VOLUME – IA
PART I & II

TECHNICAL CONDITIONS OF CONTRACT (TCC)

FOR

PRE-ASSEMBLY, ERECTION, WELDING, NDT, HYDRO TESTING AND COMMISSIONING OF COOLING WATER PIPING AND ASSOCIATED PIPING, INCLUDING SUPPLY & APPLICATION OF CEMENT MORTAR LINING/ PAINTING AS APPLICABLE, HANDLING OF MATERIALS AT BHEL/CLIENT STORES/STORAGE YARD AND TRANSPORTATION TO SITE AT 2×700 MWe KAIGA ATOMIC POWER PROJECT – UNIT 5&6, UTTARA KANNADA DISTRICT, KARNATAKA

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VOLUME – IA - TECHNICAL CONDITIONS OF CONTRACT

PART I - CONTRACT SPECIFIC DETAILS

VOLUME-IA PART – I CHAPTER – I

PROJECT INFORMATION

1.1.1 INTRODUCTION

2 x 700 MWe PHWR – Kaiga-5&6 Atomic Power Project is being set up by Nuclear Power Corporation of India Ltd. (NPCIL) at Kaiga Village, Karwar Taluka, Uttara Kannada District, Karnataka, India. Kaiga Site is at about 13 km upstream of Kadra Dam and associated hydro-electric power house on the left bank of Kali River on the banks of the Kadra reservoir.

1.1.2 PROJECT INFORMATION

1	Name of the Project	2 X 700 MWe PHWR – Kaiga-5&6 Atomic Power Project
2	Station Capacity	2 X 700 MWe
3	Owner	Nuclear Power Corporation of India Ltd. (NPCIL)
4	Site Location	Kaiga, Uttara Kannada District, Karnataka. About 53 km from Karwar (Konkan Railway) Station and NH 10 passes through Karwar
5	Nearest Railway Station	Karwar (Konkan Railway)
6	Nearest Airport	Goa – 140 kms
7	Accessibility	Kaiga site is accessible from Karwar through State Highway 06 (SH-06) by taking 3 km diversion from SH06 at Hartuga. SH-06 is interconnected with SH 34 at Kadra and NH-66 at Karwar. Hence the nearby towns like Dharward, Hubballi, Belgaum, Goa etc. is connected. The nearest Broad gauge rail connectivity exists at Karwar on Konkan Railway and Londa on Belgaum-Goa broad gauge of South Western Railway Division. Air connectivity exists with Goa, Hubballi and Belagavi at 140, 150 and 175 kilometre respectively from Kaiga Site

<table>
<tr><td>8</td><td colspan="2">Ambient Air Temperature</td></tr>
<tr><td>A</td><td>Max. Dry Bulb Temperature</td><td>+ 41.6 Deg.C</td></tr>
<tr><td>B</td><td>Min. Dry Bulb Temperature</td><td>10.9 Deg.C</td></tr>
<tr><td>C</td><td>Design temperature for electrical equipment / devices</td><td>+ 50 Deg.C</td></tr>
<tr><td>9</td><td>Relative Humidity</td><td>i. Maximum during monsoon 99.9 %
ii. Minimum(design) 3%
iii. Performance 50 %</td></tr>
<tr><td>10</td><td>Air Quality</td><td>Clean and free from chemical pollutants.</td></tr>
<tr><td>11</td><td>Rainfall</td><td>a) Annual Average: 3649.31 mm
b) Highest annual rainfall: 4695.1 mm in 1988
c) Lowest annual rainfall: 2345.3 mm in 2016
d) Period: Year 1987-2017
Average rainfall of 3900 mm during the four months of monsoon (June to September)</td></tr>
<tr><td>13</td><td>Wind Pressures</td><td><table><tr><td>Height above mean ground level, m</td><td>Design Wind Speed m/sec</td></tr><tr><td>@ 10 M</td><td>5.0</td></tr><tr><td>@ 100 M</td><td>13.8</td></tr></table>The assessment of wind loads based on the above basic wind speed shall be done as specified in IS: 875.
Wind direction: Predominantly W, SW, NE & E with respect to true North</td></tr>
<tr><td>14</td><td>Seismology</td><td>Zone III as per IS1893-2002 part I</td></tr>
</table>

1.1.3 INSTRUCTIONS TO BIDDERS

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.

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.)

Pre-assembly, erection, welding, NDT, hydro testing, and commissioning of Cooling Water (CW) piping and all associated system piping. The scope also includes supply and application of cement mortar lining, painting as applicable, handling of materials at BHEL/Client's stores/storage yard and transportation to the site of work at 2 × 700 MWe Kaiga Atomic Power Project – Units 5 & 6, Uttara Kannada District, Karnataka.

IMPORTANT CONDITIONS OF THE CONTRACT

1.2.1. The work to be carried out at quoted / accepted rates by the contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning, chipping and levelling of foundations, providing packers and shims, pre-assembling at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, grinding, radiography, LPI/MPI/UT/PAUT/CRT testing wherever needed, hydraulic test including inter connection of all the termination points, supply & application of cement mortar lining/painting and all other tests as per drawings/specifications and commissioning procedures, required for the above operations, all pre-commissioning tests and trial runs of cooling water piping system.

1.2.2. Before commencement of any work, the bidders have to check with Civil/Mechanical/Electrical drawings jointly with concerned BHEL Engineers.

1.2.3. The work under this contract shall be carried out as per BOQ Cum Rate Schedule and in compliance of tender conditions including technical specifications and approved drawings/ documents.

GENERAL

1.2.4. Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.

1.2.5. The drawings enclosed with this tender are intended to give the tenderer a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings.

1.2.6. Further this is to be noted that the drawings and the documents furnished along with this specification are the sole property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company.

1.2.7. Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and fro the site, fuel, compressed air, water, transit and storage insurance for own TnP and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handing over the works in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works.

1.2.8. The area of work shall be cleared of all vegetation, rubbish and other objectionable matter and materials by contractor. No separate payment for these operations shall be made for such works.

1.2.9. All the works areas shall be adequately flood lighted to the satisfaction of the Engineer-in-Charge when the work is in progress during the night shifts.

1.2.10. Drawings showing enough details for the construction as per the specification shall be furnished to the contractor in a phased manner as far as possible.

1.2.11. All necessary arrangement for safety like Hard Barricading with scaffolding pipes and providing of safety net is in bidder's scope.

1.2.12. The Customer may depute their representative for checking and supervision of important stages of work. The contractor shall be required to provide all facilities for inspection of works at no extra cost to BHEL. Any defect in quality of work or deviations from drawings / specifications pointed out during such inspection shall be made good by the contractor in the same way as if pointed out by the BHEL Engineer, without any cost implication to BHEL.

1.2.13. Giving all notices, paying all fees, taxes etc., in accordance with the General Conditions of Contract, that is required for all works including temporary works shall be in the scope of contractor.

1.2.14. Carrying out establish levels and coordinates at suitable intervals from existing grid levels and coordinates furnished by the owner established bench marks, setting out the locations and levels of proposed structures.

1.2.15. The contractor shall provide the owner/BHEL such an assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used.

1.2.16. Arranging for joint checking (with BHEL / BHEL's Customer / Consultant) of all site construction activities Preparation of joint protocols for each & every activity and maintaining quality records for audit/inspection as per approved FQP by BHEL.

1.2.17. Medical/First aid center/medicine purchased for emergency/Doctor purpose along with ambulance services with fuel and operator (round the clock) shall be arranged by BHEL for handling medical emergencies. Cost against these facilities shall be distributed / shared among the vendors working in Kaiga Project site proportionately based on contract value.

1.2.18. The complete works shall be carried out as per BOQ cum Rate schedule. If any work covered in the scope of contract cannot be executed using items available in BOQ, additional / extra items shall be made and rates for such items shall be worked out as per GCC. However, contractor shall be bound to execute all the works under the scope of the contract and decision whether an extra item is applicable or not, shall be taken by BHEL Engineer which will be binding on the contractor.

1.2.19. Any activity which is necessarily required for satisfactory execution of any item of BOQ in line with technical specifications shall be deemed to be included in BOQ item even if it is not described in the item description and no extra payment shall be made against such activity.

1.2.20. Tentative Technical Staff Requirement:

- **Project Manager** – 01 Head with relevant experience shall be appointed with approval of BHEL, Project Director in Industrial Building & Power Plant Works etc.
- **Asst. Project Managers** – 01 Head with relevant experience shall be appointed with approval of BHEL, Project Director in Industrial Building & Power Plant Works etc.
- **Experienced Engineers**– 02 heads (CW Piping).
- **Quality Control Engineer**
    - Sr. Quality Control Engineer– 01 Head with relevant experience in quality control of Piping Area

- Quality Control Engineer – 02 head with relevant experience in NDT (Level-2 in RT, UT, LPI/MPI)
- QA/QC Documentation Engineer with relevant experience in QA/QC of Piping – 01 Nos.

In addition to the above, following manpower shall be for the package.

- Experienced Foreman / Supervisors – 01 head.
- Planning & Billing Engineers – 01 head
- Stores, Gate Pass – 01 head
- Accounts & Administration – 01 head
- Human Resourse officers – 01 head
- Safety Engineer – As per HSE Plan
- Operator, Licensed Electrician, Mechanic - As per requirement
- Experienced Helpers – 1 lot for similar nature of work
- Security Guards (Round the Clock) – As per requirement.

Note: Above manpower requirement is tentative only. Contractor shall augment manpower to meet the project schedule/ milestones. Deployment of manpower shall be progressive to meet the project schedule. Relevant experience is subject to decision of BHEL site in-charge.

1.2.21. Deputation of the above man-power shall be jointly decided at site in line with construction Schedule.

1.2.22. Any Engineer/ supervisor required for proper execution which are not specified in above clause are to be provided as per site requirement within the quoted rate.

1.2.23. BHEL reserves the right to reject or approve the list of personnel proposed by the contractor. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not be permitted unless specific & reasonable justification is made.

1.2.24. The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent construction manager having sufficient authority to take decisions at site.

Field Quality Assurance:

1.2.25. The contractor shall be responsible for day-to-day quality checks for works and other building materials in line with approved Field Quality Plan (FQP) during the progress of work. All quality records and log sheets shall be maintained as per the requirement of BHEL/CUSTOMER and as per FQP approved by BHEL/CUSTOMER.

Erection Clause:

1.2.26. The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipment at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, grinding, radiography, LPI/MPI/UT/PAUT/CRT testing wherever needed, hydraulic test including inter connection of all the termination points, supply & application of cement mortar lining/painting and all other tests as per drawings/specifications and commissioning procedures,, required for the above operations, all pre-commissioning tests and trial runs of cooling water piping system.

1.2.27. The works to be performed under this contract consist of providing all labour, supervision, scaffolding, construction equipment's, tools and plants, temporary works, supplies including POL, transportation and all incidental items not shown or specified but reasonably implied or necessary for the proper completion of work in all respects. Testing of all materials etc. are included on the rates of items of work. Works shall be carried out only with approved erection drawings.

The unit rates shall include all material equipment, fixtures, labour construction plant, temporary works and everything whether of permanent or temporary nature necessary for the completion of job in all respects.

All rectifications/modifications, revamping and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation/maintenance requirements, mismatching or due to damages in transit, storage and erection/commissioning and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works and shall be dealt as per GCC.

The vendor shall assist in providing their deployed T&P's for use by other vendors generally nearby their working area in best interest of Project. While it shall be BHEL's endeavour to mutually settle any reasonable commercial issue between the vendors, such assistance shall not be denied by the vendor on instructions of BHEL.

1.2.28. The bidder should fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, local conditions, soil strata and site-specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may have not been specifically brought out in the specifications.

1.2.29. The quantities indicated in the tender specification are approximate and are liable for variation at the discretion of BHEL. The work executed shall be measured and priced as per the unit rate arrived at for each work area as mentioned in the relevant clauses. Quantity variation shall be governed as per GCC.

1.2.30. All transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables etc., except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by Contractor unless otherwise specified in the relevant clauses. The Contractor's quoted rates should be inclusive of all such contingencies.

1.2.31. It shall be specially noted that, the contractor may have to work round the clock (24x7) or may have to deploy additional manpower/resources to achieve the completion schedules / plans / targets during the entire course of erection and commissioning works, which may involve considerable payment including overtime. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including labours, engineers / supervisors, T&Ps etc.

Time is the essence of contract. Night shift working is envisaged for works not hazardous in nature Ex- Erection works at low level, Material shifting, Preassembly works etc.

1.2.32. The terminal points can be inferred from the relevant drawings and any further clarifications can be obtained/decided by BHEL and that is final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also, where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL

Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

1.2.33. The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be affected from contractor's bill towards expenditure incurred including BHEL's overhead charges.

1.2.34. Considering the area constrain in the subject project, Contractor has to work in close co-ordination with another erection/Civil 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 erection program have to be planned in such a way that the project milestone events are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

1.2.35. No member of the already erected structure/ platform, pipes, grills, platform, other component and auxiliaries should be cut without specific approval of BHEL engineer. In case it is necessary to cut, the contractor shall rectify / repair in a manner acceptable to BHEL / Customer without any additional cost.

1.2.36. The storage yard is located within the plant boundary in multiple locations. All other materials have to be transported from storage yard to construction area by the contractor at his own cost, using own Pick & Carry Crane with front mounted cabin (Farrana), crane and trailer.

1.2.37. Painting: The scope of work shall include supply and application of final painting for all the components is covered under this scope of work.

1.2.38. Cement Mortar lining and Coating: Pipes which are to be laid underground shall be protected by protective covering of cement mortar lining on the inside and outside surface of the pipes of specifications mentioned under relevant chapters of the TCC. Supply of cement mortar materials, application and testing of the lining and coating as per the standards mentioned under the TCC shall be included in the scope.

1.2.39. During the course of erection, certain rework / modification / rectification / repairs / fabrication etc will be necessary on account of feedback/revision from various relevant sources, and also on account of design discrepancies/ alterations, manufacturing defects, site operations/ maintenance requirements. This will also include modifications / re-works suggested by BHEL /

customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repairs etc promptly and expeditiously. This shall be dealt as per GCC.

1.2.40. The scope of work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management including high standard safety management (as per relevant clause of tender document) and green belt management (Project Management, HSE & Quality etc.). The contractor should ensure successful and timely completion of the work. 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. The manpower deployment identified by contractor shall match with above scope of works. (Refer HSE Manual).

Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The erection manuals which are available with BHEL site office are to be referred for compliance and guidance before taking up the work. Any failure to comply with the above might lead to rework and the cost for the same shall be borne by the contractor only. BHEL engineer, depending upon the availability of materials, fronts etc., will decide the sequence of erection and methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs or for any reason whatsoever.

1.2.41. Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and fro the site, fuel, compressed air, water, transit and storage insurance for own T&P and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handling over the works, except in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works.

1.2.42. Furnishing samples of all materials required by the engineers for testing/inspection and approval for use in the works. The samples may be retained by the engineer for final incorporation in the works.

1.2.43. Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.

1.2.44. Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified.

1.2.45. Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.

1.2.46. Contractor shall set up suitable guarded storage facilities. Contractor shall ensure the Storage of only those material at site which will be erected/Pre-assembled within 10 days OR as directed by BHEL Engineer. Any wastage due to lapse of storing shall be debited to contractor with 5% overheads.

1.2.47. The drawings enclosed with this tender are intended to give the tenderer a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings.

1.2.48. The scope of work will also include such other related works although they may not be specifically mentioned above and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer.

1.2.49. The detail scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual requirements.

1.2.50. Adequate lighting facilities such as hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre-assembly yard and contractor's material storage area etc. at his cost.

1.2.51. Adequate water less/Bio urinals (at least 1 no. per 100 nos of manpower, at locations identified by BHEL site in-charge) shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas with proper disposal arrangement.

1.2.52. Vendors have to comply requirements of HSE & Statutory requirement in line with BHEL HSE plan, NPCIL Safety requirement, State/Central statutory requirement.

1.2.53. Preparation of erection procedure, WPS, method statement, HIRA, Job Safety analysis, permit to work, lifting plans, and all supporting documents as required for starting & continuation of work/job is in vendor's scope.

1.2.54. Contractor shall prepare Welding Procedure specification (WPS), Procedure Qualification Record (PQR), assembly, NDE, cleaning, etc. Preparation, submission of welding procedure specification (WPS) and conducting Procedure qualification record tests (PQR) as per relevant standards are in contractor's scope of work. In that case an under taking towards owning full responsibility for achieving the desired quality shall be given by the contractor.

1.2.55. Contractor shall prepare all the work procedures with reference to applicable codes and standards and shall submit the same for the approval of BHEL/NPCIL including WPS and PQR for the pipe welding and qualification of welders.

1.2.56. Contractors shall ensure that all construction activities are performed following duly approved Procedures, methods and work instructions. All hazardous activities shall be duly identified, Procedures duly formulated for the same, approved and implemented, and continuously monitored for their effective implementation. Job Hazard Analysis (JHA) shall be undertaken, updated (if required) and documentation to this effect maintained.

1.2.57. Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.

Consumables

1.2.58. All the required electrodes (in Contractor scope) as approved by BHEL shall be arranged by contractor at his cost including approval from customer. It shall be the responsibility of the contractor to obtain prior approval of BHEL site, 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. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.

1.2.59. The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), all gases (inert, welding, and cutting), soldering 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 (structural steel, concrete sleeper, concrete blocks etc. required as per the discretion of BHEL Site) hardware items etc. required for temporary works such as supports, scaffoldings, pre-assembly bed etc. can be issued from BHEL on returnable basis subject to availability with BHEL site store. In case of non-availability same has to be arranged by agency.

1.2.60. All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.

1.2.61. All the required gases like Oxygen / Acetylene / argon / Nitrogen required for work shall be supplied by the Contractor at his cost as per the specification. 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. BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

1.2.62. The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.

1.2.63. The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

1.2.64. Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate.

1.2.65. Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.

1.2.66. All low hydrogen electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C - 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost.

1.2.67. In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's subsequent bills at market value plus 5% overheads.

1.2.68. BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

PLEASE NOTE: TANDEM OPERATION FOR MATERIALS HANDLING/ERECTION/LIFTING/ LOWERING FROM HEIGHTS NEEDS TO BE APPROVED BY BHEL/CUSTOMER.

1.2.69. Brief feature of Cooling Water Piping System

The condenser cooling water (CCW) system is provided separately for each unit of KAIGA-5&6 to serve the heat rejection from condenser. CCW system is an open recirculation type cooling water system incorporating Natural Draft Cooling Towers (NDCTs) for heat dissipation. The heat load for the CCW system is from the main condenser.

There are 4 CCW pumps (all working). Pressure drop of about 8 mwc across condenser and CCW piping (including on line tube cleaning system drop) within terminal point of this package has been considered. CCW main inlet and outlet conduits are of carbon steel with inside and outside cement mortar lining. Internal diameter of this conduit is about 5 m and minimum thicknesses of CS and mortar lining and coating each shall not be less than 25 mm and 50 respectively.

The broad scope of CW system includes but not limited to the following systems and equipment. The items/equipment though not specifically mentioned but are needed to make the system/plant

complete shall also be furnished, erected, and commissioned unless otherwise specifically excluded.

The scope shall include but will not be limited to the following:

1) CCW System including piping, conduits and systems components like Rubber Expansion (RE) joints, motor operated butterfly valves and other valves within the terminal point outside turbine building as indicated in drawing. Also scope includes associated valves with its isolation gate valves and drain collection & associated piping up to nearest plant drain chambers.
2) Rubber expansion joint to suit CW pump discharge pipe with counter flanges, accessories including control rod assemblies, bolts, nuts, washers, gaskets for each CW pump.
3) Butterfly Valve (s) with all accessories in the re-circulation pipeline, with actuators.
4) Sufficient number of Automatic air release valves (ARVs) along with its isolation valves for CW system.
5) Terminal Point as per the drawing. In case of any dispute the decision of BHEL Engineer at site shall be final and binding on the contractor.
6) Connecting both the end terminal joints of the above with the equipment / pipes / systems are included in this scope work.
7) Erection of Butterfly Valves/ other valves, expansion joints, Air Release Valves, Pressure Transmitters, Pressure Gauges, RTDs, Thermowells, Stubs, Temperature Gauges, pH Transmitters, Chloride Transmitters, Salinity Transmitters, Flow Transmitters, other metering elements, etc forming part of the system (under this scope of work/within the terminal points) irrespective of the suppliers is also to be carried out by the agency.
8) Civil works including excavation will be done by the Civil Agency. However minor chipping/ chiseling required for erection & alignment are to be done by the contractor. Dewatering of the excavated area during pipe erection, alignment, welding & NDT will be under the scope of this contract. Sufficient numbers of dewatering pumps to be mobilized for the same. The contractors quoted rates should be inclusive of the same.
9) Access shall be provided by the contractor for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained.
10) The scope of work shall include supply and application of painting/coating for all the components is covered under this scope of work.
11) Misc Platforms for accessibility to valves and equipments as specified by BHEL Engineer at site.

1.2.70. GENERAL

1) The bidder shall, prior to submitting his tender for the work, visit and examine the site of works and its surroundings at his own expense, and obtain and ascertain for himself on his own responsibility all information that may be necessary for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.

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 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 or the cost thereof under this contract.

3) 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 approach platforms or scaffolding works or as bed for pre-assembly works. Contractor shall arrange himself all such materials. The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel (angles, channels, beams, plates etc) for such usage as normal scope of work without any cost implication on BHEL. 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. However, if available with BHEL (in form of scrap/good steel), vendor may be allowed to use on returnable basis on discretion of BHEL.

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

5) Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like TG equipment, Cabling, instrumentation, insulation etc., to commence their work from / on the equipment's coming under this scope. Sometimes, more than one agency may have to work in same location. 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.

6) 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.

7) Scope of work covered under this specification requires quality workmanship, engineering along with the supply of all consumables, tools and tackles and testing instruments. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments etc. in his possession. Contractor shall also have adequately trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.

8) All necessary certificates and licenses, permits & clearances to carry out this work from the respective authorities/statutory/ local authorities/ etc are to be arranged by the Contractor, if required, at his cost in time to ensure smooth progress of work and render all assistance, service required in this regard.

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.

10) The contractor shall carryout additional tests if any, which the Engineer feels necessary because of site conditions and also to meet system specification.

11) 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.

12) The contractor must obtain the signature and permission of the security personnel of the customer 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.

13) During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

14) The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

15) Contractor shall erect and commission all the piping/equipment's and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the Contractor. No claims for extra payment from the Contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

16) The Contractor shall perform any services, tests etc. which may not be specified but nevertheless, required for the completion of work within quoted rates.

17) The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.

18) BHEL reserves right to recover from the Contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to Contractor's lapse during any stage of work. Any loss to BHEL due to Contractor's lapse shall have to be made good by the Contractor as per GCC.

19) The Contractor shall take delivery of the components, equipment's, chemicals, and lubricants etc. from the BHEL stores/ storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipment's after usage shall be submitted to the BHEL and reconciled periodically.

20) 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.

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

22) Plant materials should not be used for any temporary supports / scaffolding/ preparing pre-assembly bed etc. The details of equipment's to be erected under this contract are generally as per the schedule given in relevant appendices. These details are approximate and meant only to give a general idea to the tenderer about the magnitude of the work involved. Actual quantum and type of equipment's will be based on the relevant erection documents which will be furnished to the Contractor in due course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.

23) Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/locks, cutting of excess thread length of hanger tie-rod etc have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/instructions, during various stages of erection & testing and after floating of piping/ducting during cold and hot condition will have to be done as part of work. This exercise may have to be repeated till satisfactory results are achieved.

24) In applicable, Layout of field routed, fine fittings and other small-bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. As such, layout of small-bore piping shall be done as per the site requirement. Necessary sketch for routing these lines shall be prepared and got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines when after completion, to suit the site conditions. The contractor should absorb this cost in his quoted rate.

25) In installation of various equipment's, it may become necessary to install these on temporary supports/ hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions/hangers and later on shift the relevant equipment's to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free -returnable basis which shall be returned to BHEL after the use.

26) Interconnection/ hookup, if any, with the existing system shall form part of work. Such interconnections, hookups may require shut down of running plant and the relevant work have to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.

27) Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary

to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.

28) It may so happen that certain components like manhole doors, hanger etc may be supplied in loose items. They need to be assembled as per relevant drawings or as per advice of BHEL engineer prior to erection. This forms the part of the scope of work.

29) The Contractor shall have total responsibility for all equipment and materials in his custody at Contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/finished surfaces should be greased and covered.

30) BHEL is operating web based computerized E-store system that includes, inter-alia, issue of materials, daily progress reporting, Contractor's running monthly billing and material reconciliation through a computerized data management system. Contractor shall install necessary hardware to hook-up with the BHEL's system and use the same for his scope of work.

31) In the event the computerized E-store/SOMS is inoperative for any reasons, the Contractor shall take delivery of materials from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer. All these records however shall be updated in the E-store/SOMS as and when the E-store/SOMS is reactivated/ normalized.

32) Gases like argon, oxygen, acetylene etc that are required for erection related activities shall be arranged by the Contractor at his cost. The supply should accompany test certificate for the batch indicating individual element 'ppm' level and overall purity level.

33) 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.

34) 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.

35) Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.

36) 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.

37) 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. 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 tools etc.

38) The consumables (welding electrodes, special T&Ps etc), commissioning spares and erection material spares released in mentioned PGMAs and other similar items are not billable. However, certain spare items when actually erected as a part of permanent equipment shall be paid as per agreed payment terms as applicable. The decision of BHEL Engineer in this regard shall be final and binding on contractor.

39) 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.

40) 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 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.

41) The contractor's work shall not hinder other work, either underground 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.

42) Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

43) Contractor at his cost shall lay all necessary temporary piping including cutting and edge preparation, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL.

1.2.71. SITE INSPECTION

1. The owner / employer 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 / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.
2. BHEL / Customer 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 customer / BHEL.
3. Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

1.2.72. DOCUMENTATION

1. Contractor shall be supplied with two extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copies with Red ink all the changes / deviations / alterations etc. carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.
2. After successful completion, testing and commissioning of installation work, as built drawings / documents if any, in line with the actual work carried out as per site routing drawing shall be submitted by the contractor as agreed for the project.

1.2.73. AS BUILT DRAWING:

After successful completion, testing and commissioning of installation work, Purchaser's drawings / documents shall be updated in line with the actual work carried out and as built drawings / documents shall be submitted by the contractor as agreed for the project. Contractor shall be supplied with one extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copies with red ink all the changes / deviations / alterations etc., Carried

out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

1.2.74. PLATFORMS, CROSSOVERS & CANOPIES

Platforms, ladders, crossovers and canopies shall also be provided at places where it has not been shown in drawings but if felt necessary by site engineer.

Contractor has to fabricate and install canopies for all outdoor pumps and motors, actuators, lube oil units, control valves and at places as instructed by BHEL Engineer etc. Platforms, ladders, crossovers and canopies shall have to be fabricated from raw materials supplied by BHEL and erected by contractor as per instruction of BHEL and shall be paid as per accepted tonnage rate for supports/structures.

1.2.75. STATUTORY APPROVAL

Necessary approval for drawings, documents, Load Testing, license of hoists, Misc cranes, Compressor House, different buildings erected by bidders has to be arranged for getting statutory fitness certificates, drawings/documents from Statutory agency/Third party inspectors without any extra commercial implication on BHEL treating as normal scope of work.

Contractor has to arrange sufficient manpower (fitters, electricians with supporting helpers) and T&P /other resources with sufficient testing instruments, IMTE/MMD for erection and commissioning of these systems without any extra commercial implication on BHEL treating as normal scope of work.

It shall be the responsibility of the Contractor to obtain the all necessary approvals/permits from the inspection/regulatory authorities etc. on behalf of the Employer, as may be required for erection, testing and commissioning etc. As called for under the statutes, regulations and the safety codes, all such documentation submission and taking necessary approval shall be the responsibility of contractors. Necessary approval is required from statutory authorities for the entire work.

1.2.76. SUPPORT FOR HANDING OVER OF T&P, SPARES TO BHEL/CUSTOMER, DIVERSION TO OTHER BHEL SITES/UNITS

Vendor will assist in handing over of Special T&Ps for Erection/commissioning which were issued to them free of charge for returning to BHEL /Customer store.

1.2.77. DEWATERING

General dewatering shall be arranged by BHEL. However specific dewatering specially in CW Pit and underground trenches for the erection of the under-ground piping and other related erection areas of vendor has to be carried out by vendor by deploying sufficient no. of pumps (diesel/electric). In case of non-deployment and leading to stoppage of work, BHEL shall deploy and all associated expenditure shall be recovered from the vendor with overhead.

1.2.78. HOUSEKEEPING/AREA CLEANING

The contractor has to do area cleaning on every date on daily basis. Noncompliance of the above cleaning shall call for penal recovery limited to Rs.2000.00 on each instance and at the same time, cleaning of the area shall be done by BHEL at actual cost incurred plus 10% overheads basis. No excuses on this above account shall be entertained by BHEL on whatsoever account. Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity at various work fronts.

1.2.79. APPROACH PLATFORMS, FIXTURES

Steel items like angles, scaffoldings for erection of bracings, Tie beams are to be arranged by vendor for structural erection treating it as normal scope of work without any cost implication on BHEL.

1.2.80. ASSISTANCE DURING COMMISSIONING OF EQUIPMENT, SYSTEM, ACTUATORS FOR VALVES (MOTOR OPERATED/PNEUMATIC)

Agency has to give assistance for commissioning during initial period and subsequently during unit operation during stabilization period/trial run/PG Test. For this purpose, items erected by agency has to provide manpower, other resources, diesel, other consumables, scaffoldings, Other T&Ps as required from time to time. These types activities will be repetitive in natures for no. of times and in cases dismantling, reinstallation of items/parts has also to be done till handing over of unit to customer. During case of dismantling /reinstallation logistic supports like Tyre mounted crane/Crawler Crane/crane/truck/trailers as applicable including manpower are to be arranged by vendor. These types of activity is treated as vendor's normal scope of work without any extra commercial implication on BHEL.

1.2.81. All relevant provisions/responsibilities of contractors as mentioned in any of the chapter of this specification (same or different chapter) shall also be applicable, mutatis-mutandis, to any other chapter of this specification.

1.2.82. **SUGGESTED GENERAL SEQUENCE FOR ERECTION OF CCW PIPES.**

CW PIPES SUPPLY TO SITE BY BHEL

i. **Pipe Size: CW pipes of NB 5100 are supplied in lengths of 2.5 m (approx. 7.9 MT each) and few pipes with length of 3.0/3.9/4.1/5.0 m.**

ii. **Testing Status: 100% RT is carried out for the Shop weld joints and are not hydro tested at shop. Hydro test of shop joints is to be necessarily carried out at site and is included in the scope of works of this contract.**

SUGGESTED CCW PIPING ERECTION SEQUENCE

1. Pre-Assembly of Pipes

i. Pipes to be pre-assembled at designated pre-assembly yard (near BHEL stores/site as per feasibility).

ii. Pipes mounted on rollers and assembled in 03/04 segments (approx. 24/32 MT total weight).

iii. Fit-up by SMAW and welding to be carried out by SAW process.

iv. Welds subjected to NDT as per QAP.

2. Cement Mortar Lining (CML) - Pre-Erection

Cement mortar lining shall be applied on external and internal surfaces, leaving shop weld and field weld joint areas uncoated.

3. Shifting to Site

Pre-assembled segments (03/04 nos., ~29/38 MT each with CML) to be shifted from pre-assembly yard to erection site using suitable trailer.

4. Foundation Preparation

PCC and bottom RCC slab shall be constructed for pipe placement. Weld/Back Gouge pit shall be provided as per the erection joints for hydro test inspection.

5. Erection at Site

Pipe segments (~ 29/38MT each) to be erected using BHEL crane of higher capacity. Crane radius and lifting plan to be confirmed before execution based on the SWP /JHA.

6. Hydro Testing

i. After erection and welding, blank plates/dished ends to be welded.

ii. Hydro test to be conducted for the entire pipeline covering all shop weld and field weld joints.

iii. Pressure and duration as per approved test procedure.

7. Post Hydro Test Lining

After clearance of the HT inspection, in-situ cement mortar lining will be applied to the field / Erection weld joints and shop weld joints. Balance CML to be carried out at all shop and field weld joints (external) including internal lining.

8. Pipe Encasing & Culvert Section Works

i. Encasing shall be constructed all around the erected pipe.

ii. In culvert sections: construct side walls/ fill sand, and cast top slab.

The contractor may propose an alternate erection sequence, which shall be permitted to be implemented upon approval from BHEL.

1.2.83. SPECIFIC EXCLUSION

The following works are specific exclusions from the scope of work under erection, testing & commissioning of tender specification-

i. Civil Works related to excavation of CW Piping System.

ii. Civil works except to the extent specifically indicated elsewhere in this tender.

iii. All electrical and control & instrumentation items except those specified elsewhere in these specifications.

iv. Erection and Commissioning of CW Pumps, ACW Pumps.

v. Electrical & C&I items of handling system.

vi. Pneumatic copper tubing and fittings thereof.

NOTE:

FOR FURTHER DETAILED SCOPE OF WORKS, REFER RELEVANT CHAPTERS IN THIS BOOK

VOLUME-IA PART – I CHAPTER – III

FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR/ BHEL

SCOPE MATRIX

Sl.No	Description PART I	Scope to be taken care by		Remarks
		BHEL	Bidder	
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 NPCIL. Location will be finalized after joint survey.
b	Open space for storage/T&P (as per availability within project premises)	Yes		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 SUCCESSFUL BIDDER'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	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	At bidder's own cost. Contractor to Refer Annexure-5 for the Guidelines for the Labour Colony.

Sl.No	Description PART I	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.2.0	**ELECTRICITY**			
1.3.1.2.1	**Electricity for construction purposes**			Chargeable See clause 1.3.5
a	Single point source (in general)	Yes		Chargeable See clause 1.3.5
b	Further distribution for the work to be done which include supply of materials, energy meter, protection devices and execution		Yes	At bidder's own cost
1.3.1.2.2	**Electricity for the office, stores, canteen, labour colony, etc. of the bidder (chargeable) 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
c	Duties and deposits including statutory clearances for the above		Yes	At bidder's own cost
d	Demobilization of the facilities after completion of works		Yes	At bidder's own cost
1.3.1.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc. on the above lines**		Yes	At bidder's own cost
1.3.1.3.0	**WATER SUPPLY**			
1.3.1.3.1	**For construction purposes:**			
a	Making the water available at single point or two points (Free of cost)	Yes		Refer clause 1.3.6
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost
1.3.1.3.2	**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

Sl.No	Description PART I	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.4.0	**LIGHTING**			
1.3.1.4.1	For construction work (supply of all the necessary materials) • At office storage area • At the construction site / area • At the labour hutment		Yes	At bidder's own cost
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) • At office storage area • At the construction site /area • 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, email etc (min 2 Nos of PC & Printer) – 2 Data entry operator with computer knowledge		Yes	At bidder's own cost
1.3.1.6.0	**COMPRESSED AIR WHEREVER REQUIRED**			
1.3.1.6.1	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc.		Yes	At bidder's own cost
1.3.1.6.2	Installation of above system and operation & maintenance of the same		Yes	At bidder's own cost
1.3.1.6.3	Supply of the all the consumables for the above system during the contract period		Yes	At bidder's 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 equipments and consumables (T&P, Consumables etc.)		Yes	At bidder's own cost
1.3.1.8.0	**DEMOBILIZATION OF ALL THE ABOVE FACILITIES**		Yes	At bidder's own cost
1.3.1.9.0	**Arranging of gate pass for workers from M/s NPCIL which requires Police verification certificate, Medical certificate and copy of Aadhaar card as per NPCIL procedure**		**YES**	At bidder's own cost

Sl.No	Description PART II	Scope to be taken care by		Remarks
		BHEL	Bidder	
	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		Shall be provided progressively
1.3.2.1.2	Drawings for construction methods	Yes	Yes	In consultation with BHEL
1.3.2.1.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site.		Yes	Changes are to be marked in drawing & handover to BHEL on completion of work.
1.3.2.1.4	Shipping lists etc for reference and planning the activities	Yes		
1.3.2.1.5	Preparation of site construction schedules and other input requirements as per Form-14		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 order to achieve the end dates and other commitments	Yes	Yes	
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	
1.3.2.1.10	Preparation of Fabrication shop and preassembly bay as per NPCIL requirement		Yes	Materials required for preassembly shall be in agency scope. However, if available, BHEL may provide such material on free returnable basis, which shall be returned without any damage.

1.3.3. LAND FOR SITE OFFICE & LABOUR COLONY

1.3.3.1. Availability of land within plant boundary is very limited and the contractor has to plan and use the existing land considering the use of land by other Civil /mechanical/ electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erection's agencies. BHEL shall provide free of charge limited open space for office, storage shed and laydown area as and where made available by Customer. It is the responsibility of the contractor to construct facilities such as sheds, fabrication/Preassembly yard, provide all utilities and dismantle and clear the site after completion of work or as and when required, as a part of his scope of work.

1.3.3.2. 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 contractor's stores shed.

1.3.3.3. Location and area requirement for office shall be discussed and mutually agreed to after award of work at site. Construction of necessary stores and storage of materials shall be in contractor's scope. Security of stores & work place shall be in Contractor's scope.

1.3.3.4. Availability of land is very limited and the contractor has to plan and use the existing land considering the use of land by other contractors. Land will be allocated with certain time frame and to the extent available/ considered necessary, and will be reviewed by BHEL depending upon the area availability. The contractor will be responsible for handing back all lands, as handed over to him by BHEL.

1.3.3.5. BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements.

1.3.3.6. Contractor has to make his own arrangements for labour colony at his cost. 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. The Contractor shall provide adequate arrangements for electricity requirements for labour colony.

1.3.3.7. Also, contractor shall establish workers canteen at site for the use of labourers engaged by him.

1.3.4. Labour and Staff Colony:

Following are in the Bidder's scope of work for labour & staff colony:

1.3.4.1. Labour colony is to be developed by bidder for all the labours required to be deployed for the works. All labour colony set-up is to be developed as per attached drawing and in compliance of statutory requirements.

BHEL has provided Guidelines in Annexure-5 for the Establishment of Labour Colony which shall be followed by the contractor.

Contractor shall construct/arrange Labour Hutment as per minimum specifications mentioned in the attached drawing, for which no separate payment shall be made by BHEL. Modifications if any proposed in the Hutment shall be in consent with BHEL/Customer.

Ownership of the labour hutment shall be of the contractor and contractor shall keep BHEL indemnified from any statutory obligations/ legal compliances w.r.t. labour hutment establishment during as well as after the completion of contract.

1.3.4.2. In case labour hutment is not completed as per the drawings and specification and any penalty is imposed by Customer, same shall be recovered from contract's RA Bill.

Rectification and Corrections in labour hutment as pointed out by BHEL/Customer shall be bidder's responsibility and any cost incurred by BHEL to complete the works, in case of non-compliance of the instructions, same shall be recovered from his RA Bills along with 5% overheads.

1.3.4.3. Land for labor colony shall be arranged by Contractor at their own cost as per availability outside project area preferably within 5 Km, Necessary levelling/dressing of land shall be done by the contractor. All arrangement for electricity and drinking/service water to be arranged by the contractor within his quoted price. All expenses towards installation of transformer, depositing requisite fees etc if required shall be borne by vendor.

1.3.4.4. Development of Bidder's temporary staff colony and labour colony having adequate no. of Bio Urinals.

1.3.4.5. All Civil and Structural work associated with drinking and service water for Bidder's labour and other personnel at the work site/colony/offices including pump houses, pipes, overhead tank, tube wells etc.

1.3.4.6. Providing and maintaining facilities for safety, welfare, drinking water and sanitation, hygiene, Half-yearly health check-up etc. for construction workers at their workplaces as well as at labour & staff colonies.

1.3.4.7. Development and maintenance of above facilities for construction workers deployed by the Contractor shall solely rest with the Contractor.

1.3.4.8. Installation of necessary amenities- and temporary infrastructure for construction activities at Project site locations.

Following are the minimum amenities to be provided by the bidder within the quoted price including removal/disposal of the same in environment friendly manner after its intended use/completion of scope of work:

i. Labour rest sheds near work spot.
ii. Canteen facility creation.
iii. Drinking water facility.
iv. Labour Bio toilets near work spot in sufficient nos. with regular cleaning & maintenance arrangement.
v. Labour colony should have all hygienic condition, dining hall, toilets, proper sewerage system, good drinking water arrangements.
vi. Regular fogging in the work place and labour colony to avoid mosquitoes.
vii. Royalty challan (if applicable) and statutory documents shall be submitted along with RA Bills for processing of Bills.

1.3.5. CONSTRUCTION POWER / ELECTRICITY:

1.3.5.1. In general, Construction power will be provided to the contractor at prevailing rates of NPCIL on chargeable basis at one single point by BHEL. The contractor has to provide necessary meter for measuring the power consumption. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc. However, based on request of Contractor and requirement of project, BHEL Site in charge, at his discretion, may provide construction power at multiple point (as close to work area as possible), on chargeable basis, for smooth execution of the work at site. If, BHEL provides electricity at more than one point (as close to work area as possible), it will be responsibility of the contractor to provide all the support necessary for enabling BHEL for extending such provision to contractor. The contractor has to provide necessary meter for measuring the power consumption. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc.

Prevailing rate of NPCIL for Construction Power Supply is Rs. 5.00 per kWh.

1.3.5.2. Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at his cost. On account of the contractor's failure in maintaining the power

factor at 0.9, penalty if any, levied by customer will be recovered from contractor's bills. Currently, this penalty will be surcharge @ 1% of energy charges for every 0.01 fall in average power factor.

1.3.5.3. The contractors/ consumers shall install suitable power factor improving device and a trivectometer for calculation of Power Factor with Maximum Demand. In case contractor fails to provide trivectometer. NPCIL/BHEL will consider P.F. at their connection as 0.6.

1.3.5.4. The bidder irrespective of connected load must have following minimum Electrical protection for Over current, Earth fault and Short circuit on their panel. Bidders have to provide soft starters for motor loads 100 KW and above.

1.3.5.5. 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 tenderer / contractor.

1.3.5.6. The bidders shall follow AERB safety guide /site procedures of NPCIL.

1.3.5.7. 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.

1.3.5.8. In case of non-availability of construction power, the contractor shall make their own arrangements for their construction power/electricity requirements to have uninterrupted work. Also, as there are bound to be interruptions in regular power supply, power cut/load shedding as in any construction sites, contractor should make his own arrangement for alternative source of power supply through deployment of adequate number of DG sets at their cost during the power breakdown /failure to get urgent and important work to go on without interruptions. No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure in providing electricity.

1.3.5.9. It shall be the responsibility of the contractor to provide and maintain their complete electrical installation with due regard to safety requirements at site. All cabling and installations shall be subject to the approval of the Engineer/ Safety Engineer and shall comply in all respects to the appropriate statutory requirements.

For this purpose, the contractor shall provide full specifications of the equipment and the layout drawings. Approval of the Engineer does not absolve the contractor from complying with any or all other conditions laid down herein.

1.3.5.10. The power supply shall be subject to all such restrictions and regulations currently in existence and as may be enforced by the NPCIL/ Government/ State Electricity Board/ or by any other competent authority from time to time for which the contractor will not have any claim whatsoever.

1.3.5.11. Electricity for labour colony shall be arranged by the contractor at his cost.

1.3.5.12. Bidder has to make his own arrangement at his cost till the construction power by BHEL is established.

1.3.6. CONSTRUCTION WATER

1.3.6.1. Boreholes for drawal of water shall not be permitted in the plant area for KAIGA-5&6.

1.3.6.2. Water source for Construction Water (Raw Water) is available within 2 KM from project site. Contractor shall make his own arrangement for drawing water from this source.

1.3.6.3. Water (Raw water) required for construction purposes will have to be drawn by the contractor and contractor has to make their own arrangement for further distribution by arranging required pipes, valves, pumps, etc. The Contractor shall make adequate arrangement for storage of sufficient quantity of water required for construction work.

1.3.6.4. No charges shall be levied by BHEL/NPCIL for the water drawn and consumed. Any new Royalty or other statutory taxes if any imposed by statutory Authority during the currency of contract shall be reimbursed by BHEL on submission of documentary proof of same.

1.3.6.5. In case of non-availability of water, the contractor shall make their own arrangements of water suitable for construction purpose to have uninterrupted work. No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure for providing water supply.

1.3.6.6. Contractor has to make his own arrangements for all water requirement for his labour accommodation at his cost. The Contractor shall make his own arrangement for further necessary distribution of the above at his cost.

1.3.7. DRINKING WATER:

Contractor has to make his own arrangement for drinking water at his cost

1.3.8. LIGHTING FACILITY:

Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the working area and contractor's material storage area etc. at his cost. Illumination LUX value to be maintained as per the requirement/standards.

1.3.9. There can be more than one location of open storage yard, Closed shed/ Semi Closed shed. Bidder shall make his establishment accordingly for material handling and MM services.

1.3.10. Furnishing all labour, materials, supervision, construction/Material Handling plans, equipment, supplies, transport, to and fro the site, fuel, electricity, water and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handling over.

1.3.11. Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that is required for allworks including temporary works.

1.3.12. CONTRACTOR'S OBLIGATION ON COMPLETION

On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions 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.

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 major T&Ps and other 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 Numbers of T&Ps to be deployed at site shall be decided with respect to Monthly plan and review formats (F-14) based on site requirement. Below given quantities of T&Ps/ Equipment are tentative and not exhaustive for initial planning purposes by the bidder.

1.4.5 **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.	Mobile / Tyre Mounted Crane – 40 MT or above	01 no	As per site requirement	Crane to be made available as per instruction from BHEL Site in-charge. Tentative schedule: From Start of CW Piping Erection till readiness / completion
2.	Pick & carry type tyre mounted mobile crane (Farana) - 12 MT or above capacity. Note: Hydra is not allowed.	As per site requirement		To be deployed as per work requirement and as per instruction of BHEL Engineer.
3.	Trailer with prime mover - 40 ft with carrying capacity of minimum 30 T or above capacity	01 no	As per site requirement	To be deployed as per work requirement and as per instruction of BHEL Engineer.
4.	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.

Sr No	Description of Equipment's	Deployment Period		
		Tentative Quantity	Tentative Deployment	Tentative Duration
5.	SAW welding machine with suitable fixtures.	As per site requirement		To be deployed as per work requirement and as per instruction of BHEL Engineer.

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
3	DG set	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

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
17	Cement mortar lining / Painting equipment sets complete with compressor, hopper, screen, blasting hose pipe, nozzle airless / conventional spray.	As per requirement	As per requirement	As per requirement
18	Holiday Testing Machine	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

B.	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
2.	Fall Arrester 'Rope grab fall arrester' & anchorage line. Anchorage Line: 14mm- 16 mm diameter, three strand twisted Polyamide rope. Rope Grab fall arrester: Openable & Guided type Fall Arrestor (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 Retractable Fall arrestor Block (Range 6 Mtr to 15 Mtr)	As per Requirement
3.	**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).	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	**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	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

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

1.4.7 In addition to the above, any other tools and plants required for execution of the above work are in contractor's scope.

1.4.8 APR (As per Requirement)- Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer.

1.4.9 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.

1.4.10 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.

1.4.11 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.

1.4.12 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 (Farana) of required capacity.

1.4.13 Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor's account.

1.4.14 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.

1.4.15 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.

1.4.16 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).

1.4.17 Contractor has to arrange slings of all sizes for completing the works covered under these specifications.

1.4.18 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.

1.4.19 All the T&Ps deployed by the bidders 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.

1.4.20 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".

1.4.21 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.

1.4.22 Crane operators deployed by the contractor shall be tested by BHEL before they are allowed to operate the cranes.

1.4.23 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.

1.4.24 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.

1.4.25 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.

1.4.26 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.

1.4.27 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.

1.4.28 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.

1.4.29 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.

ii. Operator shall have latest physician's certification for their physical fitness in vision with/ without lenses & adequate hearing with or without hearing aid.

1.4.30 In construction projects of this magnitude all the areas/ approaches might not be ready. In such cases consolidation of ground and arrangement of sleepers/ sand bag filling, construction of Temporary approach road for all their working area etc. for safe operation/ movement of T&P, etc. shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.

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

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

In order to meet the site requirement and in line with monthly plan and review format (F-14), Contractor has to mobilize their T&Ps and make it available at site for required activities.

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)'.

VOLUME-IA PART – I CHAPTER – V

T&PS PROVIDED BY BHEL ON SHARING BASIS

1.5.1 List of T&Ps to be made available by BHEL to contractor free of hire charges on sharable basis are as below:

S.no	Description	Quantity	Remarks
1	Crawler / Mobile Crane (75 MT / 100 MT / 270 MT) Capacity or above over and above vendor deployed crane.	As per requirement	Based on work requirement, Cranes other than mentioned in Chapter-IV, which shall be required to complete the package shall be provided by BHEL. The Capacity of such Crane, Quantity and duration of deployment shall be drawn mutually during the review meeting held at site. BHEL decision on deployment of crane other than mentioned in Chapter-IV shall be final.

Note:

i. The cranes may be BHEL owned or may be obtained on hiring basis including operating and maintenance crew.

ii. BHEL owned / hired cranes shall be provided on sharing basis with other agencies / contractors of BHEL.

iii. Operator and O&M for BHEL owned/hired crane will be provided by BHEL (including extended hours), free of charge.

iv. Contractor shall provide the fuel for BHEL (Hired/owned) provided cranes for his use.

v. Contractor shall make necessary arrangements like laying of special sleeper beds and steel plates (Plates for BHEL owned/ hired cranes shall be provided by the BHEL), assembly and dismantling of heavy attachment, boom, jib etc. for movement and operation of the crane. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work. Levelled & reasonably compacted area will be provided by BHEL/customer for the movement of BHEL cranes. If required, Further Consolidation of the ground with hard-crusting of Area required for movement of crane

(including civil work with material) for placing crane for operation shall be facilitated by BHEL. Necessary plates required for marching operation shall be provided by the BHEL only for BHEL owned/hired cranes.

1.5.2 For all BHEL's crane, BHEL shall provide crane operator, free of charges. Fuel to be provided by the contractor within the quoted rate.

1.5.3 The day-to-day and routine maintenance including replacement of spares for the BHEL T&Ps will be carried out by the contractor at his own cost. However, BHEL shall supply spare parts free of charges for normal wear and tear only.

1.5.4 Cranes provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor. Cranes will be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose. Augmentation of BHEL T & P under special circumstances shall be discretion of BHEL.

VOLUME-IA PART – I CHAPTER-VI

TIME SCHEDULE

1.6.1 TIME SCHEDULE:

1.6.1.1 The entire work of CW piping, as detailed in the tender specification shall be completed within **18 (Eighteen)** months from the "START OF CONTRACT PERIOD".

1.6.1.2 The materials are likely to be received in stages during the period.

1.6.1.3 The work shall be commenced on the mutually agreed date between the bidder and BHEL engineer. The decision of BHEL in this regard shall be final and binding of the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

1.6.1.4 If work is not completed with-in the contract period the contract may be extended at the discretion of BHEL.

1.6.2 MOBILISATION

After issue of LOA (though Fax/courier/email) the contractor shall report to the Construction Manager/Site In-Charge of BHEL at site within seven (07) days from date of LOA and make a Kick of meeting (KOM) for mobilization of manpower, T&Ps and date of start of work and detailed completion program etc. Contractor shall submit detailed mobilization plan to start work within 25 days from date of LOA; unless instructed otherwise by BHEL in writing.

The activities for Erection etc. shall be started as per directions of Construction Manager of BHEL. 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.

1.6.3 COMMENCEMENT OF CONTRACT PERIOD

Pre-assembly/Erection/placement of the first major permanent equipment / component covered in the scope of these specifications, (whichever is earlier as decided by BHEL) shall be recognized as "Start of contract period".

Date of Start of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy, the decision of BHEL engineer is final.

Based on the availability of civil foundations, drawings and material from BHEL, contractor may have to advance the erection activity after getting clearance from Construction Manager, or the erection activity may get delayed due to site conditions.

The contractor shall have to mobilize his resources before the start of contract period for preparatory work like taking over of Foundations, drawing & materials. The contractor shall complete all the works in the scope of this contract within the contract period. Pending points identified by the customer/BHEL during the execution of the contract are to be liquidated during the contract period itself.

1.6.4 SCHEDULE OF COMPLETION:

The contract period for completion of entire work under scope shall be as mentioned hereunder, from the "START OF CONTRACT PERIOD" as specified earlier for completion of the entire work in Package.

S.No.	Package	Contractual Schedule (Month)
1.	Erection, Testing and Commissioning of CW Piping.	18 Months

The schedule of important milestones is as follows:

SL No.	Milestones	Tentative Schedule w.r.t date of start of work	
		Unit#5	Unit#6
1	Pre-assy / Erection Start CW Piping.	1st Month	
2	Erection Completion with 50% Welding and NDT Completion.	5th Month	8th Month
3	Readiness for hydro test (Completion of Erection & Welding of all joints along with NDT & Supports)	9th Month	12th Month
4	Completion of Hydro Test.	10th Month	13th Month
5	Completion of Cement mortar lining / Painting	14th Month	17th Month
6	Completion of contractual obligations	18th Month	

The above schedule is only tentative. The above schedule shall be advanced, if there are requirements to advance the project to meet the project requirement. No extra payment whatsoever shall be paid on this account.

In order to meet the above schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, Contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL Engineer w.r.t. monthly plan and review format (F-14).

1.6.5 INTERMEDIATE MILESTONES:

Two Major Intermediate Milestones are identified as M1 and M2 above.

S.no	Milestones for Package	Tentative Schedule	Intermediate Milestone
1	Erection Completion with 50% Welding and NDT Completion (Unit#6)	8th Month	M1
2	Completion of Hydro Test (Unit#6)	13th Month	M2

1.6.6 PROVISION OF PENALTY IN CASE OF SLIPPAGE OF INTERMEDIATE MILESTONES:

In case of slippage of Two Major Intermediate Milestones, mentioned as M1 & M2 above, delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to F-14.

i. In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld.

ii. In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value, will be withheld.

iii. Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone.

iv. Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (corresponding RA Bill) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.

v. Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion/ closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.

vi. In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery.

vii. Contractor shall make all possible efforts to expedite the activities, in case of delay of any intermediate milestone, to maintain overall project completion schedule.

1.6.7 The contractor shall submit and a detailed area/structure wise L3 schedule within 25 days from date of LOA, in consultation with BHEL, based on the tentative schedule provided as above. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Bidder shall submit L3 schedule in MS Projects and excel to meet the agreed project schedule covering various mile stone activities and their split-up details such as mobilization, procurement of materials & erection activities. This schedule shall also clearly indicate the interface facilities / inputs applicable in package. Bidders shall submit Resource deployment plan Area wise with detail program in line with above schedule in the form of Bar Chart/ MS project planner along with their offer.

1.6.8 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.

1.6.9 COMPLETION OF WORK AND COMMENCEMENT OF GUARANTEE PERIOD

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 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 12 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.

VOLUME-IA PART – I CHAPTER-VII

TERMS OF PAYMENT

1.7.0 The progressive payment for Erection and commissioning on accepted price of contract value will be released as per the break up given hereinafter:

Payment Terms for Package - Payment shall be regulated progressively as mentioned in Table 1.7.1 & 1.7.2 below.

Progressive Payment against monthly running bills shall be made up to 95 % of the value of the erected Pro-rata as per SL no 1.7.1.1 to 1.7.1.9 of the following table.

Sl No.	Sub Packages ---------- >	CW Piping (CS)
	Rate schedule Identifier --->	**1A,1B,1C**
1.7.1	**PRO RATA PAYMENTS (95%)**	
1.7.1.1	On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position)	10%
1.7.1.2	Placement in position	15%
1.7.1.3	Alignment	15%
1.7.1.4	Welding/bolting/fixing/Torque check/tightness check of bolts	20%
1.7.1.5	Completion of non-destructive examination –as per approved FQP/EWS (if not applicable, then this portion to be paid along with S.No. 1.7.1.4)	10%
1.7.1.6	Hangers & supports etc wherever necessary as per drg (if not applicable, then this portion to be paid along with S.No. 1.7.1.4)	5%
1.7.1.7	Hydraulic test/pneumatic test	10%
1.7.1.8	Completion of Cement Mortar Lining / Painting (Outer Surface) as applicable of the Piping (if not applicable, then this portion to be paid along with S.No. 1.7.1.2)	5%
1.7.1.9	Completion of Cement Mortar Lining / Painting (Inner Surface) as applicable of the Piping (if not applicable, then this portion to be paid along with S.No. 1.7.1.2)	5%
	TOTAL FOR PRO RATA PAYMENTS (TOTAL 95%)	**95%**
1.7.2	**STAGE PAYMENTS (5%)**	
1.7.2.1	Area cleaning, temporary structures cutting/removal and return of scrap	1%
1.7.2.2	Punch List points/pending points liquidation	1%
1.7.2.3	Submission of 'As Built Drawings' (If not applicable the same shall be clubbed with 1.7.2.2)	1%
1.7.2.4	Material Reconciliation	1%
1.7.2.5	Completion of Contractual Obligation	1%
	TOTAL FOR STAGE PAYMENTS (TOTAL 5%)	**5%**
	TOTAL (1.7.1 + 1.7.2)	**100%**

1.7.3 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.

1.7.4 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 alongwith 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
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.

1.7.5 <u>Documents required for Final Bill:</u>

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.

1.7.6 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.

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.

1.7.7 Secured advance/Mobilization advance is not applicable for this tender.

1.7.8 Retention amount is applicable as per GCC.

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

1.8.1 All taxes and duty other than GST & Cess and BOCW Cess

1.0 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.

1.8.2 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 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)
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

GSTN of BHEL: ----------

(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, along with the payment due to the contractor in the RAB, upon receipt of a valid tax invoice. However, if the Vendor/Contractor fails to comply with the GST compliance requirements specified below for any prior invoice, BHEL reserves the right to recover an amount equivalent to the reimbursed GST from subsequent invoices as a corrective measure for statutory non-compliance. Furthermore, the GST amount claimed in any subsequent invoices will be withheld until the statutory compliance for the preceding invoice is ensured.

However, In the case of the Vendor/Contractor's final bill, or in case where single invoice is submitted for the entire contract, BHEL will withhold an amount equivalent to the GST claimed from the invoice value towards pending statutory compliance. This withheld amount will only be released once Vendor/Contractor satisfies the below specified GST compliance requirements.

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 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.

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.

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.

1.8.3 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

1.8.4 New Taxes/Levies –

4.1 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.

4.2 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.

1.8.5 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.

1.8.6 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.

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.

VOLUME-IA PART – I CHAPTER – IX

BILL OF QUANITY (BOQ)

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

Pre-assembly, erection, welding, NDT, Hydro testing, and commissioning of Cooling Water (CW) piping and all associated system piping. The scope also includes supply and application of cement mortar lining, painting as applicable, handling of materials at BHEL/Client's stores/storage yard and transportation to the site of work at 2 × 700 MWe Kaiga Atomic Power Project – Units 5 & 6, Uttara Kannada District, Karnataka as per the tender specification.

Sr. No	Description	Total Weight (MT) (Approx) Unit 5&6	No of Field Joints (Approx) Unit 5&6	Underground / Overground	Rate Schedule
1	**Pipe OD5100x25** - IS3589 Fe410 from IS2002 GR.2 PLATES PIPE LENGTH – 2.5 MTR (Approx)	1000	172	UG	1A
2	**Fittings of NB5100**-IS2002 GR.2 / SA515GR70 (UEQT NB5100/NB1800- 24 Nos, UEQT NB5100/1200- 02 No, MANHOLE ASSY NB5100/NB2300/NB1000-04 Nos, MANHOLE ASSY NB5100/NB1000- 04 Nos, MAN HOLE ACCESS SHAFT ASSY NB5100/NB2350-04Nos, Dished End NB5100-04Nos)	650		UG	1B
3	**Pipes OD1829x14**-IS3589 Fe410 from IS2002 GR.2 PLATES **& Fittings** IS3589/IS2002 GR.2/SA515GR70 OF NB1800 (MITRE BENDS, UEQTS, MAN HOLE ASSY, SADDLE SUPPORTS, PUDDLE FLANGES, SLEEVE PIPE), BUTTERFLY VALVES, EXPANSION JOINTS, NOZZLE, SUPPORTS, AIR RELIEF VALVES, DRAIN PIPES & VALVES ETC	990	320	UG & OG	1C
	TOTAL	**2640**	**492**		

Note to weight schedule:	
1	The weights/Quantities/dimensions mentioned above are approximate and liable to vary as per design consideration. There will be change in weight, description etc. However, payments will be made for the tonnage actually erected at the quoted rate. Quantity Variation will be dealt as per General Conditions of Contract.
2	A material breakup under category indicated under each SL No of above table are indicated in the relevant chapter of this tender specification, but the contractor is required to erect actual tonnage which may be necessary to complete the work in all respects as detailed in the tender specifications, for which payments shall be released based on agreed rates. The weights and dimensions of material shown are approximate and are liable to vary.
3	Besides the weight schedule, there is likely hood of addition product groups integral to Piping etc. and its aux. The quoted rate shall be applicable for such product groups also. There may be variation or addition of PGMAs, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted / accepted rate in the respective category at the discretion of BHEL. Decision of BHEL Engineer shall be final and binding to the contractor in this regard.
4	Rate Schedule Identified are based on envisaged material specification. Payment shall be made on the basis of material specification of actual material received and erected at site. BHEL's decision in this regard shall be final.
5	Payment for control valves / flow nozzles / orifices & other valves and fittings will be made as per the quoted / accepted tonnage rate of respective piping category in which these materials is installed.

Weight of BOQ for CW Piping System

System	MARK NO./DESCRIPTION	UOM	QTY	Total Weight in MT	Rate Schedule
CWP	PF PIPE OD5100X25-IS2002GR2; L=2.5M	Nos	122	1000	1A
CWP	Fittings of NB5100, L= 3MTR TO 5MTR (Approx)	Nos	42	650	1B
CWP	Pipes OD1829x14 & Fittings L=1.7MTR TO 10MTR (Approx)	Nos	216	610	1C
CWP	1800 NB - Expansion Joints, Butterfly valves, Nozzles, Air relief Valves, Drain pipes & valves etc (Approx)	Nos	74	380	1C

Note: Detailed PGMA wise weight of BOQ shall be shared during commencement/execution of work.

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.

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 contactor 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 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 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 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 tools etc.

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 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 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 drawls 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.

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

VOLUME-IA PART – I CHAPTER - XI

MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

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.)

1.11.1 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation / location, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. 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.

1.11.2 The storage yard is located within the Main Plant Boundary.

1.11.3 Transportation of all items including ODC items from BHEL Store/Yard to Erection site shall be in the contractor's scope. However, in some cases, consignments including ODC may be unloaded near erection site as per space availability and site requirements.

1.11.4 For transportation of the CW Pipes (Dia 5100 MM), the contractor shall arrange proper fixtures/saddle supports and proper tying arrangements shall be in place while transportation from storage yard to pre-assembly yard/Project sites on the trailers.

1.11.5 Loading at storage yard and transporting to site, unloading at site / pre-assembly area or at working area, is in the scope of work. Required cranes for loading & unloading of materials, trailer shall be in the scope of contractor. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, sandbags which are required for temporary supporting of the components at site.

1.11.6 The equipments / 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.

1.11.7 The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.

1.11.8 Sometimes it may become necessary for the contractor to handle certain unrequited components 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.

1.11.9 Contractor shall plan and transport equipment's, components from storage yard to erection site in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. However, in specific cases "as a special case to expedite the job" the consignment received at BHEL stores can directly be diverted to the work site, as decided by BHEL, following issuance procedure of BHEL. Such direct issues shall be as per the Challan/dispatch document/LR received with the consignment. In such cases, contractor shall do unloading of materials from trucks/lorry/trailers at their own cost.

1.11.10 All materials issued by BHEL shall be stacked neatly, preserved, stored in the contractor's shed / work area above ground level by use of concrete or wooden sleepers. No materials shall remain on ground at any time. All concrete or wooden sleepers required for stacking the materials shall be arranged by contractor at his own cost within the quoted rates. However, if available, BHEL shall provide on hiring basis. 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.

1.11.11 All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

1.11.12 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered. Contractor has to arrange required fire proof tarpaulins to protect the machined components / assembled parts drawn from BHEL store before and after erection as required at their cost.

1.11.13 The contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its sub-contractors with respect to the transport of Goods, Materials and Labour to the site do not interfere with local traffic in the vicinity of the site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.

1.11.14 The contractor shall solely be responsible for the safety & security of material after it is handed over and issued to contractor by the BHEL. BHEL reserves the right to recover from the contractor any loss arising out of damage/ theft or any other causes or during verification/stacking or at any time under the custody of the contractor.

1.11.15 Open land for storage purposes shall be provided by BHEL on free of cost/as available basis for storage of materials issued to contractor (if required). Temporary barbed wire fencing (if required), as required, of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc wherever required off the land provided to agency and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel to safeguard all such materials in his custody. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. In case, loss of any materials for whatsoever reasons attributable to the contractor, then cost of such materials shall be recovered from the running bill payment with applicable overheads.

1.11.16 All surplus materials shall be returned to BHEL store. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be returned to the stores on weighment basis in consultation with BHEL Engineer and a receipt obtained for material accounting purposes.

1.11.17 Scrap materials shall be sorted category-wise and returned separately at a place directed by BHEL Engineer within the project area. Return of such materials will not be entitled for any handling and incidental charges.

VOLUME-IA PART – I CHAPTER - XII

WELDING SCHEDULE & PROCEDURES

Following points may be noted with respected to the Welding schedule

1.12.1 Erection/Final Welding Schedule of subject Project/sample shall be provided during erection if available else to be prepared by the contractor based on the details/drawings provided by BHEL. The electrode details provided along the tender and drawings are for general understanding about the scope of work and does not entitle contractor of any compensation on account of any changes in final ESW issued by BHEL during execution of works at site.

1.12.2 Preparation, submission of welding procedure specification (WPS) and conducting Procedure qualification record tests (PQR) as per relevant standards are in contractor's scope of work. In that case an under taking towards owning full responsibility for achieving the desired quality shall be given by the contractor.

1.12.3 Contractor shall prepare all the work procedures with reference to applicable codes and standards and shall submit the same for the approval of BHEL/NPCIL including WPS and PQR for the pipe welding and qualification of welders.

1.12.4 Preparation of erection procedure, WPS, method statement, HIRA, Job Safety analysis, permit to work, lifting plans, and all supporting documents as required for starting & continuation of work/job is in vendor's scope.

VOLUME-IA PART – I CHAPTER - XIII

CIVIL WORKS FOUNDATIONS & GROUTINGS

CIVIL WORKS, PREPARATION OF FOUNDATIONS, AND GROUTING OF CW PIPING SYSTEM & AUXILIARIES

1.13.1 The major civil works like excavation, compaction, sand filling & concrete encasement wherever applicable for the buried piping identified in this contract are excluded from the scope of this work. However, the widening of the trench at the weld joint area for giving free working space on each side of the pipe is included in the scope of this work. This type of incidental works is to be carried out by the contractor within quoted rates. The required coordination with civil and other agencies shall be extended by the contractor to ensure smooth execution ofworks.

1.13.2 Box cutting and excavation of earth up to the required depth and width, concreting etc., are not covered in the scope of works of this tender and shall be carried out by others on phased manner as per the site requirement and decided by BHEL site in-charge. As and when the clearance for erection of piping is given, contractor shall carry out erection work promptly without any delay and release for further civil in a phased manner as instructed be site in-charge.

1.13.3 Necessary excavation for buried pipe, Encasement with concrete, backfilling with earth, Sand filling etc is excluded from the scope of bidder and shall be done by BHEL. BHEL will release excavated front to bidder for erection of buried pipe. Dewatering with all necessary arrangement required like pumps after handing over of excavated front is under the scope of bidder. Foxholes (cutting of earth below pipe joint) for welding will be in bidder's scope. No separate payment shall be made on account of fox holes, dewatering, as detailed above. Concrete bedding / encasing is excluded from scope of work.

1.13.4 Building foundations and other necessary civil works for supporting structures, equipment's etc will be provided by BHEL / Customer. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits have to be checked and logged by the Contractor. The permanent benchmark / reference marks will have to be transferred to new locations with sufficient care to maintain the accuracy and protected / preserved with adequate care (to enable rechecking at later dates) as per BHELinstruction.

1.13.5 Minor adjustment of foundation level, dressing and chipping of foundation surfaces and blue-matching (wherever required) for of all equipments/components as per BHEL Engineers

instructions, should be done by the Contractor as part of the work. Contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations up-to 30 mm for achieving proper levels will be within the scope of work/specification.

1.13.6 It shall be contractor's responsibility to check the various equipment/component foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.

1.13.7 All temporary foundations and anchor points required for installing erection Equipment's and winches, foundations for pumps, tanks etc (until otherwise explicitly mentioned in the tender) are in the scope of Contractor. All building materials like cement, steel including re-enforcement bars, grits cements etc for such temporary foundations shall have to be arranged by the Contractor within the quoted rates. All such foundations shall be demolished and normal ground conditions restored after the usage.

1.13.8 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipment's / components based on the foundations including shear lug provisions / openings.

1.13.9 Contractor shall carry out scrapping and blue matching of embedded plates/ packers if necessary. Chipping and the leveling of concrete surfaces, fine dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of this work. Scrapping, chipping and matching shall be done so as to achieve prescribed percentage of contact between the two surfaces.

1.13.10 Complete grouting (if applicable) of structures, equipment's, including anchor/ foundation bolts, beneath base, base hollows etc, as may be applicable, is included in the scope of Contractor. Arranging all labour, building materials including cement, ordinary portland as well as quick setting – free flow - non-shrink grout mix (e.g. conbextra GP-1/GP-2/GP-3), form work, shuttering, and any other requirements is in the Contractor's scope. Contractor shall obtain approval of BHEL for cement (Ordinary Portland as-well-as quick setting – free flow- non-shrink grout mix) prior to use. Cleaning of foundation surfaces, pocket holes and anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda

washing, water washing, compressed air and other approved methods are within the scope of this specification/ work.

1.13.11 After the grouting has finally set and cured, alignment of equipment's involved shall be checked again to verify for any disturbance or any other reason. If required, de-coupling of equipment's has to be done for conducting the verification. In case any disturbance is noticed the cause, if any, shall be removed and re-alignment done as part of work.

1.13.12 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment. Packer plates should not only be blue matched with foundation but also inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineer's instructions.

1.13.13 Total grouting of the columns / equipment's including pocket grouting, grouting at the gap between foundation and base plates top surface of column / equipment's is in the scope of the contractor. All the grouting should be carried out by non-shrink cement like conbextra GP-1 / Conbextra GP-2 / GP-3 Shrinkkomp or its equivalent etc. This special nonshrink cement shall be arranged by the contractor at his cost. The quoted rate shall be inclusive of the same.

1.13.14 All equipment bases and structural steel bases and foundations pockets shall be grouted and finished as per these specifications after surface preparation unless otherwise recommended by the equipment manufacturers. The surface preparation includes soda washing of the foundations to remove oil, grease etc. to ensure proper grouting.

1.13.15 The certificates of the grout are to be submitted to BHEL. If necessary, test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.

1.13.16 All the materials required for grouting including special cements as approved by BHEL and other materials like Portland cement, sand chips, gravel etc., are to be arranged by the contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.

1.13.17 PROCEDURE FOR GROUTING: Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per the supplier's recommendation / IS standard. Copy of those recommendations is to be submitted to BHEL for records.

VOLUME – IA PART-I CHAPTER-XIV
ERECTION

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.)

ERECTION:

1.14.1 The work to be carried out at quoted / accepted rates by the contractor under the scope of these specification covers the complete work of pre-assembly, erection, welding, NDT, hydro testing, and commissioning of Cooling Water (CW) piping and all associated system piping. The scope also includes supply and application of cement mortar lining, painting as applicable, handling of materials at BHEL/Client's stores/storage yard and transportation to the site of work at 2 × 700 MWe Kaiga Atomic Power Project – Units 5 & 6, Uttara Kannada District, Karnataka.

1.14.2 Brief list of pipes/components to be erected by the contractor & approximate weight and size of individual heavy components are given under the chapter-IX (Bill of quantity) and is meant for giving general idea to the tender only about magnitude of the work involved. The components are sent in parts for convenient transportation. They are to be cleaned, assembled in stage by stage, fastened / welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.

1.14.3 CW Pipes & fittings of large dia pipes & fittings are supplied in different lengths and are generally edge prepared. If required edge preparation to be rectified/carried out by the agency, in case of minor damages caused during handling or transportation.

1.14.4 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.

1.14.5 The contractor will have to follow the instructions provided in the technical manuals, drawings, and specifications provided by BHEL to the contractor from time to time. In case of ambiguity or deviation the decision/clarification of BHEL engineer will have to be followed.

1.14.6 The work covered under this scope of work is of highly sophisticated nature requiring best quality /precision workmanship engineering and construction management. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequately trained qualified and experienced supervisory staff and skilled personnel.

1.14.7 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 affected for such excess drawls at the rate prescribed by manufacturing units.

1.14.8 All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include equipment for checking, cleaning, servicing and site fabrication.

i. Scaffolding and rigging operations
ii. Flame / electric cutting, grinding, welding, radiography and stress relieving & coating/lining inspection by HOLIDAY equipment.
iii. Fitting, fettling, filing, straightening, chamfering chipping,
iv. Scrapping, reaming, cleaning, checking, leveling, blue matching, Aligning and assembly.
v. Surface grinding, drilling, doweling, shaping
vi. Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication

1.14.9 Approach road in the vicinity of erection area only, to be maintained by Contractor.

1.14.10 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor. (As stated elsewhere in the tenderdocument)

1.14.11 Field Quality Assurance 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 customer as token of their acceptance. Payment to the contractor will be linked with the submission of these FQA log sheets.

1.14.12 In case of any class of work for which there is no such specifications as laid down in the contract such us blue matching, welding of stainless-steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.

1.14.13 Contractor has to arrange required fire retardant covering materials (tarpaulins) to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.

1.14.14 Any fixtures, scaffolding materials, approach ladders, concrete block supports, steel structures required for temporary supporting, pre-assembly, checking, welding, lifting & handling during pre-assembly and erection shall be arranged by the contractor at his cost.

1.14.15 The contractor shall erect scaffolding / temporary platforms for erection as per the guidelines of relevant IS codes. These should be of adequate capacity and shall never be over loaded. These should be replaced when not found suitable during erection work and dismantled on work completion and removed from work site. Only steel scaffolding materials with proper clamps should be used. Use of bamboo / casuarinas shall not be permitted.

1.14.16 Contractor shall remove all scrap materials periodically generated from his 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. BHEL reserves the right to collect and remove the scrap if there is any failure on the part of contractor in this respect and actual expenses incurred plus 5% overheads shall be recovered from the contractor. All the packaging materials, including special transporting frames, etc. shall be returned to the BHEL stores / customer's stores by the contractor and maintain records.

1.14.17 Any faulty erection shall be removed and re-erected promptly to comply with the design requirements to the satisfaction of Site Engineer.

1.14.18 Prior to erection of any components, inspection to be done for any foreign materials and damages and they are to be removed / attended as per instructions of BHEL engineer.

1.14.19 The temporary structures / items welded to permanent members / pipes are to be cut and removed without any damage. Any damage so to permanent members / pipes to be made good by the contractor at his cost.

1.14.20 Upon completion of daily work, the contractor shall remove from the vicinity of work all scrap packing materials rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer.

1.14.21 Delay in clearance of fronts like equipment's, piping, buildings is unlikely to happen. However, if any delay occurs, the contractor shall not claim anything extra, like idle charges.

1.14.22 Handling at site stores / storage yard, transporting to site, inspection, fabrication, pre- assembly, erection, alignment, welding, NDT, fixing of hangers & supports, water flushing, hydro testing, surface finish, supply & application of cement mortar lining, primer & finish paints including labeling & flow direction on the piping & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer CW Piping and its associated items / systems, hangers and supports, valves and miscellaneous equipment's and structures.

1.14.23 Brief list of system / sub system, approximate weight of pipes and accessories to be erected by the contractor mentioned in the Bill of Quantity of this tender specification are meant for giving general idea to the tender only about magnitude of the work involved. The piping components are sent in parts for convenient transportation / layout requirements. They are to be cleaned,

pre- assembled/fabricated in stage by stage, welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.

1.14.24 All the works such as cleaning, leveling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, weld depositing, grinding straightening chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up, inspection, edge preparation if required, etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.

1.14.25 Erection of all items comprising piping systems such as valves, filters / strainers, expansion bellows, flow elements, hangers and supports, tanks, pumps, associated skids are also a part of the scope. CW Pipes of large dia are supplied in different lengths with edge prepared. For small bore if applicable necessary edge preparation, welding for pipes and fittings as well as threading for small bore pipe shall be done by vendor at site. Hence Erection activities like cutting/ threading/welding etc. of conduit/pipe/ISMC/ISA shall be carried out at site as per requirement.

1.14.26 Erection of all the systems supplied under this package, including auxiliaries covered in this contract, is to be erected by the contractor as per the accepted tonnage rate.

1.14.27 All operating/ approach platforms, cross over, canopies, ladders etc. along with their supporting structures, for the equipment's/valves/filters etc shall be erected by the contractor as per instructions of BHEL and shall be paid as per accepted tonnage rates of "Hangers and Supports" under respective rate Schedule. The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit to site requirements.

1.14.28 If the provision of creep measurement is envisaged in the drawings, stubs erection and welding as per drawing shall be done by the contractor within the quoted rate.

1.14.29 The work on piping system will include cement mortar lining & coating, laying, fixing and welding of the elbows / fittings / valves etc., welded on the lines, NDE, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and/or as per approved drawings / documents.

1.14.30 Contractor shall arrange the necessary clearance from any other statutory authorities as required for installation of the plant and equipment and render all assistance, service required in this regard. Inspection fee, if any will be paid by BHEL.

1.14.31 Obtaining statutory approvals from Electrical Inspector or any other Governing Agencies shall be in Vendor scope. Documentation required like Layouts, Schemes shall be furnished by BHEL.

1.14.32 The contractor shall arrange necessary statutory inspections and obtain certificate for installation work at their cost. Any Expenditure related to documentation shall be borne by the contractor. Contractor shall pay all fees relates to TAC/Electrical inspectorate or any other Governing Agency approval. However, BHEL shall reimburse all statutory fees on production of receipts (FEES FOR VISITS, INSPECTION FEES, REGISTRATION FEES and any other statutory fees).

1.14.33 Any modification work required by inspector shall be attended by the contractor. Modifications which had raised due to execution deficiencies are at the cost of contractor whereas modifications which are due design change shall be treated as extra work.

1.14.34 Fittings like bends, tees, elbow / bends, reducers, flanges etc., will be supplied as loose items. Fittings shall be supplied with standard dimensions. Edge preparation, matching inner diameter of pipes for welding as per the drawing dimensions shall be part of erection works. No separate payment will be made for the correction of pipes, edge preparation of standard fittings such as bends, Tees etc.,

1.14.35 Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like tees, weld neck flanges, reducers, elbows, flanges, inserts etc., shall be suitably edge prepared and matched with pipes for welding. No extra cost shall be paid for this.

1.14.36 During connection & floating of any decks, etc., before and after pipe connections, adding tentative loads, readjusting of spring to the required level is covered in this scope ofwork.

1.14.37 Carrying out erection of piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work / specification, contractor shall carry out the terminal joints at either end. Also, where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment

end by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

1.14.38 Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive within the quoted / accepted rate.

1.14.39 Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., shall be the responsibility of the contractor and the same shall be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if the items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package.

1.14.40 All the valves will have to be checked, cleaned, lapped or overhauled in full or in parts before erection, after chemical cleaning and during commissioning. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.

1.14.41 Contractor shall study the layout of CW piping and other site routed piping well before the start of work. Final routing shall be decided after approval from Site Erection Engineer for site routed pipe in such a way that it does not foul with other equipments and piping etc.

1.14.42 For Thermo-Well welding with Carbon steel / alloy steel welding applicable combination electrodes shall be arranged by the contractor within the quoted rate.

1.14.43 Immediately after erecting electrically operated valves, Valve Tag Nos shall be painted or stickering shall be done for ease of identification.

1.14.44 All the valve packing has to be lubricated as per BHEL Engineer instruction till handing over. Necessary gland packing will be supplied by BHEL.

1.14.45 All the lifting equipments, actuators / power cylinders, valves / dampers, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre-commissioning. The required cleaning, servicing and lubrication of bearings to be carried out before commissioning at no extra cost.

1.14.46 In the case of structural members, pipes, plates, ducts etc, in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints within the quoted rates / prices.

1.14.47 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into

position. Pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.

1.14.48 All the equipments / material to be taken inside the plant building shall be cleaned thoroughly before taking them inside and erect. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints assembly and other components as per instruction of BHEL Engineer during erection at the quoted rate. The necessary compressor for air cleaning is to be arranged by contractor at his cost.

1.14.49 Fine fittings and other small-bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. In case any minor modifications are required in these pipelines after completion to meet the system requirements, the same shall be carried out by the contractor within the quoted rate. The contractor should absorb this cost in his quoted rate.

1.14.50 Work such as minor rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc. are covered in the scope of work.

1.14.51 Assistance for calibrating / testing the power cylinders/ actuators / valves, etc. and setting to actuators shall be provided by contractor within the quoted rates.

1.14.52 Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.

1.14.53 All the drain lines should have sufficient slope towards drain. Slope of 1:500 shall be maintained towards drain point unless otherwise specified. Expansion loops shall be provided in all the vents and drains than carries steam and water having temepature above 50 Deg Cel. as per the drawings.

1.14.54 Wherever pipes / bends / equipments are supplied in pre-fabricated / assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope. Complete fabrication is included in the scope of the contractor for the raw material supplied.

1.14.55 All the oil & gas piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.

1.14.56 Wherever drawings indicate site routing and site fabrication, such pipes (in general equal to and less than 2" Dia) will be issued in running meters as straight length. These are to be cut to require at site length to suit layout as given in the erection drawing and edge prepared as per

the standards / drawings and as per the instruction of BHEL Engineer. In some cases, attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor. The contractor shall weld the joints of site routing piping as per site requirement.

1.14.57 Certain extra lengths of portions / parts of various site fabricated components / parts / bellows / piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout. Certain small length of portions / components / bellows / piping casing etc., may have to be added to suit conditions and layouts. Preparing edges afresh and adopting specified heat treatment procedure as applicable, are in the scope of work. No extra payment will be admitted for such works.

1.14.58 Some extra lengths in various fabricated pipes given as erection allowance shall have to be cut and edges prepared to suit the site conditions at no extra cost. The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting should be done. Gas cutting will be allowed only wherever edge preparation otherwise is impractical. All slag / burrs shall be removed from the edge and all the hand cuts shall be ground smooth to the satisfaction of engineer. Prepared edges to be preserved / applied with weldable primer.

1.14.59 Minor adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL Engineer to suit the layout, with specified heat treatment procedure shall be carried out by the contractor within the quoted rate.

1.14.60 Certain adjustments in length may be necessary while erecting pipelines / steel members. Removing / adding extra lengths to suit the final layout, preparing edges afresh and adopting specified NDT, heat treatment procedure is in the scope of work.

1.14.61 For pipes nominal bore size 2” and below routing shall not be shown in piping layouts or in isometrics and the same to be routed/ connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site engineer’s advice.

1.14.62 For piping of nominal bore size 2” and below, valves, flanges, fittings etc. shall be supplied as commercially available. Hence fit-ups, edge preparation including welding of stubs, shall be included in the contractor’s scope.

1.14.63 Contractor should fabricate bends of </=2’ diameter size at site from running meters of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer’s instruction.

1.14.64 Contractor shall use only bolted clamps for achieving alignment of piping. Wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipment's, the same shall be subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., by grinding / gouging and not by hammering. Any burrs left on the equipment's / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and sub-surface cracks in these ground areas.

1.14.65 Flame cutting of piping and other equipment shall be strictly done as per BHEL Engineer's Instructions and in his presence only.

1.14.66 All the weld joints on equipment's and piping shall be ground or filed after completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,

1.14.67 All welded joints should be painted with anti-corrosive primer once NDE works are over.

1.14.68 Wherever elbows of 45 deg or any other angle are required, the same shall be cut from 90 deg. elbow supplied and used as per the instructions of BHEL engineer. No extra cost shall be paid.

1.14.69 Flow nozzles, orifice, spray nozzles etc., shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.

1.14.70 Erection of Flow nozzles, flow orifices, flow switches, filters, flow meters, flow indicators, other metering elements, spray nozzles, steam traps, flow orifices, flow indicators, control valves, aux. control valves, filters, suction strainers, NRVs, etc. forming part of the system (under this scope of work) irrespective of the suppliers is also to be carried out by the agency without any extra cost after chemical and / or steam blowing / oil flushing at site. This will include collecting from BHEL/ Customers Store, transport to site, suitably cutting the erection piping, cleaning, erection, welding, radiography, NDE and stress relieving and commissioning.

1.14.71 Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipment's. Contractor shall dismount such instruments and re-erect whenever required prior to commissioning. Sometime this may have to be handed over to store or instrumentation contractor.

1.14.72 Fixing of stubs, root valves & welding of thermowells shall be within the scope of contractor.

1.14.73 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

1.14.74 Welding of all thermowells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads for permanent system as well as for performance guarantee test is in the scope of work.

1.14.75 It shall be the responsibility of the contractor to provide ladders on column for initial works till such time stairways are completed. For this the ladder should not be welded on the column and should be prefabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL.

1.14.76 All small-bore piping items, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs of small-bore pipes is included in the contractor's scope.

1.14.77 Before lifting the heavy components, soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc.

1.14.78 The contractor shall also weld all thermowells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermowells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermowells and flow elements with branch pipes be installed and welded.

1.14.79 The hangers and supports for pipelines may be supplied in dismantled / knocked down condition. It is the responsibility of the contractor to assemble them as per approved drawings and install them in position as per site engineer instructions.

1.14.80 For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold / hot values and locking etc.

1.14.81 Where the flange comes welded to the equipment, erection of counter flange, Hydrotesting and Normalization of the line is under the scope of this contract. Where both the flange and counter flange come as loose items and need to be welded, the entire welding of flange and counter flange, Hydrotesting and Normalization of the line are under the scope of this contract.

1.14.82 Wherever hangers and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work within quoted rate. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports.

1.14.83 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc. shall be carried out at site by contractor within the quoted rate.

1.14.84 Contractor has to fabricate and erect temporary spool pieces wherever required due to non-receipt of valves in time and after receipt of valves the spool pieces are to be replaced with regular valves at free of cost. For spool pieces materials will be supplied free of cost by BHEL.

1.14.85 Welding, non-destructive testing and heat-treatment as prescribed in BHEL Welding / Heat treatment manual is to be carried out by the contractor. The contractor shall conduct nondestructive tests like radiography, ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipment's etc. as per BHEL Engineer's instructions within the quoted rates.

1.14.86 Cutting and removal of dummies for all the shop welded stubs (irrespective of the equipment's supplier for the above) for all the terminal points and preparation of edge where the piping is to be terminated is also in the scope of the contractor without any extra payment.

1.14.87 HSFG Bolts are to be tightened by turn of nut method / Torque Wrench, as per the instruction of BHEL Engineer. The bolted joints shall be jointly checked by BHEL/Customer and contractors' personnel for the required tightness and retightened wherever necessary. The tightened bolts shall be identified by color paints. Facility for random checking with calibrated Torque Wrench shall also be provided by contractor.

1.14.88 All the bearings, gearboxes etc., of the equipment / actuators and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing / gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing / lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.

1.14.89 All motors / pumps shall be stripped opened, thoroughly serviced with proper care and re-assembled properly before erection by the contractor. During servicing, pre-commissioning & commissioning, if any deficiency is observed the same should be taken up with BHEL Engineer at site and rectified at site without any delay.

1.14.90 The actuators / motors of valves may be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.

1.14.91 Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.

1.14.92 Platforms, ladders crossovers and canopies shall be fabricated and erected by contractor at site as per site engineer's advice. Platforms shall also be provided at places where it has not been shown in drawings but if felt necessary by site engineer. Canopies shall be provided for all out-door pumps and motors.

1.14.93 The Buried pipe in general shall be laid with the top of the pipe minimum 2.0 /1.5 metre below finished general ground level or as specified in the drawing. Anti-corrosive treatment for all buried pipes as specified in the drawings including supply & application of cement mortar lining /coating, required consumables are in the scope of contractor and shall carry out as per drawing within the quoted rate.

1.14.94 Free access is to be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained. This type of incidental works is to be carried out by the contractor within quoted rates.

1.14.95 Prior to lowering and laying pipe in any trench, the contractor shall ensure for the backfill and compact the bottom of the trench or excavation in accordance with IS 5822 / as per drawing to provide an acceptable bed for placing the pipe.

1.14.96 Preparation of pipe surface as per customer/ consultant specifications by sand/grit blasting (if required) for wrapping and coating is included in the scope of this tender. All fittings like elbows, tees, reducers, flanges, inserts etc., valves flow nozzles, etc shall be matched with pipes for welding which may require re-edge preparation, grinding etc., if found necessary.

1.14.97 All dimensions / elevations refer to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per Engineers' advice.

1.14.98 Contractor shall arrange all the equipment's, alignment bolts, tools, consumables like welding electrodes (all type), TIG wires (Other than the supplied TIG wires from BHEL if any) and argon gas cylinders etc., for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc are in the scope of contractor.

1.14.99 Bidders to exercise utmost care while doing execution and commissioning work for this package so that no damage is caused to the existing plant at site. Any such damage will be back charged to bidder.

1.14.100 Protection of pipeline against floatation during the contract period shall be the responsibility of the contractors. Should any section of the pipe line float due to their negligence etc. the entire cost of laying it again to the correct line and level shall be to the contractor's account.

1.14.101 Contractor has to take care for the Buoyancy effect which may arise in due course of erection of the Pipeline. Proper care to minimize the Buoyancy effects has to be ensured by the contractor during the erection of the pipelines. Any mitigation measures to be adopted for minimizing the buoyancy effects has to be arranged by the contractor within the quoted rates.

ARRANGING CEMENT MORTAR LINING AND COATING MATERIALS, PRIMER PAINTS AND FINAL PAINTING (AS APPLICABLE) AS PER TENDER SPECIFICATION FOR ALL ERECTED MATERIALS IS IN THE SCOPE OF CONTRACTOR.

Reconciliation of Material issued by BHEL (free of cost):

General Notes

a) All materials as specified in relevant BOQ shall be issued free of cost by BHEL for use in the work covered in this contract from BHEL stores/storage yard. The contractor shall collect these materials from BHEL stores/storage yard at specified places at his own cost and store the same at his stores as per standard norms. Materials issued will be used only for construction of permanentworks.

b) The contractor shall in no case be entitled for any compensation (other than explicitly mentioned in the tender conditions) on account of any delay in supply or non-supply thereof for all or any such materials. However, in case of non-availability of any specific section(s) which delays the completion of work, such cases shall be recorded separately in monthly planning format (F 14) and shall be considered for time extension of contract in line with GCC.

c) Contractor will have to make his own arrangement at his own cost for procurement of any other materials except as mentioned above/ BOQ, as required for the works and of such quality as acceptable to BHEL.

d) The contractor shall maintain proper store account for all the BHEL issued materials and shall give Three (03) copies of monthly-computerized reconciliation statement of such account showing total receipt, consumption and balance at site to the BHEL. BHEL Engineer's certification for the reconciliation of BHEL Supplied/erectable material shall be final. The detailed reconciliation (dia. Wise or Wt. wise or as required) shall be done at least once in three months (03) or before submission of final bill which comes earlier.

e) Contractor shall also carryout in complete association with BHEL, the material management functions and execution like day-to-day update of materials, issued to contractor, accounting for surplus/scrap material returned etc. These functions shall also be carried out through computerized system utilizing suitable software. Contractor shall engage experienced software personnel to associate on dedicated basis for efficient discharge of the same in time.

f) BHEL issued materials, shall not be under any circumstances whatsoever, and shall be taken out of the project site unless otherwise permitted by BHEL for outside job.

VOLUME-IA PART – I CHAPTER - XV

WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

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.)

1.15.1 The CW piping works shall be erected in conformity with the standard / specification / drawing and as may be directed by BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions.

1.15.2 If applicable, all necessary preheating, post heating of welds and stress relieving operation of welds are part of the erection work and shall be performed by the contractor in accordance with the relevant regulations and standards of BHEL practice and to the satisfaction of BHEL Engineer and in accordance with the drawings and specifications.

1.15.3 Erection of equipment involves good quality of Welding, Heat treatment and Non-Destructive Testing. Wherever required, dye penetration tests have to be carried out as per instructions of BHEL Engineer. Contractor's Engineers, Supervisors, Technicians and workers engaged should have adequate knowledge on the above works.

1.15.4 All welders including tack welders, structural and pipe welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification and performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.

1.15.5 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. The Engineer prior to any repair being made shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the quality engineer.

1.15.6 The contractor shall carry out the root run welding of piping, valves as specified in applicable

procedure/manual issued by BHEL during execution.

1.15.7 All expenses for testing of contractor's welders including destructive and Non- destructive tests conducted by BHEL at site or at laboratory shall have to be borne by the contractor only. Limited quantity of tube and pipe/plate material required for making test pieces will be supplied by BHEL free of cost.

1.15.8 Only BHEL approved electrodes and filler wire shall be used. All electrodes shall be baked and dried in the electric electrode-drying oven to the required temperature for the period specified by the Engineer before these are used in erection work. All welders shall have electrodes drying portable oven at the work spot. The electrodes brought to the site will have valid manufacturing test certificate. The test certificate should have a co-relation with the lot number / batch number given on electrode packets. No electrodes will be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven will be also calibrated and test certificate from Govt. approved / accredited test house traceable to National / International standards will be submitted to BHEL before putting the oven in use. The contractor shall also arrange periodical calibration for the same. Separate ovens shall be used for baking and holding.

1.15.9 All butt and fillet welds shall be subjected to NDE in accordance with the approved drawings, procedures, welding schedules, and other contract documents at no additional cost. The percentage of NDT shall follow the approved field-welding schedule.

1.15.10 Non-Destructive Testing such as RT, CRT, UT, MPI, PAUT, hardness test, SR etc. wherever applicable shall be in Contractor scope. In case of any delay (i.e. 2 days from the date of completion of joint/intimation) in execution of NDT, BHEL shall be entitled to execute the work at cost recovery basis.

1.15.11 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld. Contractor has to maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or otherwise of the welds shall be final.

1.15.12 The contractor shall carry out the edge preparation of weld joints if required at site in accordance with the details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting should be done. Gas cutting will be allowed only wherever edge preparation otherwise is impractical. All slag / burrs shall be removed from the edge and all the hand cuts shall be ground smooth to the satisfaction of engineer. Prepared edges to be preserved / applied with wieldable primer.

1.15.13 All welds shall be painted with anticorrosive red oxide paint once radiography and stress reliving works are over. Necessary consumables and scaffolding etc including paints shall be provided by contractor at his own cost.

1.15.14 Where ever applicable Pre-heating, radiography and other NDT tests, post heating and stress relieving after welding shall be carried out by the contractor in accordance with the instructions of the Engineer. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

1.15.15 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress-relieving operations. The contractor should take a note of the following,

- Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL.
- All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National /International standards will also be arranged by the contractor for such equipment at his cost. The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of SR operations.

1.15.16 The contractor shall also be equipped for carrying out other NDT like LPI / MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required, will be arranged by contractor within the quoted rate.

1.15.17 The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR or ISO as specified by BHEL through its manuals/procedures etc.

1.15.18 The contractor for radiography work shall use Iridium-192; the geometric un-sharpness shall not exceed 1.5 mm. The contractor should take adequate safety precautions while radiography is being carried out. Contractor at his cost shall arrange necessary safe guards required for radiography (including personnel from BARC).

1.15.19 Low speed high contrasts, fine grain films (D-7 or equivalent) in 10 cm width only are used for weld joint radiography. Film density shall be between 1.5 and 2.0.

1.15.20 All radiographs shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetrometer as per ASME or ISO must be used for each exposure.

1.15.21 Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs.

Contract number, joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.

1.15.22 Lead intensifying screens for front and back of the film should be used as per the above-referred ASME specification. The joint is to be marked with permanent mark A, B, C to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the down streamside of the weld. For multiple exposures on pipes, an overlap of about 25-mm of film should be provided.

1.15.23 The contractor shall be fully equipped with radiography equipment's, films, chemicals and other dark room facilities. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor's radiographers shall also be registered with BARC for film badge service.

1.15.24 All arrangements for carrying out radiography work including dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.

1.15.25 The contractor shall have a dark room & pit room fully equipped with radiography equipment, film (un-exposed), chemicals and any other dark room accessories. All radiography films shall be developed in the dark room at site.

1.15.26 In case of radiography of less than 100%, the joints identified by BHEL at random shall be radiographed.

1.15.27 Contractor shall note that radiography (as applicable) shall be carried out on all the piping welding joints. However minimum percentage of joints to be radio graphed shall not be less than the requirement of BHEL welding schedule / IBR / Customer's requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL.

1.15.28 All the Radiographs shall be properly preserved in AC room and shall become the property of BHEL. They are to be reconciled with the work done, joints radio graphed and submitted to BHEL / Customer.

1.15.29 Since radioisotopes are being used, all precautions and safety rules as prescribed by BHEL/BARC/ Customer shall be strictly followed. BARC /DRP certificate to be provided before taking up the work.

1.15.30 Radiography of joints shall be so planned after welding, that the same is done either on the same

day or next day of the welding to assess the performance of welders. If the performance of welder is unsatisfactory, he is to be replaced immediately.

1.15.31 Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re- submitted for evaluation.

1.15.32 However, if the defect persists after first repair, further repair work followed with radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radio graphed at contractor's cost.

1.15.33 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including labour, supervisors/ Engineer required the work as per directions of BHEL.

1.15.34 The contractor shall assist BHEL Engineer in preparing complete field welding schedule for all the field welding activities to be carried out in respect of piping and equipment erected by him involving welding at least 30 days prior to the scheduled start of erection work at site. The contractor shall strictly adhere to such schedules.

1.15.35 The contractor shall deploy required number of welders to carry out the weld joints. The welding works should not be held up due to shortage / want of welders.

1.15.36 All welded joints shall be subjected to acceptance by BHEL Engineer.

1.15.37 The technical particulars, specifications and other general details of work shall be in accordance with BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.

1.15.38 Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR, enclosed. However, percentage radiography shown in the respective drawings shall be final and binding on the contractors.

1.15.39 The field joints are to be radiographed and preheating and post weld heat treatment shall be done as per BHEL procedure and manuals.

1.15.40 The percentage of Radiography are tentative, which may be increased depending upon the quality of joints at the discretion of BHEL.

1.15.41 Penetrometer as per ASME/ISO shall be used for all exposures.

1.15.42 Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work.

1.15.43 The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radio graphed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.

1.15.44 The contractor shall also be equipped for carrying out other NDT like liquid penetrant inspection, magnetic particle inspection, etc. as and when required in the interest of work within the quoted rates.

1.15.45 For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work includes such preparation and no extra charges are payable for this.

1.15.46 It may also become necessary to adopt inter layer radiography / MPT / UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all this into account and quote the price inclusive of all such work and radiography.

1.15.47 The welded surface irrespective of place of welding shall be cleaned of slag and painted at the center with primer paint to prevent corrosion at no extra cost towards this.

1.15.48 All welders shall be tested and approved by BHEL Engineer before they are actually engaged on work though they may possess the required certificate. BHEL reserves the right to reject any welders without assigning any reason. The welder Identification code as approved by the BHEL Engineer shall be stamped by the welder on each joint done by them. The contractor will be responsible for the periodic renewal, retesting of the welders as demanded by BHEL.

1.15.49 BHEL Engineer is entitled to stop any Welder from the work if his work is unsatisfactory for any technical reasons or there is a high percentage of rejection of joints welded by him, which in opinion of the BHEL Engineer will adversely affect the quality of the welding though the Welders, has earlier passed the tests prescribed by BHEL Engineers. The welders having passed qualification tests do not relieve the contractor of a contractual obligation to check the welder's performance.

1.15.50 All charges towards testing of Welders for destructive and non-destructive test, testing and approval of welders for engaging in the erection work shall be borne by the contractor.

1.15.51 The welding process, weld joint details, joint configuration and material specification may change to suit the design requirements. The contractors quoted rates shall be inclusive of each contingency. All welds involved in the erection of temporary pipe lines for hydraulic test to be carried out within the quoted rates.

1.15.52 MPI must be done on joints, those are undergone ultrasonic testing.

1.15.53 Where ever applicable, preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions. Where the electric resistance heating method is adopted,

Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chalks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

1.15.54 List of Penalties on Violations on Quality Provisions

Sr no	Violation	Penalty in Rs
1	Mother oven not working	500 per day & ban on its use
2	Slackness in control over baking of welding electrodes (Doc.)	200 per incident
3	Holding oven not working/plugged in	500 per incident/day & ban its use
4	Portable oven not working/Plugged in	100 per incident & welder to be removed from duty.
5	Use of cold electrodes (Except E6013)	1000 per incident & welder to be removed from duty.
6	Unauthorized welder on job	5000 per incident & welder to be removed from duty.
7	Delay in NDT Agency deployment w.r.t jointly agreed Ere. Prog	500 per incident
8	Failure to monitor Welder's Performance (RT, SR, Penalty Joint etc.)	5000 per week
9	Improper acts w.r.t maintain SR Charts	10000 per incident
10	Site Welding/QLY Engineer not deployed w.r.t mutually agreed Ere. Plan	500 per day
11	Delay in (RT, SR, UT) report submission & customer acceptance Log sheets esp. for Billed qty. from dt. of Billing (Vendor)	10,000 per week
12	Lack of safe approach Scaffolds/Platform for inspection & non-availability of calibrated MMDs.	1000 per incident.

1.15.55 STORAGE & IDENTIFICATION OF WELDING ELECTRODES / FILLER WIRES

1. Scope

1.1 This procedure is applicable for storage of welding electrodes / filler wires used at sites.

2. Procedure:

2.1 Only materials accepted (based on receipt inspection) shall be considered for storage.

2.2 Storage Facility:

2.2.1 The storage facility shall be identified.

2.2.2 Access shall be restricted to authorized personnel.

2.2.3 The storage area shall be clean and dry.

2.2.4 Steel racks may be used for storage.

2.2.5 Avoid storing wood inside the storage room.

2.2.6 Maintain the temperature of the storage facility above the ambient temperature.

2.2.7 This can be achieved by the use of appropriate heating arrangement.

2.3 The electrodes / filler wire shall be segregated and identified for

1. Type of electrode e.g. E7018.
2. Size of electrode e.g. Dia 3.15 mm.

2.4 Colour coding for filler wires:

2.4.1 On receipt of GTAW filler wires, codify the filter wires as per table I below. Both ends shall be coloured.

Table - 1

Specification	Brand Name*	Colour Code
RT 1/ 2 Mo (ER80s-D2)	TGSM	Green
RT 1 Cr 1 / 2 Mo (ER80S-B2)	TGS 1CM	Silver grey/White
RT 2 1/ 4 Cr 1 Mo (ER90S-B3)	TGS 2CM	Brown / Red
RT 347 (ER 347	TGS – 347	Blue

(* or other approved equivalents)

2.4.2 Where another set of colour code is followed, maintain a record of coding used.

2.4.3 Where the filter wire is cut, apply the appropriate colour code at both ends of the piece.

2.4.4 For other filler wires, a suitable colour distinct from table 1 shall be applied

1.15.56 BAKING AND HOLDING OF WELDING ELECTRODES

A) Purpose:

This section details activities regarding baking and holding of welding electrodes used at sites.

B) Procedure:

While handling, avoid contact of oil, grease with electrodes. Do not use oily or wet gloves.

It is recommended that not more than two days requirements are baked.

C) GTAW Filler Wires:

These wires do not require any baking.

D) Covered Electrodes:

I. Baking and holding

II. Identify baking oven and holding oven.

III. They shall have a temperature control facility upto 350 °C for baking oven and 200 Deg. C for holding oven.

IV. A calibrated thermometer shall be provided for monitoring temperature.

V. On opening a packet of electrodes, segregate and place them in the baking oven. Avoid mix up.

VI. After loading, raise the baking oven temperature to the desired range as per Table below.

VII. Note the time when the temperature reaches the desired range. Maintain this temperature for the duration required as per Table below.

VIII. On completion of baking, transfer the electrodes to holding oven, maintain a minimum temperature of 100°C till issue.

IX. The electrode shall not be subjected to more than two cycles of baking. Maintain a register containing following details:

a. Brand name (e.g. Supratherme)

b. Size (e.g Dia 4.0 mm)

c. Quantity (e.g. 110 pieces)

d. Time at required temperature ie. Above 2500C.

e. Time of Transfer to holding oven. Activities a, b, c to be recorded before loading into the oven.

1.15.57 NDT of CW Piping shall be guided by the approved site erection welding schedule.

VOLUME-IA PART – I CHAPTER - XVI

HYDRAULIC TESTING

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

1.16.1 The contractor shall make all necessary arrangements including making of temporary closures on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost.

1.16.2 Soundness of the welds shall be tested hydraulically under the supervision of the BHEL Engineer and Customer, to the pressure indicated in the drawing.

1.16.3 Hydraulic testing, as required shall be carried out by the contractor. The servicing, installation, electrical connection, erection, testing and dismantling of Hydraulic Test pump, temporary pipelines, fittings, etc. shall be carried out by the contractor as part of this work.

1.16.4 Contractor has to arrange required pumps with sufficient capacity for filling water in the tubes and pipes for conducting Hydraulic testing of pipelines of CW system. Contractor has to arrange the required Hydraulic Test pump / Hand Pump for Hydro test at his cost.

1.16.5 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.

1.16.6 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL. 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 material and plates for fabrication of blanks will be provided by BHEL.

1.16.7 All the hydraulic tests shall be repeated till all the pipelines satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of BHEL / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost. The contractor shall carry out all the required tests and pre-commissioning and commissioning activities required for successful and reliable operation.

1.16.8 Test records shall be made for pressure testing of above piping system. These records shall contain the following information:

a) Date of test
b) Identification of piping tested
c) Test fluid
d) Test pressure
e) Approval of the Engineer.

1.16.9 Raw materials for all temporary piping necessary for conducting Hydraulic test 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.

1.16.10 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 equipment 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 without charging extra. 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.

1.16.11 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 no extra cost. Necessary material for fabrication of blanks will be provided by BHEL.

1.16.12 In general HT of piping shall be performed after all eventual pipe branches have been completed and valves installed. Should it be required to hasten erection work, pressure tests may be performed by sections. For this scope of work, the erected pipe lines shall be hydraulically tested as per site requirement in segments. For conducting hydraulic test, both ends of pipe lines shall be blanked by welding of plates. Plates and structural materials for blanking required for one segment will be provided by BHEL free of charge. After completion of hydraulic test in one segment, the same plates are to be cut and removed and utilized / welded on the other segment of the pipe lines, to carry out the hydraulic test for the respective segments. No separate plates for blanking for each segment will be provided. After completion of Hydraulic test, the required edge preparations shall be carried out on the end of pipe lines

and to be welded with the respective pipe lines. In such cases joint connection shall be checked during a final and additional test, if required. The contractor shall note this aspect and quote accordingly.

1.16.13 During hydraulic test, the pipes being tested shall be isolated from the equipment's to which they are connected.

1.16.14 Openings on piping for pressure / temperature impulse connections shall be fully closed during the test to prevent dust or foreign matter entering into the instrument piping inadvertently.

1.16.15 Hydraulic test is to be carried out for buried piping also. Where the length of laid and welded pipe is more, pressure test is to be conducted in sections, blanked at both ends. All arrangements for Hydro test like arranging water, pumps, piping, valves, blanks, pipe connections, etc., are to be arranged by contractor within the quoted rate. The section of the pipe can be closed and back filled for the portion of the pipe hydraulically tested and cleared.

1.16.16 The following specifications shall also be complied with during hydrostatic test.

a. Vent nozzles with valves shall be provided at the highest point of the runs, to eliminate air pockets. At the lowest point d rain nozzles, with valves shall be provided to drain water from pipes. The nozzles and valves shall be of the same materials as the pipe.
b. Pressure shall be slowly increased (without shocks) to the stipulated value and maintained as long as required to visually check all joints.
c. Following these tests, the pipe shall be drained or pumped out to the other section to be hydro test using the drain out pump to be provided by Contractor and wherever necessary shall be flushed with air for all pipes.
d. The pressure test is considered satisfactory if no cracks, unjustified pressure reductions, leakages, seepages etc., appear.
e. Should defects be found, these shall be repaired in the same manner as these during radiographic examination. Hydraulic test shall be repeated after defects have been repaired.

1.16.17 All CW piping systems shall be subjected to Hydraulic test as specified in the drawing or as per instruction of BHEL engineer for various system. The contractor shall supply necessary labour

and other services to carry out the required tests as per the instructions and directions of the BHEL Engineers.

1.16.18 The pump shall be suitable for pressurization to this test pressure and the volume of water to be used for sectionalized hydro test.

1.16.19 The contractor has to arrange (low pressure) hydro-testing pump for conducting hydraulic test on his own within the quoted rate. The servicing, installation, electrical connection, erection, testing and dismantling after completion of hydro-test shall be carried out by the contractor as part of this work without any extra charge. The pump would be taken back after completion of the work as certified by BHEL engineer.

1.16.20 Required water filling pump is to be arranged by the contractor.

1.16.21 During the testing and commissioning period, though BHEL's and Customer's staff will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned units are taken by the customer / BHEL.

1.16.22 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.

1.16.23 In case the Hydraulic Test of the System, Sub System or any component related to the system could not be carried out due to any reason, the system, part of the system, sub system should be Non-Destructively tested (100% UT or Radiography Testing) with approval of BHEL/NPCIL.

Note: Refer P&ID drawings for conduction of hydro test, if details are not available the decision of BHEL is final.

VOLUME-IA PART – I CHAPTER - XVII

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.)

1.17.1 The Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation as instructed by BHEL using contractors own consumables, labour and scaffoldings etc.

1.17.2 This specification is mainly intended to cover the erection & commissioning of CW piping including filters commissioning and other low-pressure piping/ misc piping if applicable, which shall cover handling from storage, erection, testing, inspection, final painting, testing, servicing and commissioning of piping & fittings as covered in specification.

1.17.3 All required tests indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications though some of the tests / activities are not listed in these specifications.

1.17.4 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.

1.17.5 The scope of pre-commissioning, commissioning and post commissioning activities cover installation of all necessary temporary piping, supports, valves, blanking, pumps, tanks etc. and other accessories with access platforms valves, pressure gauges, electric cables, switches, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test or any other tests as the case may be and will carry out above activities under this scope of work as per instructions of BHEL.

1.17.6 Raw materials for all temporary piping necessary for conducting Hydraulic test 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.

1.17.7 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 and attending any problem in the system 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.

1.17.8 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. No extra payment shall be made for rectification works.

1.17.9 During commissioning, opening / closing of valves, changing of gaskets, attending to leakage and adjustments may arise. The finally accepted price /rates shall also include all such work.

1.17.10 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load.

1.17.11 The contractor shall carry out cleaning and servicing of valves and valve actuators 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.

1.17.12 Cleaning and servicing of all the filters / strainers, in the system shall be done by the contractor within the accepted price. All oils and greases to be filled in the main equipment's as first fill and subsequent topping up's will be furnished by BHEL.

1.17.13 At the time of each inspection, the contractor shall take note of the decisions / changes proposed by the BHEL Engineer and incorporate the same at no additional cost.

1.17.14 The valves, dampers, actuators etc. will have to be checked cleaned and overhauled in full or in part before erection and during commissioning as may be necessary.

1.17.15 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable deaeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipment's 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.

1.17.16 The Hydraulic Testing of the equipment and piping, covered under this scope of work has to be carried out by the contractor as per instructions of BHEL Engineer. The contractor shall provide all facilities required for hydraulic testing. Before hydraulic test, all the hangers are to be locked by locking pin / plate or temporary support. After completion of Hydraulic test, these are to be removed and all hangers are to be readjusted if required, to the desired value within quoted value.

1.17.17 All the tests shall be repeated till equipment's satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of BHEL / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost.

1.17.18 Replacing / Cleaning of filters of the erected equipments, piping system etc. during Pre-Commissioning / Commissioning stage are within the scope of work.

1.17.19 Contractor shall lay the temporary pipelines with fittings, accessories and Erection / Commission pumps, tanks, valves, fittings, hangers and supports and other installations as instructed by BHEL, Engineer for the purpose of water flushing etc. of piping. Necessary, materials for this will be provided by BHEL. Weight for the same will be based on jointly measured quantity and corresponding standard weights. No payment will be made for the equipment's brought by the Contractor such as pumps etc and foundations made by the Contractor for temporary systems. Weight for the same will be based on jointly measured quantity and corresponding standard weights.

1.17.20 During the initial stages of work, trenches for draining water may not be available for draining the system and piping. Necessary low point drains and temporary piping for this will have to be erected by contractor from materials provided by BHEL.

1.17.21 The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces.

1.17.22 Contractor may have to replace old/damaged gaskets / packing etc. for equipment's and the same shall be carried out by contractor as per requirement. Materials will be given by BHEL.

1.17.23 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain etc. the contractor shall immediately attend these defects and take necessary corrective measures. The parts to be replaced shall be provided by BHEL free of cost.

1.17.24 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.

1.17.25 Contractor to provide necessary commissioning assistance from pre-commissioning state onwards and up to continuous operation of the unit & handing over to BHEL/customer. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programs made to achieve the schedule agreed with customer.

1.17.26 After initial commissioning of the package, further commissioning activities and trail operations will continue up to handing over of the unit. Contractor shall provide the manpower for three months from trial operation or submission of final bill with material reconciliation whichever is later. It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers as per the work requirement along with supervisors including necessary consumable tools etc., during this period. The rate quoted shall indicate all these contingencies also.

1.17.27 Further in addition to the above, contractor has to arrange the minimum manpower in each Unit exclusively for assisting BHEL commissioning engineers during commissioning stabilization and trial operation period. This manpower will be directly controlled by BHEL commissioning engineers.

1.17.28 During commissioning any improvement or rectification due to design requirement is involved and if the contractor is asked to carry out the job, they shall be paid at man-day rates. For this purpose, daily labour report indicating therein nature of work carried out, consumables used, etc. shall be maintained by contractor, and got signed by BHEL Engineer every day. It is not obligatory on the part of BHEL to get the works done by the contractor. They can employ any other agency if they so desire at that time.

1.17.29 During commissioning any Improvement / Repair / Rework / Rectification / Fabrication / Modification Due to Design Improvement / Requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.

1.17.30 Hanger adjustment / re-adjustment during erection, before and after Hydraulic Test during and after full load operation, are to be carried out by the contractor within Quoted Rate.

1.17.31 No payment will be made for temporary installations made for testing of systems & similarly no payment will be made for electrical installations made for any temporary system for small volume of works which is intended to be part of the commissioning activity.

All materials, equipment's necessary for installation of temporary system as above will be supplied by BHEL as free returnable issue in random sizes / lengths. However, servicing, fabrication, erection, dismantling of the same after completion of the process, and handing over

back to BHEL stores will be the responsibility of the Contractor. In accounting of temporary materials following wastage allowances are provided:

1. Structural items : 4%

- ✓ Contractor shall cut / open / dismantle work, if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.
- ✓ Similarly, during the course of erection, if certain portion of equipment's erected by the Contractor has to be undone for enabling other Contractors / agencies of BHEL / Customer to carry out their work, Contractor shall carry out such jobs expeditiously and promptly and make good the job after completion of work by other Contractors / agencies of BHEL / Customer as per BHEL engineer's / agencies of BHEL / Customer s instructions. Claims, if any, in this regard shall be governed as relevant clauses of 'General Conditions of Contract.

1.17.32 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.

VOLUME-IA PART – I CHAPTER - XVIII

CEMENT MORTAR LINING

TECHNICAL SPECIFICATION FOR

CEMENT MORTAR LINED & COATED LARGE DIAMETER

CARBON STEEL PIPING ERECTION AND TESTING

1.0 SCOPE

This specification covers the technical requirements fabrication, inspection & testing, painting, cement mortar lining and coating, handling and erection at site and final hydro testing for large diameter cement mortar lined & coated piping of Atomic Power Project.

2.0 CONTENTS

3.0 APPLICABLE CODES AND SPECIFICATIONS

For Applicable Specifications, Codes and Standards Refer following Applicable Specification Sheets / Drawings:

3.1 Materials Specifications

Mechanical :-

IS : 2002 Gr.2 - Steel Plates for Pressure Vessels for Intermediate & High Temperature Service Including Boilers.

IS : 2062	-	Structural steel (Fusion welding quality- To be used for Support structure only)
IS : 808	-	Rolled steel beams, channels and angle sections.
IS : 814	-	Specification for covered electrodes.
IS : 1363 &1364	-	Black hexagonal bolts, nuts & lock nuts and black hexagonal screws (Size Range M5 to M64)
IS : 3589	-	Steel pipes for water and sewage.
IS : 1352	-	Specification for rolling & cutting tolerance for hot rolled steel products.

Civil :-

IS : 432	-	Steel wire for concrete reinforcement.
IS : 383	-	Specification for coarse and fine aggregates from natural sources for concrete.
IS : 12330	-	Sulphate resisting Portland cement.
IS : 8041	-	Specification for Rapid hardening Portland cement.
IS : 1786	-	High strength deformed steel bars and wires for concrete reinforcement

3.2 Specification for Codes of Practice

Civil :-

IS : 456	-	Code of practice for plain & reinforced concrete.
IS : 3764	-	Safety code for excavation work.
IS : 2720	-	Methods of test for soils.
IS : 516	-	Method of test for strength of concrete.
IS : 4082	-	Recommendations on stacking and storage of construction materials and components at site.
AWWA Standard C – 205	-	Cement mortar lining & coating system.
AWWA Standard C – 602	-	Cement mortar lining of water pipelines in place.

Mechanical :-

IS : 1916	-	Steel cylinder pipes with concrete lining & coating.
IS : 1730	-	Steel plates, sheets, strips and flats for structural and general engineering purposes – dimensions.
IS : 5822	-	Code of practice for laying of electrically welded steel pipes for water supply.
IS : 800	-	Code of practice for use of structural steel in general building construction.
IS : 919	-	Recommendations for limits and fits for engineering.
IS : 1852	-	Rolling and cutting tolerances for hot rolled steel products.
IS : 4353	-	Submerged Arc Welding of Mild Steel and Low Alloy Steels-Recommendations.
IS : 7322	-	The permissible tolerances for specials for diameter, arm length and angular deviation.
IS : 1566	-	Recommendations Specification for Hard-drawn Steel Wire Fabric for Concrete Reinforcement.

AWWA Standard C – 200	-	Steel water pipe.
AWWA Standard C - 206	-	Field welding of steel water pipe.
AWWA Standard C – 207	-	Steel pipe flanges.
AWWA Standard C – 208	-	Dimensions for steel pipe fittings.
AWWA Manual M 11	-	Steel pipe - Guide for design and installation.

ASME Sections - V, VIII DIV-I and IX - Boiler and Pressure Vessel Code.

3.3 Applicable NPCIL Specifications:

PC-P-285	-	Technical specification for field welding of piping for nuclear power plants.
PC-P-344	-	Technical specification for fabrication & erection of piping for nuclear power plants.
PC-P-345	-	Technical specification for cleaning methods of piping in nuclear power plants.

In the event of conflicting requirements, between specifications or the drawings, the governing requirements shall be at the discretion of the Purchaser.

WELDING

4.1 The welding procedure and Welder's qualification shall be as per PC-P-285 and ASME Section -IX. The procedure of welding and electrodes to be used shall be approved by the Purchaser before commencing qualification/fabrication.

4.2 All electrodes shall be selected to match the mechanical and chemical properties of the parent material. The welding rods shall be as per PC-P-285 or AWS-E-7018 and shall be subjected to Purchaser's approval.

4.3 The edge preparation and fit-up of weld joints shall be as indicated in the approved drawing. However, in case of conflicting requirement between the specification and the drawings the governing requirements shall be at the discretion of the Purchaser.

4.4 The pipe circumferential welds shall be done in such a way that the longitudinal welds are staggered in any two consecutive sections.

INSPECTION AND TESTING OF STEEL PIPES

All the work being carried out shall be subjected to inspection and testing as per approved QAP generally in line with the following;

5.1 Fit-Up Checking

Inspection of the fit-up for both longitudinal and circumferential welding shall be carried out before the welding in order to ensure its proper alignment. Tack welds shall be used to hold the edges in position during the fit-up operation.

5.2 Check of Diameter

Once the fit up check is over and found satisfactory, the diameter of the pipe shall be measured and checked with the requirement.

5.3 Check on Weld Joints

Pipe spool pieces (straight), specials which are being subjected to hydro test prior to cement mortar lining and coating weld joint inspection shall be as indicated in table-1.

Table-1

Type Of Welds							
Butt Welds		Nozzle Welds		Seal Welds		Socket Weld/ Slip on Flanges Joints	
Root Pass	Completed Weld	Root Pass	Completed Weld	First Pass	Final Pass	First Pass	Final Pass
V+ S1	V+ S2	V+ S1	V+ S2	V	V	V	V+ S1

V = 100% Visual Examination.

S1 = 10% Supplementary Examination it may be Liquid Penetration or Magnetic Particle.

S2 = 10% Supplementary Examination it may be Ultrasonic or Radiographic.

Pipe spool pieces (straight), specials, butt weld, nozzle weld joints and terminal point tie-up joints which are not subjected to hydro test prior to cement mortar lining and coating, on these joints 100 % radiography inspection at completed weld joint shall be carry out apart from visual inspection.

5.4 Visual Examination

Visual Examination method shall extend to cover atleast the following steps

(a) Base metal identification, punching details.

(b) Base metal defects, if any such as surface irregularities, cracks or lamination or surface corrosion.

(c) Edge preparation.

(d) fit-up, Joints

(e) Tacking

(f) Root pass & subsequent pass appearances

(g) Cleaning between passes

(h) Appearance of completed welds, their conforming to drawings and method of examination.

(i) Condition of base metal in the area adjoining the weldments.

(j) Excessive or unexpected distortion due to welding.

(k) Cleanliness of pipes, cement mortar lining & coating surface finish.

5.5 Procedure and Acceptance Standards for Non Destructive Tests (NDT)

All the NDTs shall be carried out as per ASME Boiler and pressure vessel code Section V and VIII division I.

Acceptance standard shall be as per ASME Section VIII division I mandatory Appendix as given below.

a. Radiography Test - Appendix- 4

b. Magnetic particle test - Appendix- 6

c. Liquid Penetrant Test - Appendix- 8

d. Ultrasonic test - Appendix- 12

5.6 Hydro testing

Hydro test can be done by two ways as per Contractor convenient depending upon feasibility.

1. Fabricate all pipe spools, specials & fittings without lining and coating, erect all piping and then do final field hydro test. After this hydro test total lining and coating of piping shall be done. Hydro test pressure shall be as per PMS. Field hydro test shall be done as follow.

   a. Before hydro testing the pipe, lines shall be cleaned to make it free from dirt, loose scale, debris or other loose foreign material.

   b. Notwithstanding the satisfactory completion of the hydraulic test, if there is any discernible leakage of water from any pipe or joint, replace the pipe, repair the pipe or re-make the joint and repeat the hydraulic test.

   c. After hydro testing dewatering and drying of complete is carried out.

2. If above said hydro test is not possible then each pipe spool, specials and fittings shall be hydro tested before the lining and coating. After the erection of lined and coated pipe spools and specials in the field to check field weld joint final hydro test shall be carried out terminal point to terminal point following the procedure indicated in above paragraph. Please note that hydro test shall be carried out before field joint lining and coating.

   Hydro test shall be done as follow.

   a. Each pipe spool and specials shall be subjected to hydrotest before cement mortar lining and coating of pipe. Hydrotest pressure shall be AS per PMS.

   b. Length of the pipe spool / specials to be tested shall be capped or blanked off at each end and securely strutted or restrained to withstand the forces which will be exerted when the test pressure is applied. Accepted spools will be stamped and released for further processing.

3. Performance of Hydrostatic testing is included in contractors' scope of work. The supply lines for water filling and the pressuring water pump shall be arranged by the contractor. The contractor shall provide fit up and temporary closures used for hydro testing as per approved procedures.
4. Steel pipe shall be kept under pressure by pumping water for a period not less than 10 minutes and while under pressure; pipe shall be moderately hammered with a 1 kg hammer throughout its length. The steel pipe shall withstand the test pressure without showing leakage. Pipes which show leakage may be rewelded at the point of leakage and subjected to a repeat hydro test and may be accepted if it does not show any leakage. After hydro test, water from pipe will be drained and pipe shall be dried by suitable means.

6.1 CLEANING

6.2 Cleaning

The surfaces (both inside and outside) of pipe shall be thoroughly cleaned i.e. loose rust, loose mill scale, dirt, debris, oil grease and other deleterious material shall be removed by manual, mechanical or chemical means. If chemicals deleterious to steel or cement are used to clean the steel surface, such chemicals shall be removed at the completion of cleaning process.

7.1 CEMENT MORTAR LINING & COATING

Work of cement mortar linings and coatings can be done at shop on pipe spools pieces and specials as per AWWA C205 and lining and coating of field joints to be carry out as per AWWA C 602 (manual) after hydro test of total system pipe line

Work of cement mortar linings and coatings can be done on total system pipe line at field as per AWWA C 602 (mechanized method) after hydro test of total system pipe line

7.2 Materials required for cement mortar linings and coatings

1. Reinforcement - All reinforcement material used in the pipe shall conform to 1S: 432 (Part 1 - 1982) or IS: 432 (Part 2 -1982).

2. Cement - Cement used in mortar lining and coating shall be sulphate resistant portland cement conforming to IS: 12330 or ordinary portland cement- 33 grade conforming to IS: 269 as per Purchaser requirement. Cement shall be free of lumps.

3. Aggregates - The aggregates used shall conform to IS 383 : 1970 grading zone III. Sand shall consist of inert granular material and the grain shall be strong, durable and uncoated. Sand shall be clean and free from injurious amount of dust, clay, flaky particles, oil, alkali, mica and other deleterious substances. The maximum size of aggregate shall be one-third the thickness of concrete covering the steel cylinder either outside or inside.

4. Water -Water used for cement mortar mixing and curing shall be clean and free from injurious ingredients or organic matter, alkali, oil, acid, salt, sugar or other impurities and shall confirm to IS: 456. Salt water shall not be used for mixing under any circumstances.

7.3 Thickness & Cover

The minimum thickness of lining and coating shall be as per PMS ensuring the sufficient cover over the reinforcement.

7.4 Application of Reinforcement

1. The reinforcement shall be wire fabric and applied to the interior pipes, specials & fittings before lining and exterior at the time of coating.

2. Reinforcement for lining 2.5 mm dia. wire @ 25 c/c and for coating 5 mm dia. wire @ 50 c/c. Reinforcement wire mesh size shall be conforming to IS: 1566 and wire to IS: 432. The mesh sheets shall overlap each other by a minimum of 100 mm and be tied with mild steel wire at 200 mm intervals. The reinforcement shall be held off the pipe wall by a series of equally spaced (500 mm c/c distance) 6 mm dia. reinforcement bars (which shall run the full length of the lining and coating.

3. Reinforcement shall be placed in pipe in such a way as to cover the whole pipe length or section to be lined. The reinforcement shall terminate at a distance of approx. 100 mm from the ends. The reinforcement then shall be suitably tack welded.

4. For field cement mortar lining & coating of erected piping, reinforcement in the form of strip approx. 400 mm wide shall be placed and tack welded. There shall be an overlap of minimum 50 mm between two reinforcement sections.

5. The wire reinforcement may be given a tension of 50 to 75 Mpa while wrapping on the pipe before the coating is applied.

7.5 Mixing of Concrete or Mortar

1. The concrete or mortar for lining and coating shall be mixed in mechanical mixers. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency to obtain a dense, homologous lining and coating that shall adhere firmly to the pipe surface. Water and cement ratio by mass shall not exceed 0.3:1.

2. The lining shall be applied in one course for the pipe section. So it is expected that batching plants shall produce minimum capacity of mortar required for complete lining of a maximum size pipe spool or specials.

3. Prior to the application of the cement lining the manufacturer shall perform procedure tests and qualify a working procedure to demonstrate that he is able to produce a lining system in accordance with design requirements. The constituents, mortar & finished pipe shall be tested. To establish the correct combination of cement, sand & water, minimum of five samples shall be prepared. For each mix following shall be accurately checked and recorded:

   For individual constituents
   - Cement / admixture ,
   - Sand
   - Water
   - Proportions & weight of respective materials.

For cement mortar test specimen

- Density
- Compressive Strength
- Water absorption

4. Test blocks of this material when subjected to testing as per IS 6441/IS 4031 shall exhibit compressive strength of not less than 300 kg/sq. cm. after 28 days of curing or 170 Kg/cm^2 of 7 days of curing and the density of cured lining shall be less than 2150 kg/cu.m . Water absorption shall not exceed 10 % for the test specimen. Based on the test results a procedure shall be standardized for mixing of the materials. Inspection personnel shall witness the mixing of materials and sample preparations for procedure qualification. Test result shall be correlated with sample number and a standard procedure shall be evolved.

5. Final designed proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value.

7.6 Field Cement Mortar Lining & Coating on field joint of lined and coated pipe spools and specials

1. Field cement lining and coating shall be done as per AWWA C-602 (manual method) standard at field welded area (area which is not lined and coated at shop) after the inspection and testing and also hydro test.

2. Reinforcement shall be applied as per clause no.10.3.4 of this specification.

3. Complete the interior mortar joints by the trowel method. Finish the surface with a steel trowel to a smooth finish and equal thickness to match the adjoining pipe mortar.

4. The coating with reinforcement shall be applied at the joints under pressure by rotary brushes or guniting.

5. After completion of lining and coating all piping shall be cleaned i.e. cement, aggregates will be removed by chipping.

7.7 Field Cement Mortar Lining & Coating on total piping after erection and hydro test

Work of cement mortar linings and coatings can be done on total system pipe line at field as per AWWA C 602 (mechanized method) after completion of hydro test of total system pipe line with in terminal points.

Material, thickness & cover .reinforcement, mixing of concrete or mortar shall be as indicated in clause no 10.1 to 10.4 respectively.

Lining and coating and its curing shall be followed similar to shop method and also AWWA C 602 Mechanized method.

7.8 Inspection & Testing of Lining & Coating

1. The entire procedure of applying cement-mortar lining and coating shall be subjected to continuous manual visual inspection by purchaser or their authorized representative. However, such inspection shall not relieve the contractor of the responsibility of meeting the specifications. The job shall be subjected to inspection at the following stages:

   - After surface preparation and prior to application of lining.
   - After the application of reinforcement and lining.
   - After application coating.
   - After curing.

2. Any lining not applied in accordance with this standard or as per required thickness shall be subjected to rejection and replaced / repaired at the expense of the contractor.

3. Defects in lining and coating including but not restricted to sand pockets, voids, over sanded areas, blisters, cracked and dummy areas, and thin spots shall be removed, and the area shall be repaired to the full required thickness of the mortar lining by pneumatic placement or hand application as approved by the Engineer.

4. In the stretch of pipe that has been lined and trowelled in each day's run, ten places shall be selected in straight sections of the pipe by Purchaser. In each of the ten places the thickness of the lining shall be re measured by non-destructive means such as ultrasonic thickness gauge.

5. Defective areas encompassing the full diameter of the pipe shall be replaced by machine. Defective lining rejected at the time of lining shall be removed before initial set of the mortar. Defective lining rejected after initial set shall be replaced or repaired by the most efficient practical method.

6. Hair cracks up to 0.25 mm width and not over 300 mm in length in finished linings may be considered acceptable at the discretion of the Purchaser but larger cracks shall be repaired or removed and redone all as directed by Purchaser. Trough to crest height shall not exceed 1.0 mm.

7. Test blocks for each day have 3 no. of samples and each sample shall have 3 no. of specimens as used for the lining and coating. Each shall be made in 100 mm cube moulds and subjected to cube crushing tests. Each block shall be removed from its mould as soon as practicable and cured under the conditions of temperature and humidity identical with those in which the lining of the pipe is cured. This test cube shall have properties as specified in clause 10.3.2 of this specification.

8.1 PIPING ERECTION

8.2 Piping Erection

8.2.1 General requirements

1. Make the procedures & work plan for laying of pipes, specials & fittings, field welding, inspection, testing, painting, lining and coating for approval.

2. Erection shall be done in proper sequence and in an organized manner. Work shall not interfere or cause damage to work done by himself or others.

8.2.2 Laying of Pipes, specials & fittings

1. Pipes shall be laid as per IS: 5822 and civil specification.

2. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the work.

3. Install all pipe, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances as shown in the approved drawing and as required to provide a complete and workable installation.

4. Pipes and specials shall only be handled with appropriate spreader bar and wide nylon slings. Chains and wire rope slings shall not be used to avoid damage to cemented lined and coated pipes and specials.

5. Pipe should be lowered into the trench with tackle suitable for weight of pipes, such as well designed slings with chain blocks or mobile crane. The factory applied pipe coatings and linings should not be damaged. The pipes shall be visually inspected to check the damage to coatings and linings.
6. No pipe shall be installed where the linings or coatings show cracks that may be harmful as determined by the Purchaser. Such damaged linings and coatings shall be repaired or new undamaged pipe shall be provided.

7. Where pipes are to be laid to curves, the deflection at each joint shall not exceed one degree. For sharper curves specifically made bends shall be provided.

8. The pipe shall be lowered into the trenches such that no part of any shoring is disturbed or damaged and, if necessary, additional temporary struts may be fixed during the lowering operations. Care shall be taken to ensure that the longitudinal joints of two consecutive pipes at each circumferential joint

are staggered by 90°.

9. While assembling the pipes, the ends shall have to be brought close enough to leave a uniform gap minimum 1.5 mm and not exceeding 4 mm. There shall be no lateral displacement between the pipe faces to be joined.

10. If necessary, spiders from inside and tightening rings from outside or other suitable equipment shall be used to bring the two ends in perfect contact and alignment. In no case shall hammering or longitudinal slitting be permitted. Jacking may be permitted for this purpose in particular circumstances.

11. When the pipe is properly assembled firmly supported on wooden beams and wedges or by other approved means it shall be checked for correct line and level and tack welded. The tack welded circumferential joints shall then be welded fully.

12. Pipes and fittings shall be aligned and fit-up shall be done in such way that welding can be done properly. Tack welding joint may be permitted to hold the pipe in place. If the joint is to be circumferentially welded, sufficient time shall elapse to allow for an initial set of interior joint lining prior to proceeding with joint welding. Rapid-setting mortar may be used in accordance with this Section.

13. When laying is not in progress, the open end of the pipe line should be covered with temporary end closures.

14. Thrust blocks shall be provided at appropriate locations.

15. Nuts shall be tightened in an alternating "star" pattern to the manufacturer's recommended torque with a torque wrench.

16. Carry out the cleaning, disinfecting and dewatering work as a part of laying the pipes.

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PAINTING & COATING

1.19.1 PAINTING

i. The scope of work shall also include supply and application of primer & final painting of CW Piping (Over Ground Piping) as required and specified in the BHEL / Customer / Customer Consultant's painting specification.

ii. In the case of steel fabricated items, raw steel after fabrication has to be cleaned by Sand / Grit / shot blasting and subsequent painting to be carried out. Sand / Grit / shot blasting equipment with all accessories and consumables as required has to be arranged by the contractor within the Quoted rates.

iii. All the exposed metal parts of the piping, structures, hangers etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats as indicated in the Painting Specification in TCC which matches the shop primer paint used, after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL/Customer official.

iv. Normally Paint shall be applied by brushing as per the instruction of BHEL Engineer. It shall be ensured that brush marks are minimum. If needed and insisted either by BHEL / Customer in certain cases, spray painting has to be carried out within the quoted rates. Spray painting gun and compressed air arrangement has to be made by the contractor himself within the quoted rates.

v. Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready-mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.

vi. The scope of painting includes application of colour bands, lettering the names of the systems, equipment's, tag nos. of valves, marking the directions of flow and other data required by BHEL within the quoted rate.

vii. All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and

uncoated spots. Each coat (Primer, intermediate, finish) shall have a minimum thickness of dry film thickness (DFT) in microns and the DFT of finish paint shall not be less than the specified. Necessary instrument for measuring the thickness of paint applied is to be arranged by the contractor.

viii. Primer & finish coat paint, no. of coat and DFT shall be as indicated in the painting specification enclosed in this tender / relevant BHEL document/ customer's specifications. The painting specification which is forming part of this tender as in TCC shall be used as guidelines to be followed.

ix. The actual colour to be applied shall be approved by the customer before starting of actual painting work or as per the specifications/colour coding being followed by customer for the Plant.

x. Primer & finish paint shall be of reputed paint supplier approved by BHEL / Customer. Contractor has to procure paints from the BHEL / Customer approved agencies only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities. The batch certificates of paints to be submitted to BHEL Engineer before using the same.

xi. No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost /foggy weather.

xii. Contractor has to prepare the painting procedure and obtain approval from BHEL/Customer.

xiii. Before commencement of final painting, contractor has to obtain written clearance from BHEL / Customer for effective completion of surface preparation.

xiv. Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL / Customer.

xv. Required paints, thinner other consumable such as wire brush, brush etc. shall have to be arranged by the contractor at their own cost. The required manpower, other required consumables, T & P etc. shall be provided by the contractor within the quoted rate. The arrangement of primer/paint will be in contractor's scope.

xvi. The contractor shall effectively protect the finished work from action of weather and from damage of defacement and shall cover the finished parts, then and there, for their protection.

xvii. Necessary scaffolding, required for painting of surfaces at various locations/ elevations shall be arranged by the contractor at their own cost. All the materials, required for scaffoldings shall be arranged by the contractor at their own cost.

xvii. Coating thickness shall be measured by elcometer or other standard measuring device for measuring of finished film thickness of finished paint. If the thickness is found to be less than specified, the pipes shall be re-surfaced to bring the same to specified thickness.

1.19.2 PRESERVATION / TOUCH UP PAINTING

i. Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipments under this tender specification right from pre- assembly stage to till the equipment is cleared for final painting. The primer paint shall be matching shop primer.

ii. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments as per instruction of BHEL Engineer during erection at the quoted rate. The Contractor has to arrange necessary paints within the quoted price.

iii. Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of same primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.

iv. Mostly the equipment / items / components will be supplied with one coat of primer paint and one coat of finish paint. However, during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour.

v. All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.

vi. Due to atmospheric conditions erected materials are likely to get rusted more frequently. It is the responsibility of the contractor to preserve the erection materials drawn from stores for erection till these are commissioned and handed over to customer. The required consumables for this purpose like paint, thinner, rust converter compound (Ruskill or Ferropro) or any other equivalent shall be arranged by bidder. However, the contractor should also arrange other consumables like wire brushes, emery paper, cotton waste, cloth etc. at their cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The decision of the BHEL Engineer is final with regard to frequency of application of paint and rust converter compound.

vii. Painting of portions of Employer's structures wherever connection/welding is carried out by contractor for supporting structures.

viii. All rectification including painting of Employer's structure which are damaged by contractor during his work.

1.19.3 Coating requirement for OD5100 pipes

i. For CMLC (Cement Mortar Lined and Coated) pipe thicknesses indicated are minimum metal thickness. Pipes are to be lined internally and coated externally as given below:
   a) Internal minimum 25 mm thick cement mortar lining with 4 mm wire diameter at 40 mm C/C wire mesh reinforcement.
   b) External minimum 50 mm thick cement mortar coating with cage reinforcement of 4 mm wire diameter at 50 mm C/C.
   c) Cement mortar lined pipes inner dia – 5000 mm, outer dia – 5200mm
   d) Cement mortar pipe lining thickness – inner 25 mm, outer 50mm.

ii. Pipe inner & outer surface to be cleaned by Sand / Grit / shot blasting and subsequent coating painting to be carried out. Sand / Grit / shot blasting equipment with all accessories and consumables as required has to be arranged by the contractor within the Quoted rates.

iii. Cement Mortar coating/lining procedure to be submitted and approval to be obtained from BHEL/Customer.

1.19.4 External Painting requirement for NB1800 pipe

External Painting for Piping:

1. Painting for Above Ground piping:
   a. Primer: Two coats of High build chlorinated rubber zinc phosphate primer. DFT 50 microns (min.) per coat.
   b. Finish Coat: Two coats of Chlorinated rubber paint. DFT 30 microns (min.) per coat.
   c. Minimum Total DFT = 160 microns.
2. Painting for Buried 1800NB Piping: 50 mm external cement coating shall be provided for buried portion of 1800 NB piping.

1.19.5 Internal Painting requirement for NB1800 pipes

Condenser inlet and outlet pipes shall be internally lined with minimum 500 microns DFT of glass flake acrylic polymer- based epoxy paint.

VOLUME-IA PART – I CHAPTER - XX

PRESERVATION & PROTECTION OF COMPONENTS

1.20.1 At all stages of work, equipment's/materials in the custody of Contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents including the primer & paint, for the above work shall be provided by the Contractor.

1.20.2 The Contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipment's from theft/fire/pilferage and any other damages and losses.

1.20.3 The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc shall be returned to BHEL stores by the Contractor.

1.20.4 The Contractor shall not waste any materials issued to agency. In case it is observed at any stage that the wastage/excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be affected with departmental charges from the Contractor. Decision of BHEL on this will be final and binding on the Contractor.

1.20.5 For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.

VOLUME-IA PART – I CHAPTER - XXI

PROGRESS OF WORK

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

PROGRESS AND MONITORING OF WORK

1.21.1 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.

1.21.2 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.

1.21.3 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.

1.21.4 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.

1.21.5 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.

1.21.6 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.

1.21.7 The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.

1.21.8 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.

1.21.9 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

1.21.10 Tenderers have to furnish a list of Tools and Plants including cranes, Tractor/ Trailers etc., which they propose to deploy for this work.

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

1.21.12 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.

1.21.13 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.

1.21.14 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.

1.21.15 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.

1.21.16 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).

1.21.17 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.

1.21.18 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.

VOLUME-IA PART – I CHAPTER - XXII

ENTRY OF CONTRACTOR'S PERSONNEL AND VEHICLES

1.22.1 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.

1.22.2 The contractor shall get the gate passes for their workers issued by Security agency deployed by NPCIL.

1.22.3 The identity cards/passes will be issued to the Contractor's staff and labour by NPCIL. A refundable amount as notified from time to time by NPCIL, shall be charged for issuing these cards. However, all such cards shall be essentially retuned back to NPCIL on completion of work or when the individual card holder leaves the site.

1.22.4 In case contract workers leave in between i.e. before the expiry of contract completion date, the contactor must inform the same to EIC & Security agency so that suitable remark can be added in the computer record for future checking. The contractor has to ensure deposition of gate pass issued to such worker to issuing authority through Engineer-In-Charge at the earliest.

1.22.5 In general, RFID cards with hand geometry shall be applicable for all the contract personnel and workmen. However, till the system for issue of RFID cards with hand geometry is established for, normal photo gate passes shall be issued. In case of damage or loss of RFID card a penalty of Rs. 200/- per card shall be imposed and recovered from the RA bill.

1.22.6 Procedure for issue of gate pass is as below:

i. Temporary passes will be issued for an initial period of 15 days on the basis of photo identity on recommendation of Engineer-In-Charge based on request & certification of contractor.

   Following forms of photo identity shall be acceptable for issue of initial gate passes to contract personnel and workmen.

   a. Voter ID card / Diving License / Passport /Photo bearing ration card/Aadhar Card

b. Letter from the following in their letter head with attested photo and individual's details

- Village Administrative officer
- Elected Councilor
- Panchayat President
- Member of Legislature Assembly (MLA)
- Member of Legislature Council (MLC)
- Member of Parliament (MP)
- Tehsildar

ii. Thereafter, renewal of above temporary gate passes will be done for a period of further two months after having completed safety induction training, first aid training and submission of medical fitness certificate.

iii. The Contractor shall submit the **police verification certificate (PVC)** for his staff and labour as a pre-condition to issue of RFID cards. On receipt of PVC, RFID card shall be issued up to a period of one year or remaining contract period, whichever is less. In between, each of contractor's employee has to undergo safety training after every 6 months, which shall be coordinated by contractor's Head (IS&F) & NPCIL Head (IS&F)]. After expiry of this one-year duration, gate passes shall be further renewed as per the same guidelines.

iv. In case of receipt of any adverse information against an individual, the issued identity card shall be immediately cancelled and contractor has to surrender it with Security Agency.

v. Separate permission will have to be obtained by Contractor for entry of personnel, equipment's & material in night shift and also for Sunday / Holidays.

1.22.7 Permission for vehicles will be given for a period of six months or expiry of contract, whichever is earlier based on the recommendation of Engineer-In-Charge, after verification of relevant documents.

1.22.8 The contractor and his employees shall not disclose any information or drawings furnished to them by the Corporation. Any drawings, reports and other information prepared by the contractor/by the Corporation or jointly by both for the execution of the contract shall not be disclosed without the prior written approval of the Engineer. No photographs of the works or plant within the site premises shall be taken.

1.22.9 On completion of work, contractor has to surrender all identity cards issued under the contract for their labour / staff to Issuing authority and a No Dues Certificate has to be submitted to Engineer-in-Charge of work before final bill payment.

VOLUME-IA PART – I CHAPTER - XXIII

SAFETY

1.23.1 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 NPCIL

Stringent of the condition(s) stipulated in the above reference shall be applicable to the contractor.

1.23.2 **The contractor shall strictly adhere to all the provisions spelt out in the document "AERB Safety Guidelines for Control of Works (guideline no. AERB/NRF/SG/IS Rev 1) and other safety requirements as applicable to the project site.**

1.23.3 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.

1.23.4 Contractor shall comply with the instructions given by the BHEL/NPCIL safety officer regarding safety precautions, protection measures and housekeeping etc.

1.23.5 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.

1.23.6 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.

1.23.7 The Contractor shall meet statutory requirements as well as regulatory requirements applicable to the project, in general, and NPCIL in particular, especially the requirements as per Factory Act-1948 (amended in 1987), Atomic Energy factories Rule-1996 (AEFR- 1996 or latest version available at the time of work execution), safety guidelines for Job Hazard Analysis (JHA) & AERB notifications on Industrial & Fire safety.

1.23.8 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.

1.23.9 Workers in general shall not be deployed at work for more than I0 hrs/day and in no case more than 12 hrs/day.

1.23.10 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.

1.23.11 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.

1.23.12 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.

1.23.13 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).

ii. The above is the minimum requirement of safety professionals. BHEL/NPCIL, if required, can ask for more safety professionals depending upon nature of jobs being executed by the contractor.

iii. 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/NPCIL. 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/NPCIL 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 NPCIL in this regard shall be deducted from the contractor's bills.

1.23.14 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/NPCIL 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 NPCIL in this regard shall be deducted from the contractor's bills.

1.23.15 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 NPCIL 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.

1.23.16 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/NPCIL 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 NPCIL.

1.23.17 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.

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

ii. 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 NPCIL.

iii. 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 NPCIL. The decision of the BHEL/NPCIL Engineer-in-charge, with regards to levying penalty in case above work practices are not ensured shall be final and binding.

1.23.18 Safety Plan

Contractor at his cost shall perform following tasks for the jobs having high risk as identified by BHEL/NPCIL 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/NPCIL 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.

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

1.23.20 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 NPCIL will be recovered from the contractor's RA bills.