in the process of piling work by competent person
- d. Adequate support and secured foundation of the piling equipment to avoid toppling
- e. Hoses should be lashed and adequately secured
- f. Proper work platform is to be provided on piling frame
- g. Safe work procedures and close supervision to prevent unsafe acts of operators/any unsafe conditions that may arise
- h. Only experienced and trained operators are engaged for the piling operation
- i. Provision of Personal Protective Equipment (PPE) like safety shoes/gumshoes/safety helmet/safety belt etc. and its use by their workmen.
- j. Special care and precautions If work is near electrical live cables/ electrical equipment
- k. Cordoning of work area to prevent un authorized entry
- l. Guarding of revolving parts
- m. Specific measures to prevent over turning of pile driver/missing of hammer/ hammer movement out of range

2.3 Batching Plant Operation

Following Safety considerations for batching plant are to be ensured:

- 1. Modern type batching plant should be used in which all the moving parts are protected and emergency

and safety features are incorporated.

2. Installation of external Electric moto-vibrators in the feeding hopper of all batching plants to reduce human intervention.
3. Installation of safety devices like pull-chord on both the sides of conveyor for stopping the conveyor in emergency
4. Workers carrying cement / sand to be given appropriate PPEs like respiratory masks & gloves.
5. Conveyor belt/rotating parts must be guarded properly.
6. Safety awareness shall be inculcated in workmen about the risk involved in rotating parts.
7. The agency shall ensure to erect the batching plant as per drawing including installation of all safety devices as provided by manufacturer and witnessed by BHEL Engineer in charge before starting of machine in future.
8. Safety audit to also focus on Batching plant.
9. The site shall impose penalty on the agency who has violated the safety norms as per contract.

2.4 Mobile Plant

Mobile plant includes tractors, trailers, dumpers, excavators, bulldozers, road rollers etc. for earthmoving purpose and concrete mixers, concrete transit mixtures, concrete pumps etc for concreting purpose. Due to the very nature of their function and movement in difficult terrains, congested areas, working in tandem with manual work and other operations the danger is inherent.

Automatic reverse camera with reverse horn connected with reverse gear is compulsory for all moving machineries.

Following Safety measures to be ensured for Mobile Plant:

- a. Where movement around site is involved, routes should be planned, obstruction free and well maintained
- b. Observe specified speed limits
- c. Operating personnel should be aware of associated risks and its preventive measures
- d. Only experienced, trained and authorized persons with valid license (wherever applicable) should operate the mobile equipment/vehicles
- e. Provide and use Warning lights and reverse horn for cautioning the people around
- f. Operation should be on level and stable ground with adequate working clearance.
- g. Loading of out riggers/stabilizers should be well within safe ground bearing capacity
- h. No person should be on equipment or vehicle during loading and unloading of material
- i. Operators should be protected by warning barriers or switching off power when working in close proximity of overhead power lines
- j. The equipment /vehicles should be well maintained and provided with effective brake system and other safety devices (wherever require)
- k. Rotating parts of equipment should be adequately guarded
- l. Provide necessary personal protective appliances and ensure its use by the operating personnel Ensure effective measures at source to control harmful emissions, dust, fumes contaminating atmosphere and cause health hazards to the operators and people in the vicinity.
- m. No overloading/over stressing of vehicles/plant is allowed
- n. Hoses, pipes, receivers, gauges and valves involved in carrying out hydraulic fluid/ compressed air should be checked for leaks and tested prior to operation.

- o. Adequate safe clearance for swing and movement is to be judged during operation of Concrete mixer
- p. Setting of machines on firm and level ground with wheel locked to prevent movement of machine
- q. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket
- r. Operator leaving work spot should ensure that the equipment/vehicle is kept in neutral position and place on firm and level ground.
- s. The hand brake should be kept in position and block road wheels as additional safety measure
- t. Blades/buckets should be kept low while moving
- u. The dozer blades should not be used as brakes except in emergency
- v. The ground should be examined for its bearing capacity and general safety especially when operating road roller at the edges of slopes, embankments.
- w. The roller should not be moved downhill with the engine out of gear
- x. If operating near excavations the following precautionary measures are to be ensured
- y. Barricading, edge protection to prevent fall of persons/vehicles over running while reversing etc.
- z. Suitable support system and adequate allowance to avoid the danger of side collapsing
- aa. Experienced signaler /attendant should be always accompanied with operator/driver for proper direction /signal and also to caution others in the working Zone during operation of mobile plant

2.5 Concrete Vibrators

- a. Revolving parts/belt drives should be adequately guarded and Vibrating unit shall be completely enclosed and have suitable overload relays and effectively earthed
- b. Ensure sufficient length of cable to the Vibrator.
- c. Ensure electric starters and other accessories are firmly fixed adequately supported
- d. Ensure locking of needle load while inserting needle in to the vibrator,
- e. Ensure periodical lubrication and maintenance

2.6 Concrete Mixers

- a. Setting of machines on firm and level ground with wheel locked to prevent movement of machine
- b. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket

3. WELDING & GAS CUTTING SAFETY (HOT WORK)

- a. All Hot Work shall require a Hot Work Permit
- b. Inbuilt Voltage Reduction Device (VRD) equipped arc welding machine will only be allowed for work.
- c. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced.
- d. All safety precautions shall be taken for welding and cutting operations as per IS-818.
- e. When possible, items to be welded, cut, heated, etc. shall be moved to a safe location free of combustible or flammable material. If this is not possible, then all combustibles/ flammables that can be removed from the area shall be removed within a 35-foot circumference and a positive means of confining arcs and sparks generated by the process shall be ensured and additional person(s) shall be stationed as fire-watch for the area(s) still exposed, along with obtaining the Hot Work Permit as applicable.
- f. Appropriate fire-fighting equipment is to be available in close proximity of any welding and gas cutting operations at all times suitable for the type of Fire.

- g. Drums, tanks, and similar containers that have contained flammable or toxic material shall not be welded, cut, or heated until they have been made safe by water filling, thorough cleansing or similar accepted practices. The container shall also be ventilated during the welding, cutting, or heating process.
- h. Proper ventilation is required for any welding or torch operations performed in a confined space.
- i. Any welding or gas cutting operations performed on metals of toxic compounds or coating such as zinc, stainless steel, lead, cadmium, chromium, and beryllium shall be properly ventilated and/or proper respiratory protection shall be worn by any person that could be exposed to fumes, vapors, and gasses created by the welding and gas cutting processes.
- j. Wherever it is practical, all arc welding operations shall be shielded to prevent direct light rays or sparks from contacting persons in the vicinity or from reaching areas normally used to travel through or into the vicinity. Where this is not practical, persons who shall be in the area are to use proper eye and skin protection. Other persons who are not participating in the welding or gas cutting operations are not to be allowed into the hazard zone.
- k. Welders and other employees who are exposed to arc welding radiation shall wear suitable clothing and protective apparel to prevent burns and other types of ultraviolet radiation damage to the skin.
- l. Arc welding machines shall be shut down when being moved or when they are not in continuous use. Electrode holders left unattended shall have electrodes removed and shall not be left where they might contact employees or conducting objects.
- m. Arc welding power supply cable shall be of proper rating and material, e.g. copper.
- n. Welders shall guard against allowing materials adjacent to or behind them to reflect radiation back toward them or towards others in the area. Reflected radiation can cause skin burns and eye flash burns.
- o. Valve caps shall be in place when cylinders are not in use. Valve caps shall never be used for lifting the cylinder vertically.
- p. Torches shall only be lit by approved strikers; never with matches, cigarette lighters, or hot-work.
- q. **Splatter / Slag Collector:**

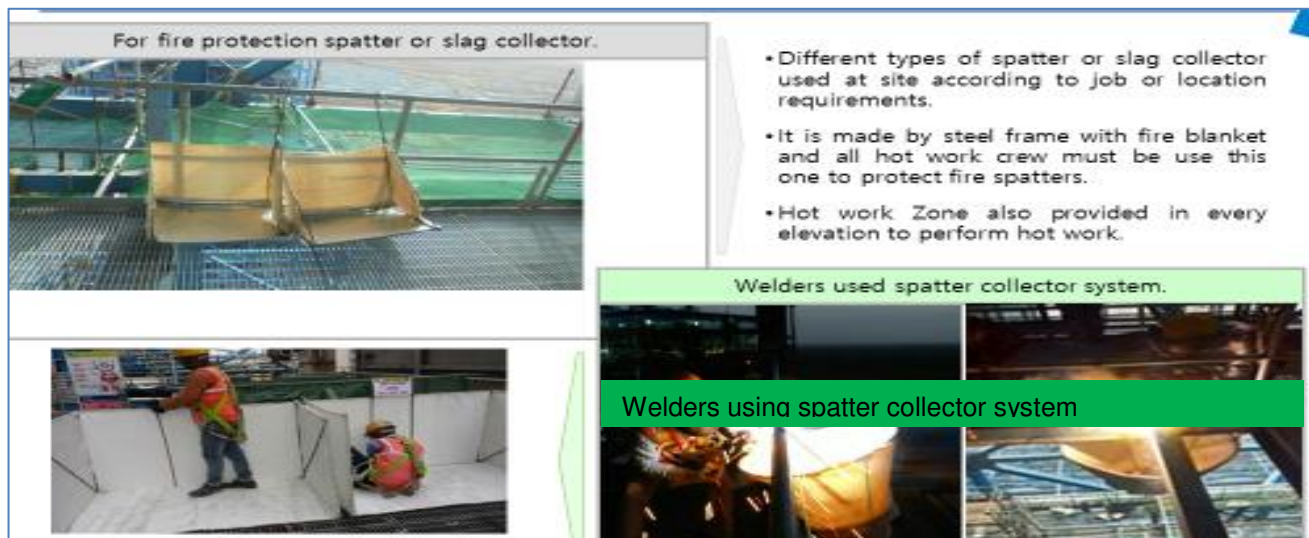


Fig. 4.1 Splatter / Slag Collector

While carrying out job at height, the sparks or molten slag shall be prevented from falling down by putting a fire-resistant (non-asbestos) sheet or pattrer/ slag collector or even MS Sheet. The passage of falling sparks

or molten slag shall be barricaded till ground floor and any cable/ tubes/ any other objects interfering in the passages hall either be removed or covered with Fire-resistant sheet or MS Sheet.

r. COMPRESSED GAS

- i. All cylinder valves shall be closed when any work is finished and when any Cylinders are empty or being moved. Valve protection caps shall be placed and secured properly before gas cylinders are transported, moved or stored.
- ii. Compressed gas cylinders shall be secured in an upright position with chain or appropriate means during storage & use. However, a trolley shall be used for transportation.
- iii. Compressed gas cylinders shall always be secured from tipping or falling, whether in use, in storage or in transit. The cylinders shall always be secured upright, except during times when actually being hoisted or carried.
- iv. When cylinders are transported by powered vehicle they shall be secured in a vertical position.
- v. Regulators shall be removed when cylinders are not in use or are in transit, unless the cylinder is firmly secured on a special carrier designed for this purpose.
- vi. Gas cylinders are not allowed to be used in man-basket when occupied.
- vii. Cylinders containing oxygen or fuel gasses shall not be taken into confined spaces.
- viii. Oxygen cylinders shall be stored a minimum of 6 meters from fuel gas cylinders or shall have an approved firewall between them.
- ix. All cylinders shall be kept at a safe distance from welding or cutting operations or shielded from arc/sparks / slag.
- x. All cylinders shall be placed where they cannot become part of the electrical circuit.
- xi. Oxygen and acetylene shall not be stored together. Oxygen must be separated from acetylene (or ANY fuel gas) or combustible material by at least 20ft or a barrier with a 30-minute fire resistance rating.
- xii. All Cylinders should be stored upright in a designated area with labels for the type of gas. All applicable precautions to be ensured during storage
- xiii. Oxygen and fuel gas regulators, hoses and associated equipment shall not be altered and shall be in proper working order while in use.
- xiv. Compressed air can be extremely dangerous if allowed to penetrate the skin. As such, the use of compressed air to clean off yourself or other workers shall be strictly prohibited.
- xv. All gas cylinders shall be stored in upright position. Suitable trolley shall be used for cylinder movement, the design of which shall be submitted to BHEL Engineer for approval.
- xvi. No of cylinders shall not exceed the specified quantity as per OCP
- xvii. Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
- xviii. All cylinder should be kept only in cylinder trolley.
- xix. Cylinder shall be transported in upright vertical position by suitable mean.

4. LIFTING & RIGGING SAFETY

- a. All Heavy / Complex Lifting operations as defined in Clause 6.12 shall require a Lifting Work Permit. A written rigging procedure and plan must be prepared for all individual heavy/ complex lifting operations.

- b. All the cranes and lifting tools & tackles shall be inspected on daily / weekly basis as well as monthly by expert as per applicable formats.
- c. In addition, inspection / certification as mandated by law shall be carried out wherein these shall be tested and certificates of fitness shall be obtained from 3rd party State Govt. approved competent agency before deploying at site and later periodically. BHEL shall be given advance intimation of any such inspections
- d. The last date of Third-Party Inspection and the next Due date shall be conspicuously displayed on all cranes. A copy of certificate shall be pasted on operator's cabin of all the lifting equipment.
- e. Specifically designed heavy steel plates lifting clamps shall be used for lifting heavy metal sheets. Manmade lifting clamp chapa shall not be used for lifting/shifting of plates.
- f. Following requirements shall be mandatorily followed, wherever applicable:
 - i. The manufacturer's instruction for maintenance shall also be followed. All safety measures shall be followed.
 - ii. All tools tackles, lifting appliances; material-handling equipment etc. used by the subcontractor shall be of safe design and construction.
 - iii. The operators, slingers and signalers shall be qualified as per IS 13367 (part-1):2003 "Safe use of cranes- code of practices".
 - iv. There shall be a person responsible for co-ordination among cranes where multiple cranes are used, and lifting over load chart of the crane to be avoided.
 - v. Mobile phone should be banned for crane operator and lifting operation. Only walkie talkie shall be allowed in rigging/Lifting purpose.
- g. Lifts/Movements between 5 Tons and 20 Tons:
 - i. Shall include a rigging plan, detailing schematic representation of the handling/lifting operations that must be included on the Method Statement.
 - ii. When performing similar lifts of identical items, only one rigging plan need be prepared, provided each of the lifts can be performed in accordance with the rigging plan.
- h. Lifts/Movements Less Than 5 Tons:
 - i. An equipment rigging plan is not required for lifts less than 5 tons, safety measures are covered in the JSA. This could change as per BHEL requirement

i. Personnel Lifts (Man-Basket / Jhoola):

The design of personnel man basket shall be submitted to BHEL Engineer for approval before use. Relevant permit (Height work & others as applicable) shall be completed prior to lifting any people, along with a rigging plan.

- i. A separate Lifeline / fall arrestor anchored to a fixed structure outside of Jhoola shall be provided for the workers inside the basket. All occupants of the basket shall have Safety Harnesses equipped with rope grabs, which are to be hooked to the vertical lifeline.
- ii. Man-basket shall be used where access through ladders or scaffolding is not feasible.
- iii. Man-baskets shall be designed and engineered by a manufacturer (job made man-baskets are not allowed, unless designed and tested by a certified engineer), and built robust with MS Angles and flats or plates or channels only.
- iv. Guard rails top and mid, must be in place and screened-in to avoid material from falling out of

- basket. The factor of safety shall be 200%.
- v. It shall have a door with double latches and shall open inside. Anchor points shall be identified within the man-basket.
 - vi. The man-basket shall be thoroughly inspected and load tested and a trial run performed without personnel before being put to job.
 - vii. It shall be treated as a lifting tool (T&P Item) and shall undergo same certification cycle and inspection as other lifting equipment.
 - viii. An additional sling of required lifting capacity shall be fixed the man-basket main lifting point and attached to the crane above the ball or block.
 - ix. While lifting man-basket, the crane shall maintain a uniform speed of lift without any swing.
 - x. Once man-basket reaches the destination, the lift brakes shall be locked as long as the basket
 - a. remains at that point. The same care shall be taken in its descent.
 - xi. As for hanging man-basket, the same shall be hung off a rigid structure with help U-shaped handle welded to man-basket. This shall be tested once in a year by a competent person.
 - xii. Use of Rebar steel for making and monkey-ladder must be avoided.

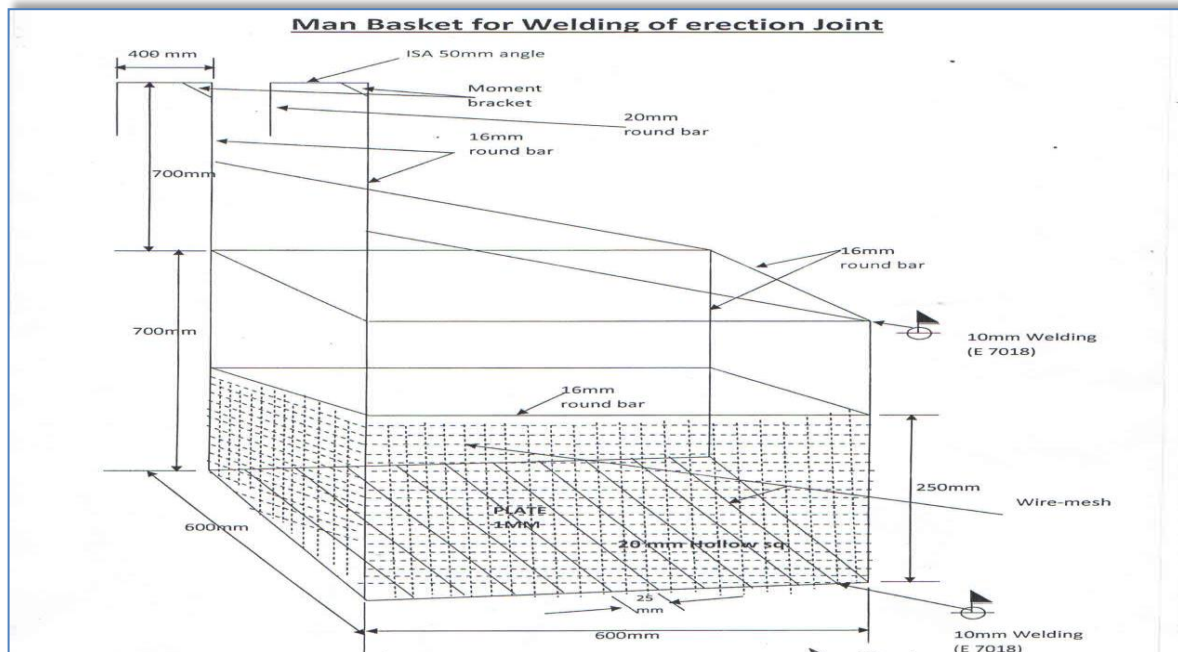


Fig. 5.1 Man Basket for Welding Erection Joint

4.1 Cranes & Hoisting Equipment:

This section provides the guidelines to ensure proper rigging and lifting activities are accomplished safely and in accordance with applicable specifications, codes, and regulations.

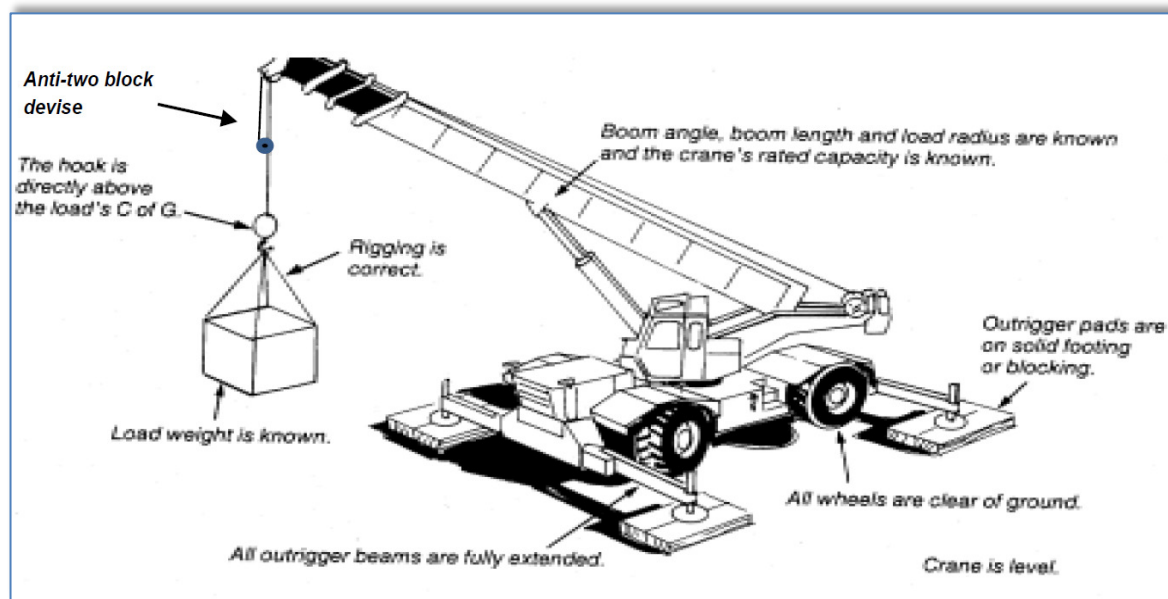


Fig. 5.2 Proper Crane Setup

- a. On every crane or piece of hoisting equipment notices of all rated load capacities, recommended operating speeds, and any hazard warnings or special instructions shall be conspicuously posted. All instructions and warning shall be visible from the equipment operator 's station.
- b. Cranes shall have an Anti-Two-block safety device installed
- c. All mobile cranes shall have overload and backup alarms, load angle indicators and limit switches
- d. All areas within swing radius of cranes that are potentially accessible by pedestrian, vehicular, or equipment movement shall be barricaded to prevent anyone or any vehicle or equipment from being struck by the crane or hoisting equipment, or its load(s).
- e. No part of the lifting equipment or its load shall be within the distance as specified in the Indian Electricity Act from an energized power line
- f. Cranes shall have annual certified third-party inspection and be inspected before use by the operator. Any defects shall be corrected before use. Logs of crane inspection shall be kept with the crane.
- g. Make certain that the rigging personnel, material, and equipment have the necessary capabilities for the job and are in safe condition.
- h. Communicate with person(s) directly responsible for accomplishing the work and / or work area to establish requirements/responsibilities and make certain that all preparatory work is complete.
- i. Mats/Pads must be used on all lifting equipment, equipped with out riggers.
- j. Pick and carry must have the load secured to the rig in front.
- k. Only BHEL Approved Plate Lifting Spreader Beam configuration shall be used (Sample in Fig. 11.3.5.3)
- l. Crane operators must follow the following:
 - i. Pass an annual Operator's Physical examination
 - ii. Carry a valid training certification card at all time while operating issued by the Govt. or other recognized institute.

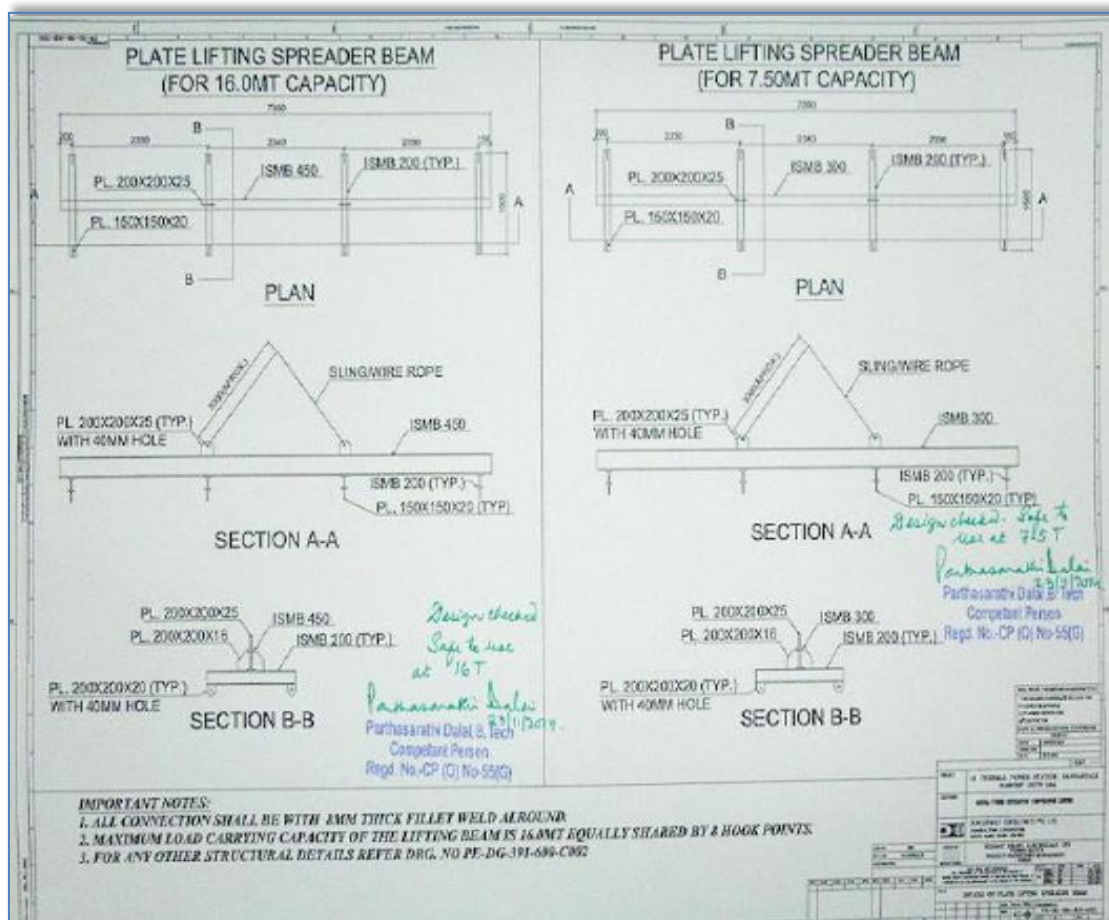


Fig. 5.3 Typical Plate Lifting Spreader Beam Configuration for 7.5 MT and 15 MT Loads

m. Safe Rigging Practices

- Review the planned operation and requirements with the operator and rigging crew.
- Ensure a pre-lift meeting is conducted with crane operator, tagline operator, signal personnel, and Safety Manager.
- Designate a qualified person from the rigging crew to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.
- Clear the lift area of all unnecessary personnel.
- Hydras shall only be allowed for loading & unloading works & shall not be allowed to move with load

n. Rules for Safe Rigging

- Use loops, thimbles and corner pads to prevent damage to slings when used around corners or on cutting edges.
- Never allow wire rope to lie on the ground for any length of time or on rusty steel or near solvents, chemicals or corrosive substances.
- Slings must not be pulled from between or under loads with load resting on the sling.
- Keep all rope away from flame cutting or welding operations.
- Never use rope as sling material.
- Never wrap a wire rope completely around a hook.

- vii. Do not bend wire rope near any attached fitting.
- viii. The sling must be selected to suite the most heavily loaded leg rather than the total weight when using multi-legged sling to lift loads in which one end is heavier than the other.
- ix. When using 3 and 4-legged sling configurations, any two legs must be capable of supporting the entire load.
- x. Where possible, wire rope choker hitches must include a shackle with the eye around the shackle pin to prevent breaking wires of the choke. The choker hitch must be “snugged down” prior to lifting, not after tension is applied.
- xi. Unless authorized by the hook manufacturer when more than two rope eyes are placed over a hook, install a shackle, pin resting in the hook, and place the rope eyes in the bowl of the shackle.
- xii. Properly rig all loads to prevent dislodgment of any part.
- xiii. Use guide ropes or tag lines to prevent the rotation or uncontrolled motion of the load when necessary.
- xiv. Loads must be safely landed and properly blocked before being unhooked and unslung. Tag lines must not be used in situations that jeopardize the safety of the lift.
- xv. Lifting beams must be plainly marked with their weight and designed working load and must only be used in the manner for which they were designed.
- xvi. The hoist rope or chain must never be wrapped around the load. The load must be attached to the hook by slings or other rigging devices that are adequate for the load being lifted.
- xvii. Multiple part lines must not be twisted around each other.
- xviii. The hook must be brought over the center of gravity of load before the lift is started.
- xix. If there has been a slack rope condition, determine that the rope is properly seated on the drum and in the sheaves prior to lifting.
- xx. Keep hands away from pinch points as the slack is being taken up.
- xxi. Leather gloves are recommended when handling wire rope.
- xxii. Avoid impact loading caused by sudden jerking when lifting or lowering. Lift the load gradually until the slack is eliminated.
- xxiii. Never ride on a load that is suspended.
- xxiv. Avoid allowing the load to be carried over the heads of any personnel.
- xxv. Never work under a suspended load until the load has been adequately supported from the floor and all conditions have been approved by the supervisor in charge of the operation.
- xxvi. Never leave a load suspended unless emergency evacuation is required.
- xxvii. Never make temporary repairs to sling.
- xxviii. The capacity of a sling is determined by its angle, construction, type of hitch and size.
- xxix. Never lift loads with one leg of a multi-leg sling until the unused legs are made secure.
- xxx. Never point load a hook unless it is especially designed and rated for such use.
- xxxi. Make certain that the load is broken free before lifting and that all legs are taking the load.
- xxxii. When using two or more slings on a load make certain all slings are made from the same materials.
- xxxiii. Lower the loads on to adequate blocking to prevent damage to the slings.
- xxxiv. Materials and equipment being hoisted must be loaded and secured to prevent any movement which could create a hazard in transit.

- xxxv. The weight of the hook, load block and any material handling devices must be included when determining crane capacity.
- xxxvi. Calculated weights cannot exceed load chart without written approval.
- xxxvii. Personnel must be completely clear of loads being picked up or set down by crane. Tag lines will be used to control the loads. Loads must not be touched by hand while placing/ moving.

o. Slings

The following are rules for safe use of synthetic slings:

- i. Synthetic slings must be marked to show the rated capacity for each type of hitch and type of web material.
- ii. Nylon web slings must not be used where fumes, vapors, sprays or mists or liquids of acids or phenolic are present. Web slings with aluminum fittings must apply in this category.
- iii. Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:**
 - a. Acid or caustic burns
 - b. Melting or charring of any part of the sling surface
 - c. Snags, punctures, tears or cuts
 - d. Broken stitches
 - e. Distortion of fittings
 - f. Synthetic web slings of polyester or nylon must not be used at or come in contact with temperatures in excess of 82°C
 - g. Polypropylene web slings must not be used at or come in contact with temperatures in excess of 93°C
 - h. Insulated hooks must be tested yearly to ensure insulation integrity to at least manufacturer's specifications.
- p. Wire Rope Slings must be removed from service and destroyed if any of the following conditions are present:**
 - i. In (10) randomly distributed wires broken in one (1) rope lay, or five (5) broken wires in one (1) strand in one (1) rope lay.
 - ii. Wear or scraping of one-third the original diameter of outside wires.
 - iii. Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure such as:
 - iv. Evidence of heat damage.
 - v. End attachments that are cracked, deformed worn.
 - vi. Corrosion of the rope or end attachments.
- q. Metal mesh slings must be immediately removed from service if any of the following conditions are present:**
 - i. A broken weld or broken brazed joint along the sling edge.
 - ii. Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
 - iii. Lack of flexibility due to distortion or corrosion.
- r. Requirements of Plate Clamps:**
 - i. The rated load of the plate clamp must be marked on the main structure.

- ii. Care must be taken to make certain the load is correctly distributed for the plate clamp being used.
- iii. Do not allow load or plate clamp to come into contact with any obstruction.
- iv. The plate clamp must not be used for side pulls or sliding the load.
- v. When lifting stainless steel or special alloys, ensure plate clamp is designed for use on the specific metal.

s. **Signaling Practices:**

- The "slinger" is responsible for attaching and detaching the load to and from the crane. He shall:
 - have received appropriate training on general safe lifting operations;
 - be capable of selecting lifting gears suitable for the loads;
 - liaise with the operator and direct the movement of the crane safely.
- The "signaller" is responsible for relaying the signal from the slinger to the crane operator. He shall:
 - have received appropriate training on general safe lifting operations;
 - be able to direct the movement of the crane and loads.

Suggested hand signals



Note: During the lifting operation, either the slinger or signaller shall communicate with the operator. Other communication methods (e.g., wireless walkie-talkies, telephones, etc.) may also be used.

Fig. 5.4 Recommended Signaling Practices

5. DEMOLITION WORK

Before any demolition work is commenced and also during the process of the work the following shall be ensured, besides using the Work Permit:

- a. All roads and open areas adjacent to the work site shall either be closed, suitably protected or restricted for movement
- b. No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.

- c. All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.

6. T&PS GENERAL

- a. All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test /calibration certificates bearing endorsement from competent authority of BHEL.
- b. Subcontractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
- c. Tagging and punching in all lifting tool is compulsory with SWL, sr. no. and due date.
- d. All T&Ps shall be inspected by authorized Third Party agency as per applicable frequency. BHEL shall be kept informed of any such scheduled inspection
- e. All T&Ps shall be internally inspected in each quarter and colour coded.

7. CHEMICAL HANDLING

- a. Displaying safe handling procedures & MSDS for all chemicals such as lube oil, acid, alkali, sealing compounds etc. at work place.
- b. Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the subcontractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The subcontractor shall be responsible for obtaining the same.
- c. The used containers of chemicals shall be segregated and disposed of suitably
- d. In case the used containers need to be re-used, all traces of the chemical to be removed by thorough cleaning with detergents etc. under trained supervision

8. ELECTRICAL SAFETY

- a. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works. The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
- b. No PDB or any other distribution board shall be more than 03 (three) years of purchase. Only modern PDB with industrial sockets as shown in layout below to be allowed to use at site.
- c. Power supply to all equipment at site to be routed through MCBs of appropriate rating. A 'Power Supply Distribution Plan' shall be prepared and submitted to BHEL Engineer for approval
- d. All power supplies through cables shall be underground or overhead with height > 3mtrs.
- e. All power distribution boxes shall be locked and the key controlled by site management of concerned subcontractor.
- f. All individual equipment & tools at site shall be powered through Earth Leakage Circuit Breakers of 30 mA sensitivity.
- g. These MCBs and ELCBs shall be regularly tested as per Clause 14
- h. All fuses and fuse wires shall be of standard size and rating.
- i. All electrical appliances used in the work shall be in good working condition and shall be properly double earthed other than armour earthing.

- j. All extension boards shall have separate switches for all sockets / connections.
- k. All portable electric tools used by the subcontractor shall have safe plugging system (industrial top & socket) to source of power and be appropriately earthed.
- l. Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts especially in confined spaces like inside water boxes, turbine casings, condensers etc.
- m. Electrical appliance shall have proper earthing and for appliances equal to & more than 415V shall have two separate earthing (as per IS-3043-1987)

n. Portable Electric Lights

- i. Portable electric lights used in wet or potentially wet locations must be either low voltage type (24 volts or less) or protected by a GFI (ground fault interrupter).
- ii. They must be visually checked before each use and periodically while in use to assure their original integrity is maintained.
- iii. Cords with cuts, breaks, deep abrasions, etc. shall be taken out of service immediately.
- iv. Repairs to extension cords shall only be performed by qualified/ licensed electricians.
- v. Must not be allowed to lie in wet or potentially wet areas.

o. Underground Cables:

- i. Every electric line or cable of unknown origin that is discovered or exposed during a digging, drilling, probing, or similar operation is to be considered as energized and life threatening.
- ii. The senior company employee on the site will ensure that all necessary safety precautions are taken in order to isolate the line from all workers and the public.
- iii. Such precautions may include halting the operation if appropriate.
- iv. The senior company employee on the site is to then contact the proper authorities to have the line identified and either confirmed to be abandoned and/or made safe for continuing the work.
- v. Any and all underground lines that are discovered or become severed must be considered energized on both sides, and be treated accordingly.
- p. Details of earth resource and their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
- q. The subcontractor shall use only properly insulated and armoured cables and conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site.
- r. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the risk & cost of the subcontractor.
- s. No maintenance work shall be carried out on live equipment
- t. Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public
- u. The subcontractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
- v. Wiring and Branch Circuits Must be protected by a proper amperage over-current device such as a HRC fuse or circuit breaker. Such installations must be located so as to prevent physical damage to the wire conductors & panels.

w. The sub-contractor shall supply modern power distribution board of different combination (1-phase & 3-phase). All the distribution of power should be through modern PDB. Equipment drawing is mentioned below.

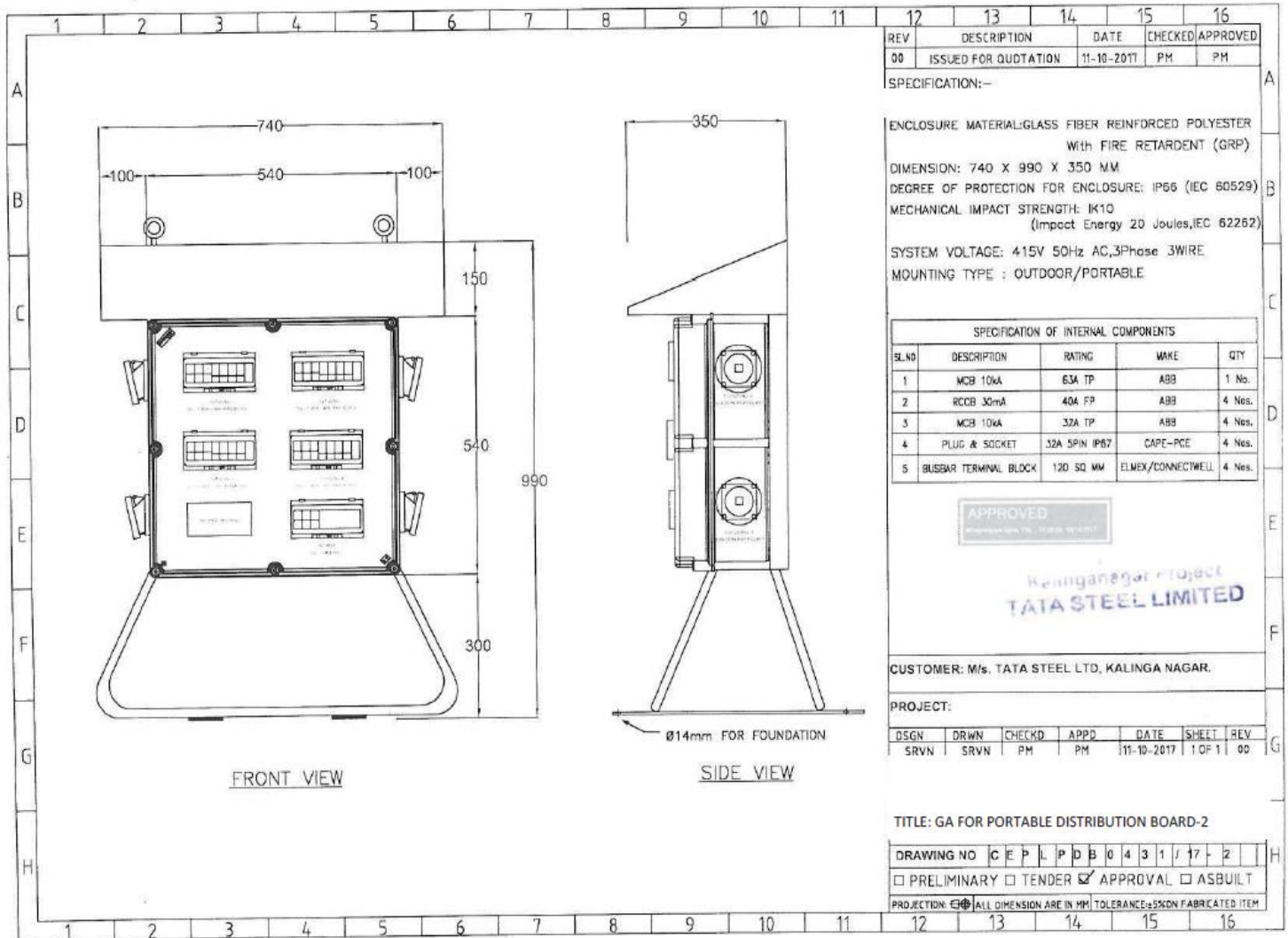


Fig. 9.1 Layout of a modern Power Distribution Board

x. General Electrical Safety

- i. In general, equipment or machinery being moved or transported must maintain minimum clearances of 25 ft. to all power lines.
- ii. TAG IN/ TAG OUT must be in force in Switch Room and all Distribution Boxes for live power line. The authorized person's name and contact no shall be displayed
- iii. Ensure "double insulated" three - core cables and three pin connectors are used and are properly ground "all insulated" types, all electrical tools and appliances must be manufactured for industrial use.
- iv. All connections shall be electrically and mechanically sound and properly insulated. Taped joints are not permitted. Connections to socket outlets must be made with proper plugs (industrial top and socket).
- v. Splices in electrical cords are not permitted. Repairs must be made at the socket connection and retain the same mechanical and dielectric condition of the original connection.

- vi. Damaged or defective electric tools, equipment and extension cords, etc. must not be used and shall be tagged out of service, removed from the work area and taken back to stores.
- vii. Only licensed electricians are authorized to repair and work on electrical equipment. Tampering with electric tools or equipment by others could result in termination.
- viii. Temporary electric cabling should be elevated 2.2 meters above the floor/ground or covered for protection. It must be kept clear of walkways and other locations where it may be exposed to damage or create a tripping hazard.
- ix. Energized wiring in junction boxes, circuit breaker panels and similar places must be covered and locked at all times.
- x. Areas with live high voltage wires or terminals must be barricaded against entry and warning signs posted Danger – High Voltage and Authorized Personnel Only.
- xi. Personnel should never work on energized equipment, de-energizing (lockout/tag out) the equipment is always the first requirement.
- xii. The lockout and tag out procedure will be used when testing or working on, or around, energized installation.
- xiii. Working around energized equipment should never be done alone. A second electrician must always be available for assistance.
- xiv. If lockout/tag out of the work is infeasible (must be demonstrated), work on energized electrical circuits must be approved by the Site In-charge. All safety precautions necessary must be taken, PPE use must be evaluated per the exposure and used, i.e high/low voltage gloves, insulated shoes, overcoats/aprons, face shields, and other protective equipment like insulated tools, blankets, mats, etc. must be used.
- xv. The welding machines earth leads shall be properly fixed without loose contacts. The earth cable only has to be used. No steel members shall be used as earth leads.
- xvi. Electrical crews must be qualified for the equipment and tools they work on, including being trained in Cardio-Pulmonary Resuscitation (CPR) methods and First Aid for rendering help in the event of electric shock.

y. Qualified Persons for Electrical Works

(One who is trained and wiremen licensed to Govt. of Respective State and familiar with the construction, operation and safety hazards of the equipment upon which they are permitted to work.)

- i. Qualified persons are intended to be only those who are well acquainted/experienced with and thoroughly conversant in the electric equipment and electrical hazards involved with work being performed.
- ii. Only qualified persons may be permitted to work on or near exposed energized parts. Such persons are required to have been trained in three specific areas:
- iii. Qualified persons must be capable of working safely on energized circuits;
- iv. Must be familiar with the proper use of special precautionary techniques and procedures bases on equipment and exposure; and
- v. Must be familiar with required personal protective equipment, insulating and shielding materials, and insulated tools.

- vi. Qualified persons are expected to be able to evaluate unknown situations and adjust their activities in such a way that only safe work practices are used. Such behavior is the responsibility of the qualified person.
- vii. It is possible and likely for an individual to be 'qualified' with regard to certain equipment in the work place, and unqualified on other equipment they must know their limitation and stop work if not qualified on what equipment they were to work on.
- viii. An employee who is undergoing on-the-job training, who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties. The process must be documented as proof.

z. Mandatory PPEs of electrical work on LV & HV

- i. HV arc flash suit with protective hood (for protection of face and head) as specified for hazard risk category-4 in NFPA-70E or similar IS specification for working on HT switch gear (for all voltage >690 V) to the concerned licensed electrician or competent person.
- ii. LV arc flash jacket/FR as specified for hazard risk category-4 in NFPA-70E or similar IS specification having ATPV rating of 8.5 to 9 cal/cm² for working on LV (>260V and <=690V) to the concerned licensed electrician or competent person.



- iii. The LV arc flash jacket as shown above shall be worn continuously while working on LV (>260V and <=690V). The color specification of LV arc flash jacket should be blue.
- iv. Electrical hand gloves should have following specification: Flame resistance, arc flash and cut protection of voltage rating (>260V and <=690V).
- v. Electrical safety over shoe of relevant IS make for foot protection of licensed electrician or competent person while working in HV & LV line or equipment.

9. USE OF HAND TOOLS AND POWER-OPERATED TOOLS

a. General Provisions

- i. All hands and power tools and similar equipment, shall be maintained in safe condition.
- ii. When power operated tools are designed to accommodate guards, they shall be equipped
- iii. with such guards, when in use;
- iv. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains and other reciprocating, rotating or moving parts of the equipment shall be similarly guarded;
- v. Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazards;

- vi. All hand-held powered platen sanders, grinders, grinders with wheels of 5 cm or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks of 0.5 cm wide or less shall be equipped with only a positive on-off control.
- vii. All hand-held powered drills, tappers, fastener drivers, horizontal, vertical or angle grinders with wheels greater than 5 cm in diameter, disc sanders, belt sanders, reciprocating saws, saber saws and other operating powered tools shall be equipped with a momentary contact on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

b. Hand Tools

- i. The subcontractor shall not issue or permit the use of unsafe hand tools;
- ii. Wrenches including adjustable pipe end and socket wrenches shall not be used when saws are sprung to the point that slippage occurs;
- iii. Impact tools such as drift pins, wedges and chisels shall be kept free of mushroomed heads;
- iv. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight on the tools.

c. Power Operated Tools

- i. Electric power operated tools shall be either of the approved double-insulated type or shall be grounded;
- ii. The use of electric cords for hoisting or lowering loads shall not be permitted;
- iii. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming incidentally disconnected;
- iv. Safety clips or retainers shall be securely installed or maintained on pneumatic impact (percussion) tools to prevent attachments from being incidentally expelled;
- v. All pneumatically riveting machine staplers and other similar equipment provided with automatic fastener feed, which operate at more than 7 kg/cm² pressure at the tool a safety device on the muzzle to prevent the tool from ejecting the fasteners unless the muzzle is in contact with the work surface;
- vi. Compressed air shall not be used for cleaning purposes except when the pressure is reduced to less than 2 kg/cm² and that too with effective chip guarding. The 2 kg/cm² pressure requirement does not apply to concrete form, mill scale and similar cleaning purposes;
- vii. The manufacturer's safe operating for hoses, pipes, valves, filters and other fittings shall not be exceeded;
- viii. Only personnel who has been trained in the operation of the particular tool shall be allowed to operate power-actuated tools;
- ix. The tool shall be tested each day before loading to see that the safety devices are in proper working condition. The method of testing shall be accordance with the manufacturer's recommended procedure;
- x. Any tool found not in proper working order, or that which develops a defect during use, shall be immediately removed from service and not used until properly repaired;
- xi. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any other person. Hands shall be kept clear of the open barrel end;
- xii. Loaded tools shall not be left unattended;
- xiii. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface hardened steel, glass block, live rock, face brick or hollow tiles;

- xiv. Driving into materials that can be easily penetrated shall be avoided unless backed by a
- xv. substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;
- xvi. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;
- xvii. Only non-sparking tools shall be used in an explosive or flammable atmosphere;
- xviii. All tools shall be used with the correct shield, guard or attachment as recommended by the manufacturer.

d. Abrasive Wheels and Tools

- i. All grinding wheel must be ISO certified only.
- ii. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;
- iii. Grinding machines shall be equipped with suitable safety guards;
- iv. The maximum angular exposure of the grinding wheel periphery and sides shall not be more than 900, except that when the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 1200. In either case, the exposure shall begin not more than 8.650 above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the bursting of the wheel;
- v. Floor and bench-mounted grinders shall be work-rests, which shall be rigidly supported and readily adjustable. Such work-rests shall be kept at a distance not to exceed 5 mm from the surface of the wheel;
- vi. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;
- vii. When safety guards are required, they shall be mounted as to maintain proper alignment with the wheel and the guard and the guard and its fastening shall be adequate strength to retain the fragments of the wheel in case of incidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 1800;
- viii. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;
- ix. When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of incidental breakage, shall be used;
- x. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that they are free from cracks or defects;
- xi. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place;
- xii. All employees using abrasive wheels shall be protected by suitable eye protection equipment.

e. Wood Working Tools

- i. All fixed power-driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off-position;
- ii. The operating speed shall be attached or otherwise permanently marked on all circular saws over 0.5 m in diameter or operating at over 3000 peripheral rpm. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is re-tensioned for a different speed,

- the marking shall be corrected to show the new speed;
- iii. Automatic feeding devices shall be installed on machines wherever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points;
 - iv. All portable power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

10. START UP, COMMISSIONING AND TESTING:

There are various activities involved prior to commissioning- the major ones are -Hydraulic Test, Steam Blowing, Transformers Charging, Boiler Light Up, Rolling and Synchronisation and Full loading of unit.

- a. These activities shall be personally supervised by the site executive along with the commissioning engineer.
- b. Appropriate Work Permits shall be taken as applicable
- c. The readiness of upstream and downstream system shall be ensured before taking up.
- d. These shall be handled strictly by the authorized persons only and the team shall be suitably briefed about the activity including hazards & risks involved and control plan by the concerned executive-in-charge before start.
- e. Entry of persons to the area of activity shall be suitably restricted and the emergency functions like Ambulance, first aid center and Fire station shall be intimated about the plan well in advance.
- f. Tag-in/ Tag-out shall be in place while charging transformer and whenever necessary.
- g. Electricians with valid wiremen license only shall be permitted to work on power lines.
- h. The area and the passage shall be adequately illuminated.

11. FIRE SAFETY

- a. The Fire Prevention, Protection and Preparedness Program is an integral part of the overall HSE Program. Effort and consideration must be given to safety, life and potential for delays in construction schedules and plant startup, as well as protection of property on a given project. The purpose of which is to prevent
 - i. Inception of fire
 - ii. Loss of life or personal injury
 - iii. Loss of Property
 - iv. Interruption of operations
- b. Site-in-charge / Safety Officer will make periodical review of the site Fire Protection, Prevention Preparedness Programme, Site conditions and available fire protection equipment. It is very imperative that the Sub-contractors along with BHEL to establish good contact with Local fire station for availability of Fire tender in case of emergencies, in addition to their own fire equipment.
- c. Fire Protection, Prevention and Preparedness Inspections - The Contractor /Sub-Contractor will be required to make frequent fire prevention inspections of his work site and operating facilities. Deficiencies will be corrected at once.
- d. Area where Hot work activities are carried out (Gas cutting / Welding/ any other spark producing work)

- above a working spot, a GI / fire-resistant non-asbestos sheet or suitable material shall be placed to prevent the fall of hot sparks. A bucket of water shall be kept nearby while doing hot work
- e. Hot work shall be preferably carried out in a designated area with a standing Hot Work Permit, to be renewed monthly. The designated area shall have fire extinguishers.
 - f. Any hot work outside designated area shall require a Hot Work permit and fire watch. No flammable material shall be stored within 35 feet from any fire load.

12. PAINTING:

- a. Requirements provide a detailed procedure to be implemented by all concerned employees and sub-contractors involved in painting activities.
- b. Significant Environmental Hazards:
 - i. Chemical hazard due to inhalation of lead fumes (lead containing paint)
 - ii. Chemical hazard due to inhalation of VOC's from painting operations
 - iii. VOC's from painting and coating operation
 - iv. Disposal of paints and coats drums
- c. Control Procedure for Painting:
 - i. Chemical products used in painting and coating operation shall have proper MSDS sheet in place. Whenever any doubt arises with respect to handling and safety point of view it should be accessed to all concerned.
 - ii. Toxic substances and hazards relate the toxic chemicals shall be identified.
 - iii. Proper PPE shall be used including plastic gloves appropriate overall etc.,
 - iv. Arrangement for cleaning of spillage shall be ensured
- d. Only trained workers shall be allowed and proper training should be imparted to the works.
- e. Exposure limits of the toxic substances shall be checked before starting the work and nobody shall be allowed to carry the work beyond the permissible limit.
- f. Ventilation or exhaust facility shall be provided at place where painting and coating operations are carried out.
- g. Overalls shall be supplied by the contractors/subcontractors to the workmen and adequate facilities shall be provided to enable the painters to wash at the cessation of work.
- h. Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored.
- i. A caution board in national /regional language "**smoking strictly prohibited**" shall be displayed in the vicinity.
- j. Suitable fire extinguishers/sand buckets shall be kept available at places where flammable paints are stored, handled or used.
- k. In case of indoor painting or painting in confined spaces, exhaust ventilating shall be provided. If adequate ventilation is not provided a proper respirator shall be provided and used by persons who are trained and fit tested.
- l. The VOC's from painting and coating operations shall not exceed the permissible level of CPCB/ SPCB norms. The paints and coats must be selected as per the guidelines.
- m. Workers shall thoroughly wash their hands and feet before leaving the work.

13. "HAZARDOUS ENERGY" CONTROL PROCEDURE/ LOCKOUT/TAGOUT (LOTO)

Hazardous Energy Control Procedures, known as "Lockout/Tagout (LOTO)" refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.

Contractors must develop and submit a written LOTO program. This requires that a designated qualified individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance and that the authorized employee(s) either lock and tag the energy-isolating device(s) to prevent the release of hazardous energy and test the machine or equipment to verify that the energy has been isolated effectively.

a. Minimum Requirements:

The following are minimum requirements that must be included in the Contractor's LOTO program:

- i. Inspection of equipment by a trained individual who is thoroughly familiar with the equipment operation and associated hazards.
- ii. Identification and labeling of lockout devices. Purchase of locks, tags, and blocks. Development of a standard written operating procedure, permitted through a controlling authority that is followed by all workers.

b. General Requirements

The following steps must be taken to protect workers that install or service equipment and systems:

Follow the hazardous energy procedures and statutory regulations. Follow the manufacturer's service/repair instructions. Identify and label all sources of hazardous energy. Before beginning work, accomplish the following:

- i. De-energize all sources of hazardous energy:
- ii. Disconnect or shut down engines or motors.
- iii. De-energize electrical circuits.
- iv. Block fluid (gas or liquid) flow in hydraulic or pneumatic systems.
- v. Block or secure machine parts against motion.
- vi. Block or dissipate stored energy.
- vii. Discharge capacitors.
- viii. Release or block springs that are under compression or tension.
- ix. Vent fluids from pressure vessels, tanks, or accumulators—but never vent toxic, flammable, or explosive substances directly into the atmosphere.
- c. Lockout and tag out all forms of hazardous energy including electrical breaker panels, control valves, etc. Make sure that only one key exists for each of your assigned locks and that access to the key is controlled. Verify by test and/or observation that all energy sources are de-energized.
- d. After completion of the work, accomplish the following:
 - i. Inspect repair work before removing the lock and activating the equipment.
 - ii. Make sure that only the worker that installed the lock removes his/her assigned lock.
 - iii. Make sure that all workers are clear of danger points before re-energizing the system.

e. LOTO Procedure**PURPOSE AND SUMMARY**

This procedure provides the requirements and responsibilities of Hazardous Energy Control and the process for Lockout / Tag out (LOTO) of energy isolating devices (valves, circuit breakers, disconnect, etc.). Its use

shall ensure that machinery, equipment, or systems are isolated from all potentially hazardous energy to prevent unexpected energization, startup, or release of stored energy which may cause personnel injury or property damage.

This procedure applies to all BHEL personnel and subcontractors working on the WBPDC (1X660MW) STAGE-III projects where equipment must be taken out of service for the performance of work activities such as installation, maintenance, repair, construction, or equipment removal. The procedure may also be used to isolate equipment of which the energization or operation may present danger to personnel or property.

Lockout / tag out are not required for electrical equipment that can be unplugged from the source and the person performing the work has control of the plug.

This procedure shall be applied to prevent injury or damage caused by the unexpected release of active or stored energy. Hazardous energy sources could be in the form of the following:

- Electrical
- Hydraulic
- Chemical
- Thermal
- Mechanical
- Pneumatic

Preplanning of work activities includes the identification of all potential hazardous energy sources so that they may be properly controlled and isolated, locked, and tagged out.

Prior to initiating work activities on or around locked out / tagged out equipment, the equipment must be tested and tried by or in the presence of the person(s) performing the work activities.

RESPONSIBILITIES

- The Engineers in Charge is responsible for implementing and enforcing this procedure and approving lockouts /tag outs that impact the operation of the project.
- The Engineer in Charges responsible for authorizing Lockout /Tag out Requests.
- The Lockout / Tag out Coordinator is responsible for maintaining the Lockout / Tag out Log. Each shift should have a designated Lockout / Tag out Coordinator.
- The Isolator is responsible for determining the proper isolation devices and device positions required to isolate all potential energy sources so that the work stated on the Lockout /Tag out Request Permit may be safely performed. The Isolator must be familiar with the equipment and energy type(s) that require isolation. For this reason, in some cases the Isolator may be more than one person (i.e. Engineer, System Operator and/or Electrician). The Isolator shall position the specified device points, and apply locks and tags, and sign the tags and the LOTO Permit isolation point blocks.
- The Safety Manager is responsible for conducting an annual audit that is documented to ensure all procedures and requirements are current and being followed as written.

DEFINITIONS

Affected Employee: -

An employee whose job requires him/her to operate or use machinery or equipment on which servicing or maintenance is being performed under a lock out/tag out procedure or whose job requires him/her to work in an area in which servicing or maintenance is being performed under a lockout/tag out procedure

Authorized Employee: -

An employee who implements a lockout/tag out procedure on machinery, equipment, or systems in order that servicing or maintenance may be performed. Often an authorized employee and an affected employee may be the same person.

Danger “Do Not Operate” Tag

A tag used to identify energy isolation devices and specify the required position of the device. The tag should be affixed to the isolation device such that it is in plain view of anyone attempting to operate the device. The tags shall be sequentially numbered and shall specify the lockout/ tag out request number. The tag shall also state the purpose, and the expected duration of the lockout /tag out

Isolation Device

A device that is designed and intended to prevent the passage of energy. These devices, usually located at the energy source, are typically valves, circuit breakers, etc. Isolation devices should have a means of being locked in position

Lockout Device

A device that uses a positive physical means such as a lock, either key or combination type to maintain an energy isolation device in the safe position and prevent the inadvertent energization of machinery, equipment, or systems. Device locks should serve no other purpose other than hazardous energy control isolation

Lockout Tag out Request Permit

A pre-numbered form used to request that machinery, equipment or systems be taken out of service. A Lockout/Tagout Request Permit may be initiated by any one requiring energy isolation for work activities or for taking faulty equipment out of service

Lockout / Tag out Request Log

A record of all Lockout /Tag out Request Permits shall be maintained by the Lockout /Tag out Coordinator.

PROCEDURE

1. REQUESTING A LOCKOUT / TAGOUT PERMIT

When machinery, equipment, or systems are partially or completely taken out of service for work activities or equipment protection, a lockout / tag out shall be requested. The requestor shall be familiar with scope of work required and shall provide a brief description of the work on the Lockout / Tag out Request Permit. The requestor shall also provide the proposed start time and estimated duration of lockout / tag out. If familiar with the machinery, equipment, or system to be taken out of service, the requestor may identify the devices that are required to be isolated. The LOTO Request Permit shall be forwarded to the Authorized Lockout / Tag out Coordinator for reviewed and signature, along with Permit to Work number to be entered on the LOTO Request Permit.

- a. The Lockout / Tag out Coordinator shall record the necessary information on the Lockout / Tag out Request Log and forward the request to the Engineer in Charge for approval.
- b. The Safety Manager or Engineer in Charge shall review the Lockout / Tagout Request Permit for impact on project operations. Project operations could be impacted by the equipment being taken out of service or by the required isolation to take the equipment out of service. If project operations are impacted by the Lockout / Tagout, the request shall be forwarded to the Engineer in Charge for approval.
- c. The Engineer in Charge shall provide the lockout / tag out isolation points necessary to perform the task stated on the request. The device identification, device location, device position, and locking mechanism

shall be entered into the appropriate blocks on the Lockout / Tag out Request Permit.

- d. The Engineer in Charge indicates approval of the Lockout / Tagout Request Permit by signing in the appropriate space on the request. If the Lockout /Tag out Request Permit is rejected, the Engineer in Charge shall return it to the requestor, via the Lockout / Tagout Coordinator with a written explanation of the rejection.
- e. Once approved, the Lockout / Tag out Request Permit shall be forwarded to the Lockout / Tag out Coordinator to assign tags and locks.
- f. The log shall show current status of all Lockout / Tag out Request Permits from submittal to approval, through lifting of locks and tags to final closeout. The log shall be maintained by the Lockout / Tag out Coordinator in their office.

2. PLACEMENT OF LOCKS AND TAGS

- a. The tags shall be filled out to match the information on the LOTO Request Permit. Appropriate locks for the types of isolation devices specified shall be collected and placed with the tags and the Lockout / Tag out Request Permit.
- b. The isolator(s) shall take the device locks, tags, and the Lockout / Tagout Request Permit to position the specified isolation devices, sign and hang the tags, and place the locks. If the isolator does not agree with or understand the Lockout / Tagout Request Permit, or has a problem performing the isolation, the problem should be brought to the attention of the Safety Representative or Area Supervisor immediately and the lockout / tag out should be postponed until the situation is resolved.
- c. Once the Isolator has placed all “locks” on isolation points, they will “test ”and “try” the machinery, equipment, or system to ensure all hazardous energy has been completely removed and the isolation is one totally accomplished, and has initialed and signed the Lockout /Tag out Request Permit indicating all isolation points have been confirmed. Examples of “lock”, “test” and “try”:
 - by checking that all locks on the LOTO Request Permit have been applied and are in the specified position open/closed, on/off, etc.; metering test of electrical circuits, opening of drain valves, checking pressure gauges or indicators; and try by pushing start buttons and on/off switches, etc.
 - Testing shall be performed by person(s) knowledgeable of the energy source(s) being isolated (e.g., an electrician should meter electrical circuits).
- d. A copy of the completed Lockout /Tag out Request Permit shall remain with the Work Package and used as part of the daily Pre-Job Briefings

3. WORKING UNDER A LOCKOUT / TAGOUT REQUEST

- a. Prior to starting the work activity, the person(s) performing the work shall review the Lockout / Tag out Request Permit and place the necessary tags and personal locks on the identified isolation devices. Personal locks may be placed only on devices that have already been locked and tagged in accordance with the Lockout / Tag out Request Permit.
 - All personal locks shall be accompanied by a tag that is signed and dated by the worker(s) and specifies the work activity being performed.
 - Personal locks should be of a different color than device locks for ready identification.
- b. Verification of the effectiveness of the isolation by the Isolator shall be performed for Worker’s working under the lockout / tag out, by demonstrating the checks on “lock”, “test” and “try”,
- c. When the work activity is finished, personal locks and tags shall be removed and the Safety Representative

shall be notified that the Lockout / Tagout is no longer required. If work under a lockout / tag out is to be delayed or interrupted for a period in excess of 24 hours, personal locks shall be removed until the work restarts. Personal locks shall be removed prior to the worker(s) leaving the project at the end of shift unless the key(s) are maintained at the project.

4. REMOVAL OF LOCKS AND TAGS

- a. When the lockout / tag out is no longer required, the Safety Representative or Area Supervisor shall obtain the Lockout / Tagout Request Permit from the work package for LOTO removal. Prior to removing locks or tags that may allow equipment to be energized, a check shall be made to verify that the equipment is free to safely operate (i.e., will not cause damage or injury). The locks and tags shall be removed and returned to the Lockout / Tagout Coordinator. Isolation devices may be repositioned at the discretion of the Engineer in Charge according to operational requirements. The Isolator shall complete the Lockout / Tagout Request Permit indicating each lock and tag has been removed and the Safety Representative or Area Supervisor forward to the Lockout / Tagout Coordinator.
- b. The Lockout / Tagout Coordinator shall discard the tags and maintain the completed Lockout / Tagout Request Permit for future reference.
- c. In the event that an employee leaves the job site without removing the personal lock I tag, the following measures shall be taken and documented. The measures listed below are a minimum set of guidelines and under all circumstances, refer to the site-specific safe work plan for detailed procedures:
 - Attempt calling / contacting the employee to return to the site for removal.
 - In the event an employee cannot be contacted, the Site Manager and Safety Manager shall sign an Emergency Lockout/Tagout Removal Form, which has been completed by the Area Supervisor.
 - Employee shall be notified upon returning to the site, prior to beginning any work.

5. INTERRUPTION OF A LOCKOUT / TAGOUT

Operational Emergency

The Engineer in Charge / Safety Manager /Area Supervisor may deem it necessary to temporarily remove the locks and tags from isolation devices, prior to the end of the work activity. The standard procedure for removal of locks and tags shall be followed. Extreme caution shall be taken by the Isolator removing the locks and tags to prevent personnel injury.

Testing

When the performance of a work activity requires the functional testing of a machine, component, or system, the locks and tags may be temporarily removed in accordance with the tag removal, to perform the test. As a result of the testing, if it is determined that the equipment needs further work, the locks and tags shall be positioned back on to the device. If it is not necessary to replace all the locks and tags, then the unnecessary locks and tags may be returned to the Lockout / Tagout Coordinator. The Engineer in Charge shall initial the Lockout / Tag out Request Permit in the removal block to indicate that these locks and tags have been removed. When testing has been satisfactorily completed, the locks and tags shall be removed.

ISOLATION DEVICES

- In most industrial applications, there are isolation devices that were not designed to accommodate a locking device. In these instances, an acceptable alternative that physically obstructs or prevents the use of the isolation device shall be found. Chains shall be placed on valves or electrical panels. Wires shall be determinate, pulled back, taped, and secured.

- If an isolation device does not accept a lock, a tag only is acceptable; however, all possible precautions shall be undertaken to provide a level of safety for the workers. The tag shall be readily visible to anyone attempting to operate the device.
- If more than one Lockout / Tagout Request Permit requires that a single isolation device be locked and tagged, a lock and tag for each request shall be placed. Each lock in itself prevents the inadvertent operation of the device.

GROUP / COMPLEX LOCKOUT

In a multiple lockout / tag out procedure, each person working on the machinery or equipment must place a lock or tag on the energy isolating device. If the energy isolating device will not accept multiple locks or tags, a hasp (a multiple lockout device, may be used. The locks or tags must be placed in such a way that energy cannot be restored to the machinery or equipment until every lock or tag is removed. As each employee involved no longer needs to maintain lockout / tag out protection that employee removes his - her lock and/or tag. The employee attaching the lock or tag is the only person authorized to remove the lock or tag.

6. TRAINING

The training must include recognition of hazardous energy source, type and magnitude of energy available, methods and means necessary for energy isolation and control. Each authorized employee shall receive adequate training. The training should address that all affected employees are instructed in the purpose and use of the energy control procedure. There should be training provisions included for any other employee whose work operations are or may be in an area where energy control procedures may be utilized. The employee training should also address when tag out systems are used including the limitations of a tag (tags are warning devices and do not provide physical restraint). The training should also include that a tag is not to be removed without authorization. The tag is never to be ignored or defeated in any way. Retraining is required when there is a change in job assignments, in machines, a change in the energy control procedures, or a new hazard is introduced. All training and I or retraining must be documented with employee's name and dates of training.

7. PROGRAM REVIEW

The lockout / tag out program must be reviewed at least annually. The review must ensure that procedures are being followed and that they are effective. A documented review of the inspection must include the date, the equipment, employees involved & the inspector. The inspector must be someone other than those actually using the lockout / tag out in progress.

ATTACHMENTS

#1. Danger (DO NOT OPERATE) Tags



#2. Device & Personal Locks and Multi Lock Hasp:



#3. Lockout / Tagout Request Permit

		LOCKOUT / TAGOUT REQUEST PERMIT			LOTO Request Permit No.: _____ Work Permit No.: _____		
		Equip. Out of Service: _____	LOTO Date Required by: _____ / _____ / _____	Estimated Duration: _____	LOTO Requested Date: _____		
Scope of Work: _____				LOTO Authorization Signed by: _____ Date: _____			
				LOTO Removal Authorization Signed by: _____ Date: _____ Time: _____			
Tag No.	Device to be Tagged / Locked I.D. No.	Device Location	Device Position <i>OPEN / CLOSE / D -</i>	Lock No.	Tag/Lock Placed by Print/Sign - Date/Time	Tag /Lock Removed by Print/Sign - Date/Time	
Comments Instructions: Attachment 3.Lockout / Tag out Request Permit:							

#4. Lockout / Tag out Request Log

LOTO Permit No.	Request or Name	Equipment & Location	Est. Work Completed Date	Approval Date	LOTO Placed Date	LOTO Removed Date	Comments

14. RISK ASSESSMENT

Risk and Hazard Analysis

In order to produce an overall Project EHS Plan, a project must be assessed for its risks. There are two components to the risk and hazard analysis. The procedure used to examine and plan for the identified risks and hazards is called a General Hazard and Risk Assessment.

JSA/HIRA review

Prior to commence the following activities Method statement and JSA/HIRA to be prepared by the concern engineer in coordination with EHS officer and submit to the client for review and approval. After getting approval the work will be started under PTW after clearance. For HIRA and criteria for the defining the high, medium & low risk the relevant annexure be referred. In case any deviations required in the approved method statement the concerned engineer/supervisor has to prepare additional HIRA/JSA to cover the new activities and associated risk. Following activities to be covered,

- Deep excavation (more than 5 feet)
- Significant concrete pouring (like heavy foundation, TG deck, Slab casting etc.)
- Confined entry
- Blasting
- Working on electrical/ energized equipment's
- Steel erection more than 5-Ton weight
- Working at height prior to completion of stairs/ladders/hand railing etc.

Definition:

HAZARD - Any potential or present danger to persons or property within the project site, e.g., oil on the floor is a hazard.

INCIDENT - An unintended happening that may result in injury, loss or damage, e.g., Slipping on the oil is an Incident.

INJURY – Physical harm, the result of an Incident, e.g., a sprained wrist from the fall would be an injury.

Hazard Analysis Document

- For high risk and dangerous work identified, the Applicant shall complete and submit a Hazard Analysis Document together with the PTW request. It will be a JSA (Job Safety Analysis) or Preliminary Hazard Analysis Checklist. And it shall be reviewed and approved by respective Construction and HSE Representatives.
- Issues such as work interface, coordination, drawings, toolbox meetings and work type/duration shall be detailed and included with supporting documentation for the Applicant's request for PTW.
- If applicable, Hazard Analysis Document shall be used as the foundation for development of Safe Work Method Statement. Each hazard identified shall be addressed in the Safe Work Method Statement and be submitted as part of the Applicant's submittal package.

Evaluation of Sub-contractor Risk Assessments includes

- Experience and expertise in performing similar type work.
- Duration of work performed
- Location of the work to be performed.

- Nature of the work to be performed.
- Potential for a subcontractor performing the work to expose themselves, other persons or employees, to hazards.
- Potential for exposure to work site hazards.

Review of Subcontractor specific issues

Preventive and protective measures must be introduced according to the following order of priority

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc.
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

15. HSE PREPAREDNESS FOR ADVERSE CLIMATES AND WEATHER

All Preventive and Precautionary measures to ensure Health & Safety of workers in all possible adverse weather conditions based on the analysis of the local area conditions to be taken by the subcontractor

15.1 SUMMER

1. The Working Time and Lunch Hour will be as per instruction of Statutory Authorities (no work between 11am to 3:30pm). However, in case temp comes down due to rain/cloudy weather work will continue as per normal routine.
2. During long lunch break, worker will be allowed to go back home for rest. Those who will like to stay back will avail at the facility of rest shed or other designed area.
3. They will be allowed to take small break during work as per their need.
4. Water sprinkling will be done on roads to reduce dust concentration.
5. Workers will be provided with adequate cool drinking water and Butter milk/Lemon water etc.
6. Adequate ORS stock will be made available at the work location in the First-Aid Box for use as needed and at First-aid Centre for emergency need.
7. Fire prevention shall be on high alert, with removal of dry grass and bushes, etc, inside and outside the surrounding work areas. No smoking, and control of open flame/sparks shall be maintained and monitored.
8. Worker will be informed about the Do's and Don'ts to be followed during summer in the Pre Job Brief.

Dos & Don'ts

1. Drink plenty of cool water and other non-alcoholic fluid and keep body well hydrated.
2. Eat salt in food to replenish loss of salt through sweating.
3. Avoid over physical exercise.
4. Have adequate sleep at night.
5. Eat light and less spicy food
6. Avoid eating food which was cooked long time ago.

7. Nobody should use small water bodies such as pits, running rain water through crevices etc. for drinking and cleaning purpose as it may be unhygienic.

Emergency Handling

In case of emergency due to heat disorder:

1. Rescue the victim from workplace and place under shed.
2. If to be rescued from height, use stoke basket or rescue kit.
3. Inform Ambulance immediately.
4. If nearby any air conditioned room/shed is available, place him inside the room/shed.
5. Administer First aid by trained First aider for Heat Disorder
6. If conscious, give him ORS solution to drink.
7. If required send the victim hospital immediately.

15.2 MONSOON**A. Height Work & Structural Safety:**

1. Ensure that all height work platforms are barricaded and avoid any highly hazardous
2. Height work.
3. Ensure that all personnel have good quality and intact safety shoes
4. Stop all dangerous height work during rain
5. Explain Do's and Don'ts to workers during Tool Box Meetings
6. Ensure that there are no weak structures, boards etc. that can fall during high winds
7. Do not allow any loose material (e.g. GI sheet, Ply board, empty cement bag, aluminium foil, foam sheets etc.) on roof sheds or top of structures.
8. Do not permit any one to ride up or come down scaffolds frame work during heavy wind or rain.
9. Provide "anchor" of adequate strength to scaffolds and other high-rise structures.
10. All rest sheds and GI sheds will be anchored into the round and wall and roof panels will be secured with J hook to prevent shed from blowing over or parts/pieces becoming airborne. Proper earthing per IS standard is also to be installed.
11. Do not go alone nor permit anyone to stay at tower-tops, roof-tops, high structures or on electrical poles during the course of stormy weather or heavy rain.

B. Electrical:

1. All electrical connections / loads have to be routed through ELCB / RCCB (residual current circuit breaker) whose rating should be 30mA.
2. RCCB operational checks need to be done DAILY / WEEKLY during monsoon season.
3. Avoid joints on power cables which need to be laid over-head or under-ground, better not to have any joint at all. In case joints become essential, such cables must be housed rigidly and insulation must be provided as per approved standard. The joint shall be suitable for outdoor use.
4. All electrical distribution board shall be properly covered at top and sides to protect from rain water. Extension boards shall be protected from rain water.
5. Ensure proper "earthing" for each and every electrical appliance.
6. Double earthing need to be provided for 3-phase power supply and for voltage more than 220V.

7. Provide lightening arrestors at the top of Boiler 3 and boiler 4 and rest sheds which are not covered by existing lightening arrestor of other installation.

C. Others:

1. Maintain smooth flow on open drains. i.e. no obstruction or blockade shall be made on storm water drains. If required, make temporary drains.
2. Arrange back-filling of excavated pits on war-footing basis.
3. Arrange bringing down booms of all cranes, hydra machines during stormy weather (wind speed 40-50 km/hr)
4. Confirm that all gantry cranes are effectively choked to prevent rolling and toppling.
5. Do not forget to deep ready a dew battery operated lights at site-offices during rainy season.
6. Avoid using wet damp clothes.
7. Hard Barricade excavated zone filled with water with scaffolding pipe & clamp with reflective net
8. Engage diesel operated water pump to dewater work area. For electrically operated water pump, the starter shall be protected from rain water. All rotating parts shall be guarded. Ensure availability of sufficient water pumps.

D. Health and hygiene:

1. Monsoon reduces the immunity of our body and makes us vulnerable to many diseases which are commonly associated with this season. It is time for us to keep our body challenging against disease by boosting our immunity and taking safety measures against these diseases.
2. The diseases associated with monsoon are Malaria, Jaundice, Gastro-intestinal infections, like typhoid, cholera etc. apart from these viral infections like cold and cough also make their presence felt. Majority of above said diseases are on account of:
3. Puddle of water formed due to rain become breeding grounds for mosquitoes which spread disease like, malaria and dengue fever. As a precautionary measure against mosquito-bite disease one can use mosquito net around the end which is better choice to mosquito repellents like mats and coils.
4. Pollution of drinking water during monsoon is very common. It is very necessary to drink clean and pure water when water-borne monsoon diseases like diarrhoea and gastro-intestinal infections threaten us.
5. Walking in dirty water during rainy season leads of numerous fungal infection which affect toes and nails. Diabetic patients have to take a special care about their feet. Keeping feet always dry and clean is very necessary. Avoid walking in dirty water. Keep shoes socks and raincoats dry and clean.

E. Workmen will be made aware of following Do's and Don'ts:

1. Do not sleep in daytime.
2. Avoid over physical exertion.
3. During lightning and thunder storm, do not take shelter under tree. Take shelter inside rest shed or store room.
4. Wash vegetables with clean water and steam them well to kill germs.
5. Avoid eating un-cooked foods and salads should be washed properly before consumption.
6. Drink plenty of water and keep body well-hydrated.
7. Always keep the surrounding area dry and clean. Don't allow to get water accumulated around.
8. Keep body warm as viruses attack immediately when body temperature goes down.

9. Do not enter air conditioned room with wet hair and damp cloths.
10. Dry your feet and webs with soft dry cloth whenever they are wet.
11. Eat light and less spicy food.
12. Avoid eating food which was cooked long time ago.
13. Eat salt in food to replenish loss of salt through sweating.

15.3 EMERGENCY WEATHER CONDITIONS

Cyclone/Severe thunder storm

In the event of Cyclone/Severe thunder storm, alert will be issued by subcontractor on notification received by Govt. authorities/Metrological departments Customer or BHEL.

The actions required during cyclone/rough weather:

1. Check and advice subcontractors to clean-up work area. Pick up all loose and unused material of respective supervisor's area.
2. Tie to secure all gas cylinders to avoid displacement and unsafe conditions which could be due to wind pressure.
3. Secure portable electricity generating sets and other equipment, pumps, hoses etc.
4. Make preparation for removal of water logging.
5. Take review of work activity and make preparation for removal of equipment and material from vulnerable areas.
6. Isolate/turn off all electrical power form the main panel/switches. Secure and anchor panels properly.
7. Recheck anchorage/tie of all temporary structures/sheds, tall objects, cranes, rigs, scaffolds etc. to avoid toppling due to wind force.
8. Cranes boom shall be secured, either locked or lowered the booms as reasonably and practicably possible and rigs to safe position for the safety point of view.
9. Group up all trash barrels, wooden pallets, forms; wooden decks etc. and anchor properly.
10. Welding machines, air compressors and such equipment are to be grouped together and secured to the stable objects. Welding leads, electrical cables, hoses are to be rolled up and secured properly.
11. Set on site vehicles on high ground in the site area with brakes set firmly.
12. Anchor all tanks, vessels, gas cylinders that may be moved by high wind and water.
13. Evacuate job site.

Personnel Evacuation:

1. Personnel Evacuation will be required if predicted wind speed and storm surge heights are beyond acceptable limits as per the instructions from Govt. Authorities/ Metrological departments or Customer.
2. Once the warning is received for personnel evacuation, an emergency response team shall be formed. The team will work with local authorities and other agencies formed/deployed to evacuate and transport all personnel involved in the project to the cyclone shelter.
3. Cyclone may be followed by the calm "EYE", be aware of it. If the wind suddenly drops, don't assume the cyclone is over. Violent wind may resume from the opposite side direction. Wait for the official "All clear Signal".

4. After the cyclone, do not go outside until officially communicated about safe situation outside. Use recommended routes for returning. Do not panic or rush while returning.
5. Checking of gas leaks and well-being of electrical appliances is essential before leaving the site.
6. Follow local communications for official warning and advice. The construction Manager shall also obtain updates from customer/metrological departments and communicate to the personnel on project site.

15.4 PREVENTION OF COVID-19 (COVID-19 HERE TO BE READ AS COVID-19 AND OTHER PANDEMICS/ COMMUNICABLE DISEASES) AT PROJECT SITE & LABOUR COLONY:

Resumption of Construction Activities after Lock Down and Prevention of Coronavirus Infection during Site Operations and OCP 61A: Prevention of COVID-19 Infection in Labor Colony will be strictly followed.

A. Preventive measures at project site:

- BHEL and Agencies shall nominate COVID Marshalls, who will be responsible for monitoring the COVID prevention measures and apprising management on the same.
- Mandatory health check-up for every worker/ official joining the site
- All activities to be carried out using least amount of paperwork and physical proximity as far as possible.
- **HSE Observer App** to be used to monitor HSE Activities and follow up with agencies for closure of non-conformities.

a. Strict Control at the Gate/ Banning Entry to Anyone Not Wearing Masks

- i. Security personnel at the gate may erect a barricade preferably approx. 10 meters from the gate and only allow personnel who are wearing proper masks inside.
- ii. Public address system may be used to warn any non-compliant visitors
- iii. Near entry gate, round markers at minimum 1-meter distance to be ensured so that distancing is ensured
- iv. A hand-wash or hand sanitiser facility is preferable at the gate to allow entry after hand wash or hand sanitisation. These are also to be provided at key locations to enable hand wash / hand sanitisation before starting work, before eating, etc.
- v. Gutkha, Paan, tobacco etc. to be banned from the site. Spitting to be strictly prohibited.

b. Screening at Gate with Contactless Thermometer & Action on Suspected Cases

- i. Security Personnel at the Gate to screen each person entering the premises using a non-contact infrared thermometer, which is duly serial numbered and calibrated.
 - ii. In case any site worker/ official is found to have fever more than 99 Degrees Fahrenheit or found coughing/ sneezing, he/she may be advised rest till recovery and entry to be permitted after obtaining clearance from medical officer/assistance/attendants.
- Parcel to be collected from gate by concerned person preferably with provision of Special Box
 - Any construction material received at site, unless properly sanitized, to be kept undisturbed for at least 3 days and to be used only after that period.
 - During Toolbox Talks, minimum 1-meter distance between any two workers to be ensured

c. During site execution activities:

For all site execution activities, social distancing is to be maintained. In case this is not possible due to nature of work, speciality of work, etc, ensure sensitisation of the labour/staff involved and use of appropriate PPEs, especially mandatory face mask. In any case, close working to be allowed only in special

circumstances and ensuring these activities are preferably time staggered to the extent possible

d. In office premises:

- i. Sharing of items like pens, water bottles etc. in office premises to be avoided
- ii. Doors preferably to be in open condition to avoid contact
- iii. All common touch points to be frequently disinfected in a day.

e. Regular disinfection of all Areas, Equipment and facilities

- i. A dedicated disinfectant gang to be identified for the task by each agency. The disinfectant gang to be provided full body suits for the task.
- ii. All areas (including office premises, site areas, chairs, tables, furniture etc.), tools & equipment to preferably be disinfected by dedicated gang every day before resumption of work.
- iv. Common touch points like handrails, lift buttons, door/window knobs or handles, vehicle door handles, taps, conference room & dining hall tables/chairs, common sofas/chairs, visitor sofa/chairs, files & folders, etc to preferably be disinfected regularly at frequent intervals every day.
- v. Pool vehicles, to be disinfected after every use. Social distancing to be maintained inside the common pool vehicles as per Govt./ statutory body guidelines.

f. Disinfecting the operator/driver touch points of Vehicles/cranes, T&Ps etc.

Disinfection to also be carried out for all Cranes, Vehicles, Equipment, consoles, T&Ps etc. which come into contact with operating personnel.

g. Posters on COVID-19

Sufficient Posters on COVID-19 to be ensured across the site in languages understood by most workers.

h. Brief guidelines for hand washing are as below:

- i. Soap to be provided at each wash basin and replenished regularly.
- ii. Washing with soap for at least 20 seconds is recommended.
- iii. As a general guideline, for every 100 workers, 1 wash-basin may be provided at site areas.
- iv. Close queue to be avoided near wash-basins and 1-meter distance to be maintained. Round markers at 1-meter distance can be ensured as guidance

Composition of Disinfectant:

- i. Readily available 1% hypochlorite solution or 4%
- ii. Liquid chlorine-1% solution
- lii. Surgical spirit-95% alcohol content
- iv. Hand sanitizer should have: Isopropyl alcohol-75%, Glycerol-1.45%, Hydrogen Peroxide-0.125%

B. Prevention of COVID-19 Infection in Labor Colony:

- Spacing of minimum 2 meters between living areas of workers inside a room may be maintained. Preferably, the living area of each worker may be partitioned using sheet of cloth, plastic etc.
- Rooms to be properly ventilated as far as possible
- Sanitation to be given prime importance and personal hygiene to be promoted
- Face masks shall be worn by everyone inside the colony premises
- Spitting of Pan. Gutkha etc. inside the colony and urinating etc. outside the toilets to be strictly avoided
- Regular visits by Doctors to the labor colony can be arranged on non-working day for check-up of all workers
- **Identification of "COVID Wardens" (CWs) by each agency for maintaining the following:**
 - i. Keeping an eye on the health of workers and report any suspected cases of fever, coughing etc. to the

management

- ii. Keeping an eye on the social distancing measures in the labor colony and report any non-conformances to the management.
 - iii. Educate the workers about social distancing and COVID prevention measures.
- Training/ Awareness regarding COVID-19 to be provided to workers regularly.
 - Workers to be instructed to maintain social distancing of minimum 1 m at all time
 - **Posters on COVID-19:** Sufficient Posters on COVID-19 to be ensured across the labor colony in languages understood by most workers.
 - All workers to be instructed to inform any suspected cases of illness (individual or others) to an emergency contact number of CW, the emergency contact numbers and CW contact numbers to be displayed at prominent locations
 - **Inspection & Review**
 - i. Daily Inspection by concerned COVID Wardens and reporting to Agency
 - ii. Regular inspection by Agency & BHEL

15.5 Noise Mitigation

High noise is harmful to the human health and it can cause impairment if exposed for long duration at regular intervals, and also cause disruption in nearby communities.

- Noise monitoring shall be carried out in all construction locations periodically.
- Use of silent DG is allowed at site during construction.
- Low noise generation equipment's to be preferred.
- Work areas where noise levels exceed the 85db shall be posted as hearing protection required.
- Use of PPEs / ear plug/ear muff for personnel entering into high noise area.
- Activities generation High noise will be planned in day shift.

Noise Level Chart

Parameter	Night Noise level dBA	Daytime Noise Level dBA
At 1-meter from each piece of equipment	85	85
At Property boundary	70	70



ANNEXURE J

First-Aid Box

Details & Contents of First Aid Box as per Contract Labor (Regulation & Abolition Act), Central Rules, 1971

- (1) The first-aid box shall be distinctively marked with a Red Cross on a white background and shall contain the following items, namely:

(a) For establishments in which the number of contract labor employed does not exceed fifty, each first aid box shall contain the following equipment:

(i)	6 small sterilized dressings
(ii)	3 medium size sterilized dressings
(iii)	3 large size sterilized dressings
(iv)	6 pieces of sterilized eye pads in separate sealed packets.
(v)	6 roller bandages 10 cm wide.
(vi)	6 roller bandages 5 cm wide.
(vii)	One tourniquet
(viii)	A supply of suitable splints
(ix)	Three packets of safety pins.
(x)	Kidney tray.
(xi)	3 large sterilized burn dressings.
(xii)	1 (30ml) bottle containing a two percent alcoholic solution of iodine
(xiii)	1 (30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label
(xiv)	1 snake bite lancet
(xv)	1 (30gms) bottle of potassium permanganate crystals.
(xvi)	1 pair scissors
(xvii)	1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labor Institutes, Government of India.
(xviii)	A bottle containing 100 tablets (each of 5 grains) of aspirin
(xix)	Ointment for burns
(xx)	A bottle of suitable surgical anti-septic solution

(b) For establishment in which the number of contract labor exceeds fifty each first-aid box shall contain the following equipment:

(i)	12 small sterilized dressings
(ii)	6 medium size sterilized dressings
(iii)	6 large size sterilized dressings.
(iv)	6 large size sterilized burn dressings
(v)	6 (15 grams) packets sterilized cotton wool
(vi)	12 pieces of sterilized eye pads in separate sealed packets.
(vii)	12 roller bandages 10 cm wide.
(viii)	12 roller bandages 5 cm wide.
(ix)	One tourniquet.
(x)	A supply of suitable splints.
(xi)	Three packets of safety pins.
(xii)	Kidney tray.
(xiii)	Sufficient number of eye washes bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times.
(xiv)	4 per cent Xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops.
(xv)	1 (60ml) bottle containing a two percent alcoholic solution of iodine
(xvi)	One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water.
(xvii)	1 (120ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
(xviii)	1 roll of adhesive plaster (6 cmX1 meter)
(xix)	2 rolls of adhesive plaster (2 cmX1 meter)
(xx)	A snake bite lancet.
(xxi)	1 (30 grams) bottle of potassium permanganate crystals.
(xxii)	1 pair scissors
(xxiii)	1 copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labor Institutes, Government of India.
(xxiv)	a bottle containing 100 tablets (each of 5 grains) of aspirin
(xxv)	Ointment for burns
(xxvi)	A bottle of a suitable surgical anti septic solution.

- (2) Adequate arrangement shall be made for immediate recoupment of the equipment when necessary.



ANNEXURE K

Vertigo Test

Vertigo Test Procedure/ Guidelines

This document specifies minimum requirements for vertigo test. These may be supplemented by any additional requirements deemed fit by the medical examiner/ HSE department)

Fear of height may be physiological or psychological. Therefore, to rule out any possibility of physiological factor, detailed medical check-up of workers is carried out before vertigo test. Medical check-up of workers includes the following:

history of past illnesses (like epilepsy, drug allergy, diabetics/ hypertension, unconsciousness etc.), general physical examination (like height, weight, BMI, build and nourishment etc.), measurement of pulse rate, Blood Pressure, respiratory rate.

After this check-up, those who are found suitable for height work by examining doctor, are allowed to undergo vertigo test.

During this health check-up, psychology of workers is also studied. If any worker finds it extremely difficult/ frightening to climb the monkey ladder & walk on the beam, during/after performing vertigo test or even before performing, then he is treated as disqualified.

As per standard, during vertigo test, worker is allowed to climb on a foundation through monkey ladder, walk on a beam, then steps down at the other end of beam, through monkey ladder. Height of the beam should be at least six feet from ground level. All necessary safety precautions are taken during this test. Worker has to wear full body harness with double lanyard. A horizontal lifeline is run parallel to the beam and worker has to put his lanyards into the lifeline. Additionally, a safety net is also put below the beam for rescue of the victim in case of a fall from beam.

Following activities are suggested to be carried out during testing:

1. Walking Bench Training:

- a. Person should walk over the channel. He should maintain balance & walk without much problem.
- b. If the person has problem to balances himself on repeated chances, he may be having flat foot or some other problem. So, he may not be fit for height work.

2. Rope Climb Training:

Person should be able to climb the rope up to the top channel for ensuring that in case of fall, a person hanging on the safety harness, will be able to safely climb back to the platform within minimum time period before the safety harness start breaking down under the load.

3. Height Work Training:

Person should walk freely on the middle channel while holding the top channel with the help of safety harness.

4. Ladder for Vertical fall arrestor Training:

Vertical fall arrestor rope is fixed from top to bottom of the ladder. It will ensure:

- Usage of vertical fall arrestor.
- Usage of two lanyards of a safety harness.
- Ensure 3-point contact on the ladder while climb.

5. Chair for work at height Training:

- Climb through vertical ladder with two lanyard ropes.
- Hooking of two lanyard ropes to life line. With this safe arrangement, he can walk to chair.
- Sits in the chair safely, comes out & walks back to the vertical ladder & come down from vertical ladder. After completion of vertigo test, blood pressure of worker is again measured. If it is not within acceptable limits for any worker, concerned worker is denied height pass.

Only those who pass the above training are to be considered as fit for height work.

Annexure**C1**

Date: 29/08/2025

**REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS**

SL NO.	ITEM DESCRIPTION	USEFUL LIFE (IN YRS)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (WITHIN USEFUL LIFE)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (BEYOND USEFUL LIFE)
I.	CRANES :-			
1	Portal Gantry Crane 500T	15	26040.00	26020.00
2	100MT Crawler Crane ZOOMLION CRANE-QUY-100	10	11470.00	11460.00
3	Heavy Lift Crawler Crane 600MT Class DEMAG Model CC2800	15	56920.00	56880.00
4	PORTAL CRANE, 360T	15	14230.00	14220.00
5	600MT Class Crawler Crane- Manitowoc Model 18000-UPGRADED	15	56070.00	56030.00
6	600MT Class Crawler Crane- Liebherr Model LR1600-2 (Upgraded)	15	69370.00	69320.00
7	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH RINGER)	15	33880.00	33850.00
8	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH-OUT RINGER)	15	21170.00	21160.00
9	MANITOWOC M-250T TRUCK CRANE	15	30490.00	30470.00
10	270 MT Class Crawler Crane- Manitowoc Model 2250	15	32010.00	31990.00
11	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1	15	26680.00	26660.00
11.A	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1 (UPGRADED)	15	36740.00	36710.00
12	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2	15	15290.00	15280.00
12.A	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2 (UPGRADED)	15	19180.00	19170.00
13	LINKBELT LS- 248H CRAWLER CRANE (180T)	15	16940.00	16920.00
14	MANITOWAC MODEL 888 CRAWLER CRANE (200 MT)	15	22020.00	22000.00
15	CRAWLER CRANE SUMITOMO, 150T	15	11010.00	11000.00
16	All Terrain Crane, 150MT- Liebherr Model LTM1150	15	13550.00	13540.00
17	CRAWLER CRANE, 120 T Fushun Model QUY120	10	10920.00	10920.00
18.A	CRAWLER CRANE 135MT Kobelco Model CK1350- 1F	15	10840.00	10830.00
18.B	CRAWLER CRANE 135MT Kobelco Model CK1350	15	8970.00	8970.00
19	CRAWLER CRANE 120MT - Tata-Sumitomo Model SCX1200-2	15	10160.00	10150.00
20	CRAWLER CRANE 100 T (KH 500)	15	10160.00	10150.00
21	Hydraulic Crawler Crane 80MT, Fushun Model QUY 80B	10	5460.00	5460.00
22	ROUGH TERRAIN CRANE 75T (RT880)	12	6200.00	6200.00
23	CRAWLER CRANE, 75T -Tata Model 955ALC/TFC280	12	5430.00	5420.00
24	Mobile Crane, 55MT (TIL)	12	4460.00	4450.00
25	CRAWLER CRANE, 25T -Tata Model TFC75	10	3050.00	3050.00
26	MOBILE CRANE, 20MT (TIL)	10	2290.00	2290.00
27	MOBILE CRANE, 20MT (ESCORTS)	10	2290.00	2290.00
28	MOBILE CRANE ESCORTS- 14MT	10	720.00	720.00
29	HYDAULIC PICK & CARRY CRANE, 8/9/10/11/12 MT	10	390.00	390.00

Annexure

C1

Date: 29/08/2025

REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	USEFUL LIFE (IN YRS)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (WITHIN USEFUL LIFE)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (BEYOND USEFUL LIFE)
30	FORK LIFT 5T	5	650.00	650.00
31	FORK LIFT 3T	5	540.00	540.00

Prakash

**REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR
OUTSIDE AGENCIES**

SL NO.	ITEM DESCRIPTION	USEFUL LIFE (IN YRS)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (WITHIN USEFUL LIFE)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (BEYOND USEFUL LIFE)
I.	CRANES :-			
1	Portal Gantry Crane 500T	15	28930.00	28910.00
2	100MT Crawler Crane ZOOMLION CRANE-QUY-100	10	12740.00	12730.00
3	Heavy Lift Crawler Crane 600MT Class DEMAG Model CC2800	15	63240.00	63200.00
4	PORTAL CRANE, 360T	15	15810.00	15800.00
5	600MT Class Crawler Crane- Manitowoc Model 18000-UPGRADED	15	62300.00	62260.00
6	600MT Class Crawler Crane- Liebherr Model LR1600-2 (Upgraded version)	15	77080.00	77020.00
7	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH RINGER)	15	37640.00	37610.00
8	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH-OUT RINGER)	15	23520.00	23510.00
9	MANITOWOC M-250T TRUCK CRANE	15	33880.00	33850.00
10	270 MT Class Crawler Crane- Manitowoc Model 2250	15	35570.00	35550.00
11	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1	15	29640.00	29620.00
11.A	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1 (UPGRADED)	15	40820.00	40790.00
12	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2	15	16990.00	16980.00
12.A	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2 (UPGRADED)	15	21310.00	21300.00
13	LINKBELT LS- 248H CRAWLER CRANE (180T)	15	18820.00	18800.00
14	MANITOWAC MODEL 888 CRAWLER CRANE (200 MT)	15	24470.00	24450.00
15	CRAWLER CRANE SUMITOMO, 150T	15	12230.00	12220.00
16	All Terrain Crane, 150MT- Liebherr Model LTM1150	15	15050.00	15040.00
17	CRAWLER CRANE, 120 T Fushun Model QUY120	10	12130.00	12130.00
18.A	CRAWLER CRANE 135MT Kobelco Model CK1350- 1F	15	12040.00	12030.00
18.B	CRAWLER CRANE 135MT Kobelco Model CK1350	15	9970.00	9960.00
19	CRAWLER CRANE 120MT - Tata-Sumitomo Model SCX1200-2	15	11290.00	11280.00
20	CRAWLER CRANE 100 T (KH 500)	15	11290.00	11280.00
21	Hydraulic Crawler Crane 80MT, Fushun Model QUY 80B	10	6060.00	6060.00
22	ROUGH TERRAIN CRANE 75T (RT880)	12	6890.00	6890.00
23	CRAWLER CRANE, 75T -Tata Model 955ALC/TFC280	12	6030.00	6030.00
24	Mobile Crane, 55MT (TIL)	12	4950.00	4950.00
25	CRAWLER CRANE, 25T -Tata Model TFC75	10	3390.00	3390.00
26	MOBILE CRANE, 20MT (TIL)	10	2540.00	2540.00
27	MOBILE CRANE, 20MT (ESCORTS)	10	2540.00	2540.00

REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR
OUTSIDE AGENCIES

SL NO.	ITEM DESCRIPTION	USEFUL LIFE (IN YRS)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (WITHIN USEFUL LIFE)	Revised rates (Rs./Hour) valid from 01/09/2025 to 31/8/2027 (BEYOND USEFUL LIFE)
28	MOBILE CRANE ESCORTS- 14MT	10	800.00	800.00
29	HYDAULIC PICK & CARRY CRANE, 8/9/10/11/12 MT	10	430.00	430.00
30	FORK LIFT 5T	5	730.00	730.00
31	FORK LIFT 3T	5	600.00	600.00

Dipak

RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
I. LIFTING EQUIPMENTS		
1	Strand Jack System for Boiler Drum Lifting	21030
2	MULTI SHEAVE PULLEY BLOCK 40/50T/60T	310
3	MULTI SHEAVE PULLEY BLOCK 100T	630
4	MULTI SHEAVE PULLEY BLOCK 150T	1270
5	ELCTRIC WINCH 5T	1280
6	ELCTRIC WINCH 10T	2370
7	ELECTRIC WINCH 15 T	2170
8	PASSENGER CUM GOODS HOIST 1T	2290
9	FURNACE MAINTENANCE PLATFORM	5060
10	Gang Operated Hydraulic Jack (Set of 4 Jacks - 175 MT each)	2100
II WELDING & HEAT TREATMENT EQUIPMENT		
1	125KW, 3KHZ, AIR-COOLED INDUCTION HEATING EQUIPMENT	16460
2	75KW, 10 KHZ, COMPACT INDUCTION HEATING EQUIPMENT	8230
3	WELDING GENERATOR 320/300 A	300
4	WELDING RECTIFIER 400A/300A	300
5	WELDING RECTIFIER 600A	400
6	DIESEL WELDING GENERATOR 400A/300A	400
7	TRANSFORMER,600A	300
8	TRANSFORMER 300/400A	200
III SERVICE PLANTS & ALLIED EQUIPT.		
1	500KVA DIESEL GENERATOR	3830
2	TRANSFORMER OIL FILTERATION EQUIPMENT 6000LPH CAPACITY WITHOUT STORAGE TANK	6400
3	-DO-, WITH STORAGE TANK	7310
4	OIL FILTERATION M/C, 250/500 LPH (OTHER THAN SILICON OIL)	910
5	OIL FILTERATION M/C, 250GPH/1000LPH (OTHER THAN SILICON OIL)	1370
6	OIL FILTERATION M/C, 500GPH/2500LPH (OTHER THAN SILICON OIL)	1820
7	OIL FILTERATION M/C, 1000GPH/5000LPH (OTHER THAN SILICON OIL)	3650
8	Portable Lube Oil Purification Unit (Centrifuge M/c) Capacity: 750 LPH	1280
9	Low Vacuum de-hydration unit	640
10	DIESEL GENERATING SET,250 KVA	1780
11	DIESEL GENERATING SET,25 KVA	510

D. Das

RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
12	VACUUM PUMP(ABSOLUTE V.C.)	540
13	ACID CIRCULATING PUMP WITH MOTOR 120M HEAD, 150T/HR	1090
14	ACID TRANSFER PUMP 20/50 T/HR	540
15	DEWATERING PUMP (Kirloskar make,11KW/15HP)	80
16	HP Air compressor (32 Kg/Sq. Cm, 150 CFM)	4260
17	AIR COMPRESSORS 250/300/330/360/350 CFM	2740
18	AIR COMPRESSORS 140/150/190/210 CFM	910
19	ACID CIRCULATING PUMP WITH MOTOR & STARTER, 200T/HR, 150M, 220 HP	1820
20	Industrial Blower 2000CFM	1280
21	Air Leak Test Blower (Flow: 40000 m ³ /Hr)	1160
22	Air Blower (Flow: 20000 m ³ /Hr)	940
IV METAL FORMING /CUTTING EQUIPMENT		
1	TUBE EXPANDING M/C PNEUMATIC 60-100 MM	640
2	ELECTRO HYDRAULIC PIPE BENDING M/C 4"	1640
3	BOLTING MACHINE (ALCOA/AVLOCK/ HUCK)	1810
4	-do- Gun with nose Assembly only	540
V TESTING/INSPECTION EQUIPMENT		
1	DATA LOGGER for PG TESTING	37110
2	MOTORISED HYDRAULIC TEST PUMP 250kg/cmsq	800
3	MOTORISED HYDRAULIC TEST PUMP 400-450kg/cmsq	1090
4	MOTORISED HYDRAULIC TEST PUMP 600 KG/CMSQ	1280
5	HYDRAULIC TEST PUMP 800 KG/CMSQ	1340
6	HYDRAULIC TEST PUMP 1000 KG/CMSQ	2250
7	BOLT STRETCHING DEVICE	910
8	BOROSCOPE/FIBROSCOPE FLEXIBLE TYPE (FLEXUX) IMPORTED	3650
9	ULTRASONIC FLAW DETECTOR	2740
10	MPI TEST KIT	360
11	GAS LEAK DETECTOR	270
12	VIBRATION/SOUND LEVEL METER IRD-306	360
13	VIBRATION/SOUND LEVEL METER IRD-308	360
14	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 350	1460
15	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 360	2560
16	SHOCK PULSE METER	640
17	HV.DC TEST KIT UPTO 50 KV	540
18	HV.DC TEST KIT ABOVE 50 KV	1000
19	HV.AC TEST KIT UPTO 50KV	820
20	HV.AC TEST KIT ABOVE 50KV	2920
21	MOTORISED MEGGER 2.5KV	400
22	MOTORISED MEGGAR 5KV	450
23	OSCILLOSCOPE-DUAL BEAM INDIGENOUS	450
24	OSCILLOSCOPE-DUAL BEAM IMPORTED	1090
25	WAVEFORM ANALYSER	910
26	OSCILLOGRAPH/UV RECORDER 24 CHANNEL	1640
27	OSCILLOGRAPH/UV RECORDER 12 CHANNEL	1090
28	OSCILLOGRAPH/UV RECORDER 6 CHANNEL	910



RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
29	DIGITAL LOW RESISTANCE METER	640
30	DC POTENTIOMETER	180
31	PRECISION DEAD WEIGHT TESTER	1000
32	OPTICAL ALIGNMENT KIT	1370
33	BOROSCOPE/FIBROSCOPE(NON FLEXIBLE)	1200
34	VERNIER THEODOLITE,PRECISION	1200
35	VERNIER THEODOLITE,ORDINARY	200
36	ENGINEERS PRECISION LEVEL/DUMPY LEVEL	120
37	ISKAMATIC 'A'	3210
38	CALIBRATOR '03'	1000
39	48 POLE EXTENDER CARD	200
40	MULTIJET NPM	400
41	OSCILLOMETER	10240
42	VOC EQUIPMENT	1400
43	BINARY SIGNAL GENERATOR	290
44	ELECTRIC COUNTER	690
45	FREQUENCY GENERATOR	1000
46	DBF 3 VIBRATION RECORDER/ANALYSER	3290
47	L&T GOULD OSCILLOGRAPH 2-CHANNEL	490
48	L&T GOULD OSCILLOGRAPH 6-CHANNEL	1180
49	VIBROPORT 41/FFT ANALYSER	5480
50	ELCID kit	10060
51	UNIVERSAL CALIBRATION SYSTEM	2740
52	NATURAL FREQUENCY TESTER	2920
53	DIGITAL HARDNESS TESTER	360
54	ADRE 208 VIBRATION ANALYSER	7310
55	PCB DIAGNOSTIC REPAIR KIT	2010
56	SECONDARY INJECTION RELAY TEST KIT	5300
57	MICRO OHM METER	1460
58	DIGITAL MICRO OHM METER MEASURING RANGE: 200 $\mu\Omega$ TO 20K Ω	3250
59	PMI Machine OLYMPUS make	3370
60	Mobile Lighting Mast - 9 metres (4X400 W)	870
61	10KVA RESISTANCE BRAZING MACHINE	140
62	RECURRENT SURGE OSCILLOGRAPH (RSO) TEST KIT WITH PORTABLE HANDHELD OSCILLOSCOPE.	460
63	HYDROGEN GAS LEAK DETECTOR	60
64	STATOR WEDGE ANALYZER KIT WITH COMPLETE ACCESSORIES	5020
65	WEDGE DEFLECTION KIT	80
66	TILE PRESSING MACHINE FOR GAS TURBINE	270
67	INDUCTION BRAZING MACHINE	4910
68	MAGNETIC COHESIVE FORCE (MCF) EQUIPMENT	3650
69	ULTRASONIC FLOW METER	180
70	PORTABLE VIBRATION ANALYSER (MODEL 811T)	40
71	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR AND PANEL) : PRESSURE -14KG/SQ CM. ; FLOW 60 M3/HR	470
72	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR AND PANEL) : PRESSURE -30KG/SQ CM. ; FLOW 15 M3/HR	430



RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
73	HI SPEED MEMORY RECORDER, MAKE -YOKOGAWA, MODEL DL850E-Q-HE/B5/HD1	1820
74	TROLLEY MOUNTED HYDRAULIC JACK (100 MT)	1260
75	5KV Insulation Tester	450
76	4 Channel Digital Oscilloscope /Fast Recorder	1720
77	4 Channel Oscillographic Recorder	590
78	Sound Level Meter	230
79	Thermal Imaging Camera	780
80	Videoscope (Video Boroscope)	1530
81	DO (Dissolve Oxygen) Meter (0 to 1500 ppb)	1320
82	Conductivity Meter	80
83	Core Flux Test Kit	7340
84	Primary Current Injection Kit (2000A)	870
85	3 Phase Secondary Injection Kit (Relay Test)	3790
86	FRF Filtration Kit	1340
87	FFT Analyser	2310
88	Flue Gas Analyser	1030
89	Oil Test Kit (Mineral Oil)-Transformer	1020
90	Winding Resistance kit (R L C Load)	880
91	SFRA test Kit	1200
92	Tan Delta test Kit	4090
93	PF Meter	330
94	Ultrasonic Flow Meter	840
95	Oil Particle Counter	360
96	Plasma Cutting Machine (With complete accessories)	320
97	JCB make DG Set 80 KVA	690
98	Diesel Generating Set 82.5 KVA	640
99	Portable Jacking Oil Pump	1110
100	Alloy Analyser	1820

Dikar

**RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS
ETC. FOR OUTSIDE AGENCIES**

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
I.	LIFTING EQUIPMENTS	
1	Strand Jack System for Boiler Drum Lifting	23370
2	MULTI SHEAVE PULLEY BLOCK 40/50T/60T	350
3	MULTI SHEAVE PULLEY BLOCK 100T	700
4	MULTI SHEAVE PULLEY BLOCK 150T	1410
5	ELCTRIC WINCH 5T	1420
6	ELCTRIC WINCH 10T	2640
7	ELECTRIC WINCH 15 T	2410
8	PASSENGER CUM GOODS HOIST 1T	2540
9	FURNACE MAINTENANCE PLATFORM	5620
10	Gang Operated Hydraulic Jack (Set of 4 Jacks - 175 MT each)	2340
II	WELDING & HEAT TREATMENT EQUIPMENT	
1	125KW, 3KHZ, AIR-COOLED INDUCTION HEATING EQUIPMENT	18290
2	75KW, 10 KHZ, COMPACT INDUCTION HEATING EQUIPMENT	9140
3	WELDING GENERATOR 320/300 A	330
4	WELDING RECTIFIER 400A/300A	330
5	WELDING RECTIFIER 600A	440
6	DIESEL WELDING GENERATOR 400A/300A	440
7	TRANSFORMER,600A	330
8	TRANSFORMER 300/400A	220
III	SERVICE PLANTS & ALLIED EQUIPT.	
1	500KVA DIESEL GENERATOR	4250
2	TRANSFORMER OIL FILTERATION EQUIPMENT 6000LPH CAPACITY WITHOUT STORAGE TANK	7110
3	-DO-, WITH STORAGE TANK	8130
4	OIL FILTERATION M/C, 250/500 LPH (OTHER THAN SILICON OIL)	1010
5	OIL FILTERATION M/C, 250GPH/1000LPH (OTHER THAN SILICON OIL)	1520
6	OIL FILTERATION M/C, 500GPH/2500LPH (OTHER THAN SILICON OIL)	2030
7	OIL FILTERATION M/C, 1000GPH/5000LPH (OTHER THAN SILICON OIL)	4060
8	Portable Lube Oil Purification Unit (Centrifuge M/c) Capacity: 750 LPH	1420
9	Low Vacuum de-hydration unit	710
10	DIESEL GENERATING SET,250 KVA	1980
11	DIESEL GENERATING SET,25 KVA	560
12	VACUUM PUMP(ABSOLUTE V.C.)	600
13	ACID CIRCULATING PUMP WITH MOTOR 120M HEAD, 150T/HR	1210
14	ACID TRANSFER PUMP 20/50 T/HR	600
15	DEWATERING PUMP (Kirloskar make,11KW/15HP)	90
16	HP Air compressor (32 Kg/Sq. Cm, 150 CFM)	4730
17	AIR COMPRESSORS 250/300/330/360/350 CFM	3040
18	AIR COMPRESSORS 140/150/190/210 CFM	1010

Vikas

**RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS
ETC. FOR OUTSIDE AGENCIES**

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
19	ACID CIRCULATING PUMP WITH MOTOR & STARTER, 200T/HR, 150M, 220 HP	2030
20	Industrial Blower 2000CFM	1420
21	Air Leak Test Blower (Flow: 40000 m ³ /Hr)	1290
22	Air Blower (Flow: 20000 m ³ /Hr)	1050
IV	METAL FORMING /CUTTING EQUIPMENT	
1	TUBE EXPANDING M/C PNEUMATIC 60-100 MM	710
2	ELECTRO HYDRAULIC PIPE BENDING M/C 4"	1820
3	BOLTING MACHINE (ALCOA/AVLOCK/ HUCK)	2010
4	-do- Gun with nose Assembly only	600
V	TESTING/INSPECTION EQUIPMENT	
1	DATA LOGGER for PG TESTING	41230
2	MOTORISED HYDRAULIC TEST PUMP 250kg/cmsq	890
3	MOTORISED HYDRAULIC TEST PUMP 400-450kg/cmsq	1210
4	MOTORISED HYDRAULIC TEST PUMP 600 KG/CMSQ	1420
5	HYDRAULIC TEST PUMP 800 KG/CMSQ	1490
6	HYDRAULIC TEST PUMP 1000 KG/CMSQ	2490
7	BOLT STRETCHING DEVICE	1010
8	BOROSCOPE/FIBROSCOPE FLEXIBLE TYPE (FLEXUX) IMPORTED	4060
9	ULTRASONIC FLAW DETECTOR	3040
10	MPI TEST KIT	400
11	GAS LEAK DETECTOR	300
12	VIBRATION/SOUND LEVEL METER IRD-306	400
13	VIBRATION/SOUND LEVEL METER IRD-308	400
14	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 350	1620
15	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 360	2840
16	SHOCK PULSE METER	710
17	HV.DC TEST KIT UPTO 50 KV	600
18	HV.DC TEST KIT ABOVE 50 KV	1110
19	HV.AC TEST KIT UPTO 50KV	910
20	HV.AC TEST KIT ABOVE 50KV	3250
21	MOTORISED MEGGER 2.5KV	440
22	MOTORISED MEGGAR 5KV	500
23	OSCILLOSCOPE-DUAL BEAM INDIGENOUS	500
24	OSCILLOSCOPE-DUAL BEAM IMPORTED	1210
25	WAVEFORM ANALYSER	1010
26	OSCILLOGRAPH/UV RECORDER 24 CHANNEL	1820
27	OSCILLOGRAPH/UV RECORDER 12 CHANNEL	1210
28	OSCILLOGRAPH/UV RECORDER 6 CHANNEL	1010
29	DIGITAL LOW RESISTANCE METER	710
30	DC POTENTIOMETER	200
31	PRECISION DEAD WEIGHT TESTER	1110
32	OPTICAL ALIGNMENT KIT	1520
33	BOROSCOPE/FIBROSCOPE(NON FLEXIBLE)	1340
34	VERNIER THEODOLITE,PRECISION	1340
35	VERNIER THEODOLITE,ORDINARY	220

Qishar

**RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS
ETC. FOR OUTSIDE AGENCIES**

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
36	ENGINEERS PRECISION LEVEL/DUMPY LEVEL	130
37	ISKAMATIC 'A'	3570
38	CALIBRATOR '03'	1110
39	48 POLE EXTENDER CARD	220
40	MULTIJET NPM	440
41	OSCILLOMETER	11380
42	VOC EQUIPMENT	1560
43	BINARY SIGNAL GENERATOR	320
44	ELECTRIC COUNTER	770
45	FREQUENCY GENERATOR	1110
46	DBF 3 VIBRATION RECORDER/ANALYSER	3650
47	L&T GOULD OSCILLOGRAPH 2-CHANNEL	540
48	L&T GOULD OSCILLOGRAPH 6-CHANNEL	1320
49	VIBROPORT 41/FFT ANALYSER	6090
50	ELCID kit	11170
51	UNIVERSAL CALIBRATION SYSTEM	3040
52	NATURAL FREQUENCY TESTER	3250
53	DIGITAL HARDNESS TESTER	400
54	ADRE 208 VIBRATION ANALYSER	8130
55	PCB DIAGNOSTIC REPAIR KIT	2230
56	SECONDARY INJECTION RELAY TEST KIT	5890
57	MICRO OHM METER	1620
58	DIGITAL MICRO OHM METER MEASURING RANGE: 200 $\mu\Omega$ TO 20K Ω	3610
59	PMI Machine OLYMPUS make	3740
60	Mobile Lighting Mast - 9 metres (4X400 W)	970
61	10KVA RESISTANCE BRAZING MACHINE	160
62	RECURRENT SURGE OSCILLOGRAPH (RSO) TEST KIT WITH PORTABLE HANDHELD OSCILLOSCOPE.	520
63	HYDROGEN GAS LEAK DETECTOR	60
64	STATOR WEDGE ANALYZER KIT WITH COMPLETE ACCESSORIES	5580
65	WEDGE DEFLECTION KIT	90
66	TILE PRESSING MACHINE FOR GAS TURBINE	300
67	INDUCTION BRAZING MACHINE	5460
68	MAGNETIC COHESIVE FORCE (MCF) EQUIPMENT	4060
69	ULTRASONIC FLOW METER	200
70	PORTABLE VIBRATION ANALYSER (MODEL 811T)	50
71	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR AND PANEL) : PRESSURE -14KG/SQ CM. ; FLOW 60 M3/HR	520
72	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR AND PANEL) : PRESSURE -30KG/SQ CM. ; FLOW 15 M3/HR	480
73	HI SPEED MEMORY RECORDER, MAKE -YOKOGAWA, MODEL DL850E-Q-HE/B5/HD1	2020
74	TROLLEY MOUNTED HYDRAULIC JACK (100 MT)	1400
75	5KV Insulation Tester	500
76	4 Channel Digital Oscilloscope /Fast Recorder	1910
77	4 Channel Oscillographic Recorder	650

Dipal

**RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS
ETC. FOR OUTSIDE AGENCIES**

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/09/2025 to 31/8/2027
78	Sound Level Meter	260
79	Thermal Imaging Camera	870
80	Videoscope (Video Boroscope)	1700
81	DO (Dissolve Oxygen) Meter (0 to 1500 ppb)	1470
82	Conductivity Meter	90
83	Core Flux Test Kit	8160
84	Primary Current Injection Kit (2000A)	970
85	3 Phase Secondary Injection Kit (Relay Test)	4210
86	FRF Filtration Kit	1490
87	FFT Analyser	2570
88	Flue Gas Analyser	1150
89	Oil Test Kit (Mineral Oil)-Transformer	1130
90	Winding Resistance kit (R L C Load)	980
91	SFRA test Kit	1330
92	Tan Delta test Kit	4550
93	PF Meter	370
94	Ultrasonic Flow Meter	930
95	Oil Particle Counter	400
96	Plasma Cutting Machine (With complete accessories)	350
97	JCB make DG Set 80 KVA	770
98	Diesel Generating Set 82.5 KVA	710
99	Portable Jacking Oil Pump	1230
100	Alloy Analyser	2030

Ambar