

VOLUME - IA


Technical Conditions of Contract (TCC) for “E& C of Boiler
& it's auxiliaries”, Stack and BOP systems along with
Material Handling

FOR

**265 TPH Steam Generation Package for
Bina Petchem and Refinery Expansion Project (BPREP),
Bina, Madhya Pradesh**

BHARAT HEAVY ELECTRICALS LIMITED

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

 <p>Technical Conditions Of Contract (TCC)</p>		Ref No: HY/HPEP/SC- PROJECTS/2026- 27/TCC/BPCL 1*265TPH/ Boiler/01, Rev.00 <hr/> Rev. No. 00		
<p style="text-align: center;">COPYRIGHT AND CONFIDENTIAL</p> <p style="font-size: small;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.</p>	<p>TECHNICAL CONDITIONS OF CONTRACT (TCC)</p> <p>FOR</p> <p>“Erection, Testing, Commissioning, Trial Operation & Handing Over of Boiler and auxiliaries & associate integral piping, pumps/Fans Ducts, Chimney & Auxiliaries etc. BOP systems, fixing of hangers & supports, NDT,application of lining, Insulation, supply & touch-up painting, Stencilling & Labelling etc., Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site for erection and Material handling & Management system including Supply and Installation of items as per BOQ for “265 TPH STEAM GENERATION PACKAGE AT</p> <p>Bina Petchem and Refinery Expansion Project (BPREP), BINA, MADHYA PRADESH</p>			
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Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

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Part I Contract specific details Chapter I- Project Information

1.0 Project Details			
1	Customer	:	BPCL BINA, MP
2	Project Information	:	265 TPH Steam Generation Package for Bina Petchem and Refinery Expansion Project(BPREP)
3	Location	:	Bina, Madhya Pradesh
4	Address Detail	:	Petro Chemical Unit, Post BORL residential complex-470124 Bina, District-Sagar, Madhya Pradesh, India.
5	Nearest Railway Station	:	Bina
6	Road Approach	:	Bhopal to Bina
7	Nearest Air Port	:	Bhopal Airport
11	Ambient Air Temperature (Average)	:	a) Maximum : 40 ⁰ C b) Minimum : 9 ⁰ C
12	Average Relative Humidity	:	52-88%
13	Climatic Condition	:	humid sub-tropical Climate

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

Other contractors would be working in this area and their structures are to be protected. The material brought and stacked for construction should not make hindrance to other contractors. The information given herein 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.

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

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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

Chapter II- Scope of Work

2.0 The scope of the work of Erection, Testing, Commissioning, Trial Operation & Handing Over of Boiler and auxiliaries & associate integral piping, pumps/Fans Ducts, Chimney & Auxiliaries etc., BOP systems, fixing of hangers & supports, NDT, application of lining, Insulation, supply & touch-up painting, Stencilling & Labelling etc., Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site for erection and Material handling & Management system including Supply and Installation of items as per of the following but not limited to:

2.1 Complete system of Steam Generator:

- i. Boiler structure
- ii. Pressure parts & non-pressure parts
- iii. IA/SA Piping
- iv. All boiler integral piping, hanger supports etc.
- v. Duct dampers, Expansion joints & Gates along-with actuators and their support structures with Ladder and platforms etc.
- vi. Rotating equipment, Air Preheaters, ID/FD Blower Fans,
- vii. Oil and Gas Burners, Ignitors and Scanners
- viii. Deaerator & its auxiliaries
- ix. Blow Down cooler & Heat Exchangers
- x. Complete Ducting (including all accessories, lining, and insulation) up to Chimney inlet
- xi. Insulation & Refractory of all required system of SG (Piping & Equipment) system as applicable.
- xii. Assistance during chemical cleaning, temporary piping with insulation, alkali boil out, acid cleaning and passivation, NDT, Hydrotest, IBR formalities, PG test as per scope given in the tender
- xiii. All Header inspection and cleaning of boiler by Borescope by cutting and re-welding of inspection nozzles of the Boilers after steam blowing or as per FQP/ Other technical document.
- xiv. Assistance during Thermal flow test (TFT) and cleaning/rectification of tubes as per findings in TFT.
- xv. Erection testing and commissioning of all Hoists of Boiler including load test.
 - a. piping, supports and auxiliaries
- xvi. Steam Blowing and Safety Valve Floating including Erection and Dismantling of all temporary Piping, Valves, etc. required for above operations and other commissioning activities including post commissioning operations and stabilization of the unit.
- xvii. painting, stenciling etc.

2.2. Complete system of Steel Chimney & its auxiliaries

- i. Height of Chimney -100.5 m(Approx.)
- ii. Weight of Chimney – 450 MT approx.
- iii. Chimney material: Carbon steel (E350). Top shell of thickness approx. 12mm will be of stainless steel

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- iv. Bottom shells of thickness 50mm-12mm/Diameter:8m-6m will be sent in 4 splits of 2.5 height each (total 26 shells- refer enclosed sketch). Top shells of thickness 12mm/Dia:3.5m will be supplied in 2 splits of 2.5 mt height each (total 14 shell- ref enclosed sketch)
- v. Each chimney shell weight will range from **6 MT to 35 MT**
- vi. Structure, Ladders, approach platform etc.
- vii. **Refractories and other Insulation work inside Chimney.** The Insulation& refractory work shall be done by a separate Contractor, However the Supply & Erection of necessary Scaffoldings both inside and outside of the chimney has to be done by the Contractor within the quoted rate. No separate payment will be made for this purpose.
- viii. The Supply & Erection of necessary Scaffoldings both inside and outside of the chimney for fabrication &Erection works of chimney has to be arranged by the Contractor within the quoted rate. No separate payment will be made for this purpose.
- ix. The contractor has to deploy Man lifter as per requirement within the quoted rate. No separate payment will be made for this purpose.

2.3 Piping and associated Items

- i. Piping, valves, Fittings
- ii. Piping Specialties (Strainers, Steam traps, Insulating Gasket kits, Jumpers across Flanges, Utility Hoses etc.
- iii. Application of Insulation

2.4 BOP system

- i. Various types of Pumps , Motors & Drive Turbines
- ii. Natural Gas System / Refinery Gas System / Off Gas System.
- iii. Fuel Oil System
- iv. PFO Fuel System
- v. LP Dosing Skid Hydrazine (Oxygen Scavenger) along with Safety Shower and Eye wash
- vi. LP Dosing Skid Amine (Corrosion inhibitor) along with Safety Shower and Eye wash
- vii. Atmospheric Flash Tank, Deaerator Overflow Collection Tank, Suspect Condensate Collection tank
- viii. Cranes & hoists

2.5 The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of Material handling (Receipt, Issue, Loading, unloading, preservation & Record keeping)transporting of materials from project stores sheds / storage yards /Customer site to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, pre-assembling of equipment at the preassembly yard with making all necessary arrangements, inspection, preservation, erection, levelling, and other adjustments, Lifting, laying, erection, bolt tensioning, bolt torque tightening, supporting and installation, pre and post weld heat treatment, inspection, NDT including radiography, providing assistance, approach and other necessary arrangements to other agency

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(deployed by BHEL) for conducting NDT/PWHT and hydrostatic tests by making all necessary arrangements (i.e. dummy plate welding, erection of temporary lines, etc. as required), water / steam flushing, air drying, nitrogen purging and other testing, cutting, edge / surface preparation, welding, grinding, radiography, LPI/MPI/UT/PAUT/CRT testing wherever needed, carrying out air tightness test using soap solution / kerosene, Vacuum test, hydraulic test, steam / air blowing, light up, assistance during chemical cleaning, passivation, steam blowing and safety valve floating including inter connection of all the termination points, below and above ground piping, erection and dismantling of all temporary piping, valves, etc., and all other tests as per FQP and commissioning procedures, required for the above operations, all pre-commissioning tests and trial runs of Boiler and auxiliaries, Power Cycle piping, BOP system, Chimney & its Auxiliaries

2.6 Scope covers installation of all valves including other miscellaneous in line / on line items, cleaning, pickling (if required) water / steam flushing, air drying disposal of fluids offsite, reinstatement, preservation of piping and miscellaneous items following hydro test, nitrogen purging, cleaning, assistance during chemical cleaning, painting, insulation, fabrication & installation, all associated incidentals setting and commissioning of pipe supports, guides, anchors, spring supports, temporary/permanent approach/platforms, as required

2.7 GENERAL

- i. 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
- ii. 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.
- iii. 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.
- iv.
- v. 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.
- vi. All necessary arrangement for safety like Hard Barricading with scaffolding pipes and providing of safety net is in bidder's scope
- vii. Establish levels and coordinates at suitable intervals from existing bench marks, marking of reference (level and distance) and other identification works etc., 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.
- viii. In case of any HP/LP pipe is routed along the path of walkways, suitable crossover has to be prepared using structural material. In case any additional approach/ platform required for commissioning/operation of the actuators/valves/gates/dampers is required it shall be in the scope of contractor. Payment/ payment terms of such work shall be done as per Rate schedule available in this contract.
- ix. 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

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2.8 Technical Staff Requirement for execution of this contract

Project Manager –with relevant experience in Power Plant (Boiler) Works etc.

- Asst. Project Managers –with relevant experience in Power Plant (Boiler & Piping) & Bop systems
- Experienced Engineers – For Structure, Boiler & Piping, Rotating Machine/duct, dedicated engineer for the commissioning activities for Boiler area and on later stage dedicated head for Insulation and cladding.
- Experienced Foreman / Supervisors – As per requirement
- Planning & Billing Engineers – As per requirement
- Stores, Gate Pass – As per requirement
- Accounts & Administration – As per requirement
- Human Resource officer – As per requirement

Industrial Relation officer – As per requirement

- Quality Control Engineer – Sr. Quality Control Engineer Head as per requirement with relevant experience in quality control of Boiler / Piping

Sr. Quality Control Engineer– As per requirement with relevant experience in quality control of Boiler and auxiliaries and Piping

Quality Control Engineer – As per requirement with relevant experience in NDT (in RT, UT, LPI/MPI)

QA/QC Documentation Engineer with relevant experience in QA/QC of Boiler & Piping

- Safety Engineer – As per HSE Plan
- Operator, Licensed Electrician, Mechanic - As per requirement
- Experienced Helpers – lot for similar nature of work
- Security Guards (Round the Clock) – As per requirement.

Note: Above various manpower requirement is tentative only. Contractor shall augment adequate manpower in various discipline 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.

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

Performance of their team to be review on quarterly basis & BHEL may ask for replacement of Engineer/ Supervisor based on their performance. Same to be replaced by Contractor within 30 days.

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 organizational structure 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.

2.9 Erection Clause:

- i. The works to be performed under this contract consist of providing all labour, supervision, material, scaffolding, construction equipment, tools & 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

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- etc. are included on the rates of items of work. Works shall be carried out only with approved 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.
- ii. 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. Declaration already provided in Forms and Procedure.
 - iii. The quantities indicated in the tender specification are approximate and are liable for variation at the requirement of work/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 of GCC and preamble to BOQ
 - iv. 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.
 - v. Time is the essence of contract. Night shift working is envisaged for works not hazardous in nature with due permission of BHEL for activities like- Erection works at low heights, Material shifting, Preassembly works etc
 - vi. 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 equipment constituting terminal points, whether the terminal equipment fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also, wherever 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, is within the quoted rate
 - vii. Considering the area constrain in the subject project, Contractor has to work in close coordination 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 like, Boiler light up, Steam blowing, SV Floating, etc., are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly
 - viii. 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
 - ix. The storage yards are located within the plant boundary and outside plant boundary of the plant premises in multiple locations which shall be intimated during course of work. All other

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materials have to be transported from storage yard to construction area by the contractor at his own cost, using own Pick & Carry Crane (Farana), crane and trailer.

2.10 Painting:

i. For components/equipment/ Structure: All materials shall be supplied from BHEL units/ workshops with finish coats of paint. Therefore, final painting is not applicable in the scope of contractor for Unit supplied items (until specifically mentioned in the tender). However, touch up painting (wherever required), incidental to the work, shall be in the scope of the contractor, including supply of the required paints and primers and associated consumables.

NOTE- The access platforms & FPS Piping Category Full painting is applicable as per painting schedule .All the FPS piping will be supplied unpainted condition .The supply of paint & consumables is in the scope of Contractor & within the quoted rate.

ii. 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 (**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, equipment etc., in his possession. He must also have on his payroll adequately trained, qualified and experienced supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works

iii. Contractor shall execute the work as per sequence /standards/ procedure prescribed. Any failure to comply with the standard practice 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

iv. 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

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

vi. Giving all notices, paying all fees, taxes, statutory clearances, license (like T&P load test, etc), etc., in accordance with the general conditions of contract, that is required for all works including temporary works

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

viii. The contractor shall provide the owner/BHEL such an assistance, instruments, machines, labour and

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materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used

- ix. Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract
- x. Arranging for joint checking (with BHEL / BHEL's Customer / Consultant/inspector) 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.
- xi. Contractor shall set up suitable guarded storage facilities for issued project materials. Contractor shall ensure the Storage of only those 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% overhead.
- xii. 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
- xiii. 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
- xiv. 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
- xv. Adequate lighting facilities such as flood lamps, 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.
- xvi. Adequate water-less/Bio urinals /Portable toilets(as per HSE plan) at locations identified by BHEL site in-charge, shall be arranged by the contractor for your own labours within quoted rates, at site of construction at different level and different areas with proper disposal arrangement.**
- xvii. Vendors have to comply requirements of HSE & Statutory requirement in line with BHEL HSE plan, BPCL Safety requirement, State/Central statutory requirement
- xviii. Preparation of 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
- xix. Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.

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

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2.11 Consumables:

All the required electrodes (in Contractor scope) as approved by BHEL shall be arranged by contractor at his cost. 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.

The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), all gases (inert, Nitrogen Gas for accumulators and Gases required welding, and cutting), soldering material, dye penetrants, radiography films, water soluble paper. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Sodium silicate, Araldite, petrol, CTC / other cleaning agents, grinding and cutting & buffing 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.) hardware items etc. required for temporary works such as supports, scaffoldings, pre-assembly bed etc. can be issued from BHEL at its discretion on returnable basis subject to availability with BHEL site store. In case of non-availability same has to be arranged by agency. Nitrogen cylinders required for Acid cleaning, & other Commissioning activities of Boiler are in the scope the bidder.

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

All the required gases like Oxygen / Acetylene / argon / Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non-availability of gases cannot be considered as reason for not attaining the required progress. BHEL reserves the right to reject the use of any gas in case required purity is not maintained

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

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

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

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

All low hydrogen electrodes if any 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

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drying oven (Baking & holding oven) and portable drying ovens shall be provided by contractor in sufficient quantities at his cost

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.

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Chapter III- Facilities in the scope of BHEL/Contractor

S. No.	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1	ESTABLISHMENT			
3.1.1	FOR CONSTRUCTION PURPOSE:			
a	Open space for office (as per availability)	Yes		Location shall be finalized after joint survey with M/s BPCL
b	Space for storage (as per availability within/nearby project premises)			Location will be finalized after joint survey with owner. Note: There can be more than one location of open storage yard, closed shed/ Semi Closed shed (few locations may also be outside project premises). Bidder shall make his establishment accordingly for material handling and MM services
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipment, office / store / canteen/Toilet consumables		Yes	
e	Toilet and Canteen facilities for the bidder's staff, Workmen supervisors and engineers etc		Yes	
f	Firefighting equipment like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder.		Yes	
3.1.2	FOR LIVING PURPOSES OF THE BIDDER			

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a	Open space for labour colony (as per availability)		Yes	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	Construction Plan shall be approved by BHEL/Customer.
3.2.0	ELECTRICITY			
3.2.1	Electricity for construction purposes (for Site/Project works only) 3 Phase 415/440 V within project premises.			Free
a	Single point source	Yes		
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.2	Electricity for the Toilet office, stores, canteen etc of the bidder			Electricity shall be provided at one point and Further distribution shall be done by contractor.
a	Single point source	Yes		
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	.
a	Single point source		Yes	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	WATER SUPPLY			BHEL shall provide water supply free of

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				cost (at single point source) for construction purpose as and when made available by customer.
3.3.1	For construction purposes			Water shall be provided at one point and Further distribution shall be done by contractor.
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	<u>Water supply for bidder's office, stores, canteen etc</u>			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	<u>Water supply for Living Purpose</u>			Contractor has to make his own arrangement.
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	LIGHTING			
a	For construction work (Supply and execution of the lighting work/ arrangements)		Yes	For office, stores, canteen etc. of the bidder; Illumination shall be in Contractor scope.
b	Lighting for the living purposes of the bidder at the colony / quarters.		Yes	

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3.5.0	COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER			Bidder has to take care
a	Telephone, fax, internet, e-mail etc.		Yes	
3.6.0	COMPRESSED AIR wherever required for the work		Yes	Bidder has to take care
3.7.0	Demobilization of all the above facilities		Yes	Bidder has to take care
3.8.0	TRANSPORTATION			Bidder has to take care
a	For site personnel of the bidder		Yes	
b	For bidder's equipment and consumables (T&P, Consumables etc)		Yes	
3.9	Work Permits, gate pass etc. from customer for inward and outward movement of manpower, machinery and material		Yes	
3.10	Preparation of site execution schedules and other input requirements as per Form-14.	Yes	Yes	In consultation with BHEL
3.11	Review of performance and revision of site execution schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
3.11.1	Erection Facilities			
3.11.2	Providing the erection/constructions drawings for all the equipment covered under this scope.	Yes		Shall be provided progressively
3.11.3	Drawings for construction methods	Yes	Yes	In consultation with BHEL
3.11.4	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.
3.11.5	Shipping lists etc. for reference and planning the activities	Yes		In consultation with BHEL

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3.11.6	Preparation of erection schedules and other input requirements as per Form-14.		Yes	In consultation with BHEL
3.11.7	Review of performance and revision of site fabrication and erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
3.11.8	Weekly erection schedules based on Sl. No. 3.11.6		Yes	In consultation with BHEL
3.11.9	Daily erection / work plan based on Sl. No. 3.11.8		Yes	In consultation with BHEL
3.11.10	Periodic visit of the senior official of the bidder to site to review the progress so that works is 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	
3.11.11	Preparation of pre-assembly bay		Yes	Materials required for pre-assembly bay/fabrication yard shall be in agency scope. However, if available, BHEL may provide such material on free returnable basis, which shall be returned without any damage.
	Laying of tracks, support for marching, erection, assembly, commissioning for all type cranes, if provided by BHEL or brought by the contractor /bidder himself.		Yes	
3.12	Land/Open Space			
3.12.1	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 agencies. BHEL shall provide free of charge limited			

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	open space for office, storage area for vendor's material and T&Ps and laydown area as and where made available by Customer.
3.13	Labour and Staff Colony: Following are in the Bidder's scope of work for labour & staff colony:
3.13.1	Labour colony is to be developed / arrange by bidder for all the labourers required to be deployed for the works. All labour colony set-up is to be developed / arranged as per specifications, drawings, standard approved by BHEL/Customer and in compliance of statutory requirements.
3.13.2	Land for labor colony shall be arranged by Contractor at their own cost as per availability outside project area within acceptable limit or approx. 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.
3.13.3	Development of Bidder's temporary staff colony and labour colony having adequate no. of rest rooms along with toilets & fencing etc.
3.13.4	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.
3.13.5	Providing and maintaining facilities for safety, welfare, drinking water and sanitation, hygiene, biennial health check-up etc. for construction workers at their workplaces as well as at labour & staff colonies.
3.13.6	Development and maintenance of above facilities for construction workers deployed by the Contractor shall solely rest with the Contractor.
3.13.7	<p>Installation of necessary amenities and temporary infrastructure 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:</p> <ul style="list-style-type: none"> • Labour rest sheds near work spot. • Canteen facility creation / arrangement. • Drinking water facility. • Labour Bio toilets near work spot in sufficient nos. with regular cleaning & maintenance arrangement. • Labour colony should have all hygienic condition, dining hall, toilets, proper sewerage system, good drinking water arrangements. • Regular fogging in the work place and labour colony to avoid mosquitoes. • Statutory documents shall be submitted along with RA Bills for processing of Bills.
3.14	Construction Power:

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3.14.1	Construction Power shall be provided at single point source on free of charge basis as and when made available at site, however contractor has to make his own arrangement to meet power requirement in case of delay in availability of single source or any kind of power interruptions during the course of the project.
3.14.2	Contractor shall make necessary arrangements for onward distribution of construction power taking due care of surrounding construction activities like movement of cranes & vehicles, civil work, fabrication/construction/assembly/ erection etc. and safety of personnel. It may become necessary to relocate some of the installations to facilitate work by other agencies or by him.
3.14.3	It shall be the responsibility of the Contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced electrician.
3.14.4	Contractor himself shall be responsible for any loss or damage to their equipment as a result of variations in voltage or frequency or interruptions in power supply.
3.14.5	Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.
3.15	Construction water:
3.15.1	Construction Water may be provided at single point on free of charge basis as and when made available at site, however contractor has to make his own arrangement to meet Water requirement in case of delay in availability of single source or any kind of interruptions during the course of the project. Bidder has to make arrangement of further distribution of water at his own cost. No extra payment shall be made under this account.
3.15.2	The Contractor should decide for storage of sufficient quantity of water required for work. The agency should also construct sumps (if required) of suitable size for storage of construction water as per their requirement for use in batching plant and construction purposes.
3.15.3	Contractor to satisfy himself that the water drawn by him is fit for construction / consumption and adequately treat such water at his cost when it is not found fit for the said purposes.

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3.16	General Note:
	1.0 There can be more than one location of open storage yard, Closed shed/ Semi Closed shed. Few locations may be outside project premises, bidder shall make his establishment accordingly for Material Handling and MM services.
	2.0 Bidder has to make his own arrangement at his cost till the construction power by BHEL is established.
	3.0 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 or specified elsewhere but reasonably implied or necessary for the proper completion, maintenance and handling over shall be in the scope of contractor.
	4.0 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.

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Chapter IV- Tools & plants to be deployed by Contractor

LIST OF TOOLS AND PLANT:

4.0. Tools and Plants: Number of T&Ps to be deployed at site shall be decided w.r.t. monthly plan and review format (F-14) based on site requirement.

4.1. Major T&P: The following Major Tools & Plants (T&P) shall be arranged by the Contractor with certified operator for execution of work as per Technical Conditions of Contract of this tender within the quoted rate.

The following tools and equipment but not limited to, are required for the efficient execution of the E&C works of this contract. The contractor shall make them available for construction purposes, including all consumables likely to be used at his own cost at the time of mobilization.

S.No.	Description	Minimum Capacity	Minimum Quantity in Nos	Remarks
1	Crawler crane /Tyre mounted (as per site requirement)	120 MT	One	Crane to be made available as per instruction from BHEL Site in-charge. Tentative schedule: from Start of Boiler Erection till Synchronization. (For Pre-Assy in Boiler/Stack/BOP system/Duct &E&C activities) Note-for erection of drums & Girder Bidder should not depend on BHEL crane/T&P, bidder has to arrange within the quoted rate.
2	Induction heating M/c with accessories	As required	04	To be made available as per instruction from BHEL Site in-charge. For welding of pipes as applicable.
3	Unloading pump for handling concentrated Ammonia, along with Motor and starter	As required	02	Good /Working condition Pumps, One month before the scheduled Acid cleaning activity till completion of activity
4	Chemical Cleaning & ABO Set up including Temporary Piping(Supply & Installation & Dismantling all inclusive)	As required	1set	This has to be arranged one month Prior to Alkali Boil out and Acid cleaning and as

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			per the Instruction of Engineer in charge
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BHEL will not provide any tool, plants, facilities or any testing facility/apparatus for the work. It will be contractor's responsibility to arrange all required tools, plants and other testing apparatus, etc. at their own cost. The prices quoted & finalized are inclusive of the charges towards providing such T&P. No extra payment will be entertained because of this.

However, subject to availability, BHEL may provide few T&P to the contractor for expediting and in larger interest of the project. In case any such facility is provided to the contractor, BHEL will make necessary recovery in the running account/final bills towards the hire charges. A departmental charge @ 5% will also be affected such cases. The decision of BHEL on the hire charges will be final and binding on contractor.

Note for clause 4.1:

1. Contractor shall mobilize aforementioned cranes/T&Ps at site, in case stated capacity crane could not be made available, for any reason what so ever, a higher capacity crane shall be mobilized by the contractor without any extra cost to BHEL.
2. Agency shall Mobilize / de-mobilize/ re-mobilize the above Major T&Ps as per BHEL instruction without any extra cost to BHEL.
3. ***The crane shall not be older than 10 years as of the latest date of Offer Submission.*** In case the date & month of crane manufacturing is not available, then 01 January of the manufacturing year of the crane shall be considered as the manufacturing date.
 In case the month is written without a date, then 1st day of the respective month shall be considered as the manufacturing date.
 The manufacturer's certificate, invoice copy, or relevant documentary proof shall be furnished Before deployment of the crane at the site bidder has to submit a set of the same documents of the crane to the BHEL site in charge to confirm /verify. Only after receipt of confirmation from the BHEL site in charge, the bidder can deploy the crane. (Applicable for Cranes in clause no4.1 &4.2)

4.2. 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. Below given Quantities are tentative for planning purposes by the bidder.

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
1	Tyre mounted mobile crane	35/40/50 MT	01no.	As per requirement
2	Tyre mounted mobile crane	18/20/23 MT	01 no.	As per requirement
4	Trailer	20 MT	01 no.	As per requirement Trailer mobilisation as instructed by BHEL Site.

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6	Man lifter	min. 40mtr height capacity	01 no.	As per requirement
7	Calibrated Power driven HSFG bolt tightening machines	As per requirement	5 Nos	As per requirement
8	Power Driven Torque tightening machine	As per requirement	06 Nos	Incl. 02 nos. of capacity upto 36 Dia. HSFG bolt tightening.
9	Torque calibrator	As per requirement	As per requirement	As per requirement
10	Bolt Tension Calibrator	As per requirement	As per requirement	As per requirement
11	Pre-heating, post-heating and post-weld stress relieving equipment with automatic recording devices and chartless recorder / IIOT sensors duly password protected with a connectivity to remote server /Cloud along with heating control panel, cables, 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.	As per requirement	As per requirement	As per requirement
12	Electrical torque wrench	As per requirement	As per requirement	As per requirement
13	Impact wrench	As per requirement	As per requirement	As per requirement
SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
14	Torque wrench	As per requirement	As per requirement	As per requirement
15	Steel tape	As per requirement	As per requirement	As per requirement

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16	Steel ruler	As per requirement	As per requirement	As per requirement
17	Ultrasonic hardness testing machine (Ultrasonic contact impedance (UCI))	As per requirement	As per requirement	GE or Kraut Kramer or Microdur make or reputed branded ultrasonic hardness testing machine. (Hardness test may be Brinell, Vickers and Rockwell tests as per the discretion of BHEL.)
18	DG SET – 250 KVA	As per requirement	01 set	For continuous/ uninterrupted back up power during welding & post weld heat treatment
19	DG SET – 500 KVA	As per requirement	01 set	For continuous/ uninterrupted back up power for HP joints.
20	Portable DG Set	As per requirement	02 set	As per requirement
21	Ultrasonic thickness guage (Thickness measurement M/Cs)	As per requirement	As per requirement	As per requirement
22	Air compressor/Blower (electric/diesel operated)	210 CFM, 7 KG/CM2	01 no.	As per requirement
23	Air Leak Test equipment with all auxiliaries.	As per requirement	02 Set	For leakage test if required
24	TIG welding set	As per requirement	As per requirement	As per requirement
25	Oxy Acetylene Gas cutting Machine	As per requirement	As per requirement	As per requirement
26	GTAW Machine: HF Welding Machine & SMAW machine: Inverter based welding machine	As per requirement	As per requirement	As per requirement
27	DC arc welding machine & Submerged ARC welding M/C	As per requirement	As per requirement	As per requirement
SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS

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28	3-phase distribution board with complete set up for drawl of construction power	As per requirement	As per requirement	As per requirement
29	Power cable for drawl of construction power	As per requirement	As per requirement	As per requirement
30	Self-drilling cum tapping machine for screws	As per requirement	As per requirement	Prior to start of sheeting works.
31	Radiography arrangement with radioactive isotope source	As per requirement	As per requirement	As per requirement
32	Theodolite of required accuracy	To ensure verticality of structural columns.	02 Nos.	Required Since start of work
33	Arrangement for UT of higher thickness joints with recording facility & required calibration blocks.	Type USN 50 or equivalent/ up graded type	As per requirement	During Pre-assembly & erection
34	Welding rectifiers / MIG Welding (electrical)	As per requirement	As per requirement	As per requirement
35	Welding generator (diesel operated)	As per requirement	As per requirement	As per requirement
36	Radiography film viewer	As per requirement	As per requirement	As per requirement
37	Pipe/Tube cutting/ bevelling /chamfering machine	As per requirement	As per requirement	During Pre-assembly & erection
38	Electro/hydraulic pipe bending machine	Up to 2.5" nb and 12 mm thick pipes	As per requirement	During Trim piping erection work.
39	Baking oven with thermostat and temperature gauge for welding electrodes	As per requirement	As per requirement	Required Since start of work
40	Holding oven with thermostat and temperature gauge for welding electrodes	As per requirement	As per requirement	Required Since start of work
41	Portable oven for welding electrodes	As per requirement	As per requirement	Required Since start of work
42	Pug Cutting machines	As per requirement	As per requirement	As per requirement

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43	Chain pulley blocks	As per requirement	As per requirement	As per requirement
SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
44	Electric winch	2/3/5/10/15 MT capacity	As per requirement	As per requirement
45	Hand winch	0.5 ton/1.0 MT capacity	As per requirement	As per requirement
46	Battery Driven emergency light	As per requirement	As per requirement	As per requirement
47	Scaffolding materials with clamps for insulation, painting etc works	As per requirement	As required	As per requirement
48	Profile making m/c	For aluminium sheet cladding work	As per requirement	As per requirement
49	Nibbling m/c	As per requirement	As per requirement	As per requirement
50	Shearing m/c	As per requirement	As per requirement	As per requirement
51	Portable grinding m/c	As per requirement	As per requirement	As per requirement
52	Portable drilling m/c	As per requirement	As per requirement	As per requirement
53	Hoisting and pulley devices/pulleys	As per requirement	As per requirement	As per requirement
54	Spanners / Eye Bolts (of All Sizes)	As per requirement	As per requirement	As per requirement
55	Magnetic particle testing equipment – DRY &WET Type	As per requirement	As per requirement	As per requirement
56	Hydraulic Jacks	10/20/50/100 MT	As per requirement	As per requirement
57	Submersible Dewatering pumps (Electrical operated)	15HP- 1 no, 10HP - 1 no, 5HP - 2no, 2 HP - 2 nos, 1 HP - 2nos		As per requirement
58	Dewatering pumps (Diesel engine operated)	15HP - 1 no, 10HP- 1 no, 2HP - 2no		As per requirement
59	Various sizes of clamps/ fixtures for assembling	As per requirement	As per requirement	As per requirement

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60	Hand Operated Megger 500 / 1000 V	As per requirement	As per requirement	As per requirement
61	Tong Tester 10, 20 Or 50 Amp + / - 3 % Accuracy	As per requirement	As per requirement	As per requirement
SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
62	Digital and Analogue Multimetres	As per requirement	As per requirement	As per requirement
63	U Tube Manometer 0-2000 mm Water Column	As per requirement	As per requirement	As per requirement
64	Inclined Manometer 0-50 mm Water Column	As per requirement	As per requirement	As per requirement
65	Special Slings for Erection of Ceiling Girders & other heavy components	As per requirement	As per requirement	As per requirement
66	Concrete Blocks	As per requirement	As per requirement	For making bed of steel structure for checking dimensional accuracy, configuration and minor rectification.
67	Wooden/Concrete sleeper 1.5-2.0 Mtr length	As per requirement	As per requirement	As per requirement
68	PORTABLE MAGNETIC STRUCTURESCOPE	As per requirement	01 no.	As per requirement
69	PMI (Positive Material Identification)	As per requirement	01 no.	As per requirement
70	Equipment for carrying out NDT test like LPI/MPI etc along with consumables.	As per requirement	As per requirement	As per requirement
71	Painting equipment sets complete with compressor, hopper, screen, blasting hose pipe, nozzle airless / conventional spray (within CGI temporary cover shed)	As per requirement	As per requirement	As per requirement
72	Digital Elcometer for paint thickness checking	As per requirement	As per requirement	As per requirement

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73	Sufficient quantity of steel ladders for approach up to the top of each erected column to be required during erection of columns.	As per requirement	As per requirement	As per requirement
74	Suspended working platform Size :7mX1mX0.5m, Rated load 800 kg to 1000 Kg,	As per requirement	02 Nos.	Prior to start of sheeting works.
75	Shot blasting equipment required capacity	As per requirement	As per requirement	As per requirement
SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
76	PAUT + TOFD Machine	As per BHEL "Guidelines for Selection of NDE & Heat Treatment Agencies	01	As per requirement
77	Tools for Reaming and Honing	As per requirement	As per requirement	As per requirement
78	PVC Caps to cover Pipe/tube ends.	As per requirement	As per requirement	As per requirement
79	Hydraulic test/ pressurizing pump (Along with Suitable/ different ranges of calibrated Pr. gauges- Minimum 06 Nos.)	As per requirement	04 Nos.	For Piping and other areas Incl. installation, electrical connection, Erection and dismantling, temporary pipelines, fittings, etc. shall be carried out by the contractor as part of this work.
80	Furnace maintenance platform (Sky climber)	As per Requirement	02 Nos.	to cover one length and one width of furnace including corners
81	Spot Welding M/c	As per requirement	As per requirement	As per requirement
82	Web Slings	As per requirement	As per requirement	As per requirement

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83	Plastic welding M/cs	As per requirement	02 nos	For welding of mis eliminator piping in internals. If required
84	Hand operated pressurising pump (capacity Up to 400 KG/Cm2)		02 No	For Hydrotest of hydraulic oil lines/ impulse lines of various system in SG
85	Air blower		01 No	For ATT of ESP and Ducts.
86	Vacuum M/c with Accessories		01 No	For inspection of welding leakage inspection of bottom plates of absorber and tanks.

4.3.	List of suggestive safety Equipment /PPEs			
1.	Safety Net (10 Mtr x 5 Mtr)			As per requirement
2.	Rope grab fall arrestor with karbiner			As per requirement
3.	Anchorage Line (30 Mtr)			As per requirement
4.	Anchorage Line (40 Mtr)			As per requirement
5.	Wire rope (life line)- (25 Mtr)			As per requirement
6.	Wire rope (life line)- (40 Mtr)			As per requirement
7.	Ladder (Vertical)			As per requirement
8.	Full body safety harness double lanyard with shock absorber			As per requirement
9.	Industrial Safety Helmet			As per requirement
10.	Industrial Safety Shoes			As per requirement
Note: - Above suggestive safety Equipment /PPEs shall be arranged by the Contractor for his workmen for execution of work as per Technical Conditions of Contract of this tender within the quoted rate.				
4.4.	List of suggestive safety Equipment /PPEs to be included in List of minimum T&P & arranged by Contractor:			

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1.	Height Rescue Kit and Confined space rescue kit	1 No each
2.	Lux Meter & Breathe Analyser	2 Nos each
3.	Multi Gas Meter	1 No
4.	ELCB & RCCB Tester	1 No
5.	Earth Resistance meter	1 No
6.	Scaffolding materials as per standard for hard barricading	As per requirement
7.	Axial Fan with exhaust hood for confined space working and DC Light Unit	Min 2 Nos each
8.	Oxygen Meter	1 No
9.	Fire Blanket	Min 500 Mtr
10.	Fire resistant tarpaulins	Min 25 Nos
11.	Safety Posters as per BHEL Guidelines	As per requirement and instruction of BHEL
12.	Fire Extinguishers: ABC – 6 Kg: 15 Nos, Co2 – 4.5 Kg: 5 Nos, Foam – 9 Kg: 2 Nos Fire Bucket (set of ¾ buckets) with stand – 5 Nos	
13.	Rubber Mat as per IS 15652	Min 50 Sqm
14.	Electrical rubber gloves	As per requirement
15.	Water Sprinkling tanker for dust suppression	As and when required
4.5.	Measuring and Monitoring Equipment (MMEs): To be finalized as per site requirement.	
4.6.	All above T&Ps are to be deployed by contractor as and when required as per instruction of BHEL engineer. If works gets delayed due to non-availability of above T&Ps, BHEL reserves the right to deploy the same and recover the charges thereof from the contractor as per prevailing market rate/hiring rate/BHEL internal hiring rates + 5% overhead rates.	
4.7.	Any Heavy Equipment (cranes, winch machine, etc.) manufactured less than 10 Years from the current Year shall be only allowed to be used at project Site. Pre-safety Inspection of the equipment by safety dept. shall be done before mobilizing the equipment at our project site.	
4.8.	Hydras are not permitted for the scope of work. Contractor shall deploy and use pick & carry crane of TRX or equivalent type only for the above purpose.	
4.9.	Tandem operation towards material handling is also avoided in the project premises.	
4.10.	Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor's account.	

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4.11.	Contractor has to submit the Calibration certificates of all the precision equipment to BHEL. BHEL may ask for recalibration of the MMEs /precision equipments 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.
4.12.	All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established upto National Physical Laboratory.
4.13.	Contractor has to arrange slings of all sizes for completing the works covered under these specifications.
4.14.	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 analysing the production capacity and suitability of both the T&Ps.
4.15.	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.
4.16.	Crane operators deployed by the contractor shall be offered for testing by BHEL before they are allowed to operate the cranes.
4.17.	The above list as mentioned is only indicative and these T&Ps may not be required for entire contract period but contractor shall ensure the availability of the T&Ps as per work requirement and T&P Deployment schedule. T&P Deployment schedule shall be finalized at site in consultation with BHEL Engineer based on the work fronts/work requirement. BHEL decision shall be final and binding regarding the T&P deployment schedule. Contractor shall mobilize / maintain the T&P's as per the deployment schedule notified time to time by BHEL Engineer.
4.18.	APR (As per Requirement)- Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer.
4.19.	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.
4.20.	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.

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4.21.	In the eventuality of contractor not deploying / abnormal down time of T&P/cranes in his scope during the period specified above, In case BHEL arrange the T&P/Crane through hiring, actual hiring charges with 5% over head shall be recovered from the contractor's running bills.
4.22.	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.
4.23.	All the T&Ps required for successful completion of this scope of work, are to be arranged by the contractor with in the quoted rates.
4.24.	All operators (for crane, winch etc.) deployed by contractor shall have valid licence from applicable authority (which ever applicable).
4.25.	The contractor has to furnish a list of Tools and plants including cranes/ tractors/trailers/trucks etc. which he has proposed to deploy for this work.
4.26.	T&Ps shown in the above in S. No. 4.2 mentioned list 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.
4.27.	Contractor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipment. Also, on completion of the respective activity, demobilization of T&Ps in total or in part can be done with the due approval of Engineer-In-Charge. Retaining of the T&Ps during the contract period will be mutually agreed in line with construction requirement.
4.28.	The contractor shall arrange operator, diesel, petrol and other consumables including electrical / water / air connections required for the tools and plants, equipment such as crane, winch, temporary Jhoola, Sky Climber etc. Preventive and routine maintenance of T & P are also to be arranged by the contractor at his cost without any delay. Required number of experienced mechanics and helpers for routine maintenance of the above T&Ps shall be provided by the contractor within his quoted rate.

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4.29.	<p>FACILITY TO BE PROVIDED BY THE CONTRACTOR FOR P91/P92 WELDING if any</p> <ul style="list-style-type: none">a. Required no. of operators/ Technicians/ Electrician for installation, commissioning & operating continuously.b. Gas Burners arrangement with required gas for maintaining temperature in the event of power failure.c. Ultrasonic Flaw detector with recording device & complete accessories (Digital Type – Krautkramer Model USN 50 or equivalent) capable of storing calibration data. All recordable indications will be stored in memory of digital flaw detector and in PC (to be provided by the contractor) for review at later period.d. EQUOTIP or MICRODUR make or equivalent portable hardness tester.e. MPI/LPI Kits with required consumables. <p>Note</p> <ul style="list-style-type: none">1) The induction heating equipment and other equipment including consumables shall be in the scope of agency. For routine maintenance & attending all type of break-down maintenance, contractor shall deploy sufficient manpower, tools and plant within the quoted rate.2) The contractor shall provide electrical cables & switches required for extending power supply to the induction heating equipment. All the equipment shall be protected by providing covers or sheds at site by the contractor with in the quoted rate.3) Adequate no of DG Set of required rating not less than 500KVA, operator and fuel for P-91 welding is in Bidder's scope. Diesel Generator for P-91/92 welding, along with required
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	<p>cables, switches, fuel and operator, has to be arranged by the contractor within the quoted rates.</p> <p>Contractor to follow and ensure the following related to DG set deployment at site:</p> <ul style="list-style-type: none"> • All rules & regulations pertaining in the state of Jharkhand to run DG sets are to be strictly followed. • Statutory permission is to be obtained from Inspection authority. • Separate earth pits for Body and neutral are to be made. • All safety precautions and protections are to be installed before starting of the DG sets. • Installation inspection is to be done by the authority. • Payment of electricity duty and generation duty is to be paid by the contractor. <p>Consumables</p> <ol style="list-style-type: none"> a. Glass fibre cloth – 1mm x 1000mm – Temp rating – 1260 °C. b. Glass fibre cord – Dia 3mm (twisted) Temp rating – 1260 °C. c. Ceramic fibre Blanket – RT Grade, density 96Kg/M3 – Temp rating – 1260 °C. d. Ceramic fibre rope – Fibre Glass braided, Dia 12mm – Temp rating – 1260 °C. e. K Type Thermocouple – 0.5mm Dia Single Strand individual fiber glass insulated f. Heavy duty TC connectors for – K Type Thermocouple – 0.5mm Dia Single Strand individual fibre glass insulated. g. All other consumables/ equipment required to carry out the work.
<p>4.30.</p>	<p>The contractor has to Supply, install, operate and maintain passenger cum goods lift with associate civil works if required in boiler to facilitate access to various platform elevations up to top floor.</p>

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4.31.	<p>Acid/Chemical cleaning including Pump & chemical supply & installation required for chemical cleaning process is part of scope of work – The work of supply & installation of tanks, Pumps, Piping and operation of the system is in the scope, the Contractor has to arrange complete interface requirements with chemical for the completion of the work. Bidder scope includes supply & return piping from pumps outlet at chemical cleaning temporary station to drain pit. Laying of insulation of this temporary piping and tank are to be carried out by the contractor within quoted rate, and required insulation materials will be provided by the contractor. The welding joints in the temporary pipe lines for acid cleaning and steam blowing are to be welded by HP welders only. Required NDT tests are to be carried out for the above joints as part of work as per customer / BHEL requirement. After completion of Commissioning protocols, the Chemical cleaning set up has to be dismantled by the contractor</p> <p>Neutralization pit for Chemical cleaning shall be made by Contractor.</p> <p>After completion of job pit has to be dismantled and area is to be levelled before handing over of area to owner. Dismantling of temporary piping & Cleaning of the area, erected by bidder, is in the scope of contractor.</p> <p>Note-The above set up has to be arranged by the contractor within the quoted rate. No separate payment will be made for this purpose. However, For the supply of chemicals/Commissioning consumables Lumpsum payment will be made under the BOQ.</p>
4.32.	Filling pump, for hydro test shall be arranged by the contractor, if required. For testing of LP lines, necessary hydraulic test pumps/ hand pumps are to be arranged by the contractor.
4.33.	All required consumables like electrodes, all gases, and other materials for this scope of work are to be arranged by the contractor at their cost. BHEL will not provide any consumable.
4.34.	All type electrode including imported electrodes as recommended by manufacturing unit / TIG welding wires including stainless steel electrodes required for shall be arranged by the contractor at his cost. However, the bidder shall use the BHEL/Customer approved quality welding electrodes only.
4.35.	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 contractor.

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4.36.	<p><u>LIFTING OPERATIONS FOR CRANE</u></p> <p>The Contractor shall prepare a lifting plan, checked and submit for authorization by contractor's competent authorized persons prior to any lifting operation and formally communicated to all persons undertaking the work.</p> <p>All persons preparing, issuing lifting plans and all persons involved in lifting operations must be subject to formal competence checks by the contractor to ensure necessary training, experience and qualification prior to commencing work. The Subcontractor must ensure that their nominated Lifting Leader has appropriate qualifications.</p>
4.37.	<p><u>Contractor lifting plans include:</u></p> <ul style="list-style-type: none">• The lifting methodology, step by step,• The risk analysis of the operation including consideration for weather conditions and work environments (e.g.: proximity of hazards and obstructions to the load, consideration for overturning, load integrity) where appropriate and consideration for simultaneous operations and the measures taken to avoid conflicting tasks in the lifting area.• The identification of the designated lifting area, the fall zone and the control measures to prevent access such as barriers, signs, etc.• The description of the type, weight, size, shape and center of gravity of the load and the method used for slinging, attaching and detaching the load with the availability of approved lifting points on load when necessary.• The list of the certified and inspected equipment and lifting accessories to be used.• The composition of the team required to perform the task (crane driver, rigger, etc.) with the needed qualifications and description of their roles and responsibilities including the intended communication method.• Any Heavy equipment (crane, winch machine, etc.) manufactured less than 15 years from the current year shall be only allowed to be used at project Site's. Pre-safety Inspection of the equipment by safety dept. shall be done before mobilizing the equipment at our project site. <p>The contractor must ensure that a competent operational leader is formally appointed to supervise each lifting operation. All lifting plans must clearly define the specific roles and responsibilities for each person involved (e.g.: crane drivers, lifting coordinators and riggers) and must be checked and issued prior to lifting operation. Clear communication channels</p>

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	<p>must be formally established and maintained between everyone involved in a lift with only authorized person giving instruction to the operator.</p> <p>Special permission needs to be taken from Customer for tandem lifting if any and for any nonroutine lifting operations must strictly adhere to the guidelines described in corresponding Standard / Procedures / Directive.</p> <p>No employee of the contractor shall be positioned under a suspended load or between a suspended load and fixed objects.</p> <p>All lifting equipment and accessories must have valid manufacturers certificates or thorough examination records and be uniquely identified, marked with the safe working load, listed in a register and subject to formal regular inspection as per EHS requirements and shall have valid certificates from a competent authority. Inspection before use by the operator is mandatory. All lifting hooks must have latch. All cranes shall be fitted with Automatic Safe Load Indicator (ASLI) and Anemo Meter.</p> <p>The contractor shall operate and maintain cranes and hoisting equipment in accordance with manufacturers' specifications and limitations and the safety Requirements. All defective, non inspected or unidentified (safe working load / identification number) lifting equipment or accessories must be either removed from site or physically prevented from use.</p>
4.38.	<p>due to non-availability of T&Ps:</p> <p>In order to meet the site requirement and in line with monthly plan and review format (F-14), Contractor has to mobilise their T&Ps and make it available at site for required activities.</p> <p>If contractor fails, due to the cases mentioned hereunder, BHEL shall be entitled to impose penalty on Contractor till any alternate arrangement is made by 'Contractor' OR 'BHEL (on cost recovery basis)'.</p> <p>Case 1: Contractor fails to mobilize the Crane within the mobilization period of 15 days from the date of intimation by BHEL.</p> <p>OR</p> <p>Case 2: After mobilization of a particular Crane at site, the work is getting hampered due to non-availability of that Crane for more than 5 days cumulatively in a month.</p> <p>In both the cases, Penalty shall be levied at the rate of 50% X "daily rate*" for total no. of days eligible for penalty.</p>

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	<p>For Case 1: Number of days eligible for Penalty = Difference of (date of availability of Crane by Contractor) - (Minus) (15 days from the Date of intimation).</p> <p>In above case if bidder fails to mobilize referred T&Ps, BHEL may mobilize the same and in that case aforementioned 'date of availability of 'Crane' shall be reckoned from the date T&P is made available by BHEL.</p> <p>For Case 2: Number of days eligible for Penalty = (Number of days in a month, in which work is getting hampered, due to non-availability the crane) – (Minus) (05 days)</p> <p>Daily Rate*= Penal Rate</p> <p>NOTE: For calculation no. of days in a calendar month is taken as 30.</p> <p>Penal rate for Major T&Ps is mentioned hereunder:</p> <ul style="list-style-type: none"> a. 120 MT Crane – Rs. 40000/day b. Induction heating M/c – Rs. 2000/day
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4.39. BHEL shall provide following T&Ps on sharing basis in this package:

SL NO	DESCRIPTION & CAPACITY OF T&P	QUANTITY	REMARKS
1	Cranes	As decided by BHEL	cranes (except that in Contractor scope), if required for mentioned work, will be arranged by BHEL as per requirement.

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4.39.1	Crane as mentioned above shall be given to contractor on sharable basis and the allotment is made by BHEL on need basis. Contractor shall plan activities well in advance and inform BHEL Engineer in charge/ Construction Manager the date of actual use. The decision of BHEL Engineer in-charge/CM on this will be final and binding.
4.39.2	Contractor shall provide assistance to transport from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores all T&Ps shared for his use.
4.39.3	Cranes provided by BHEL are only for erection purpose and shall not be available for material handling or transportation purpose. Contractor shall make their own arrangements for material transportation to erection site.
4.39.4	All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections, load test, assembly/dismantling/marching of crane for the BHEL issued T&Ps shall have to be arranged by the contractor at his cost.
4.39.5	The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to agency if required. Necessary grout materials are to be arranged by the contractor at his cost.

4.39.6	The day-to-day and routine maintenance including replacement of spares for the BHEL T&Ps will be carried out by the crane owner.
4.39.7	Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor.
4.39.8	Crane provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of T&Ps shall be the discretion of BHEL engineer, which shall be binding on the contractor. T&Ps 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.
4.39.9	This crane will accordingly be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose.
4.39.10	The consumables such as electrodes and filler wire, thermocouple, ceramic pads, annealing cable and insulation, induction coil etc. required for Induction Heating Machine has to be arranged by the contractor.
Note	For BHEL hired Crane:
	1. The cranes may be obtained on hiring basis including operating and maintenance crew.

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	2. Operator and O&M for BHEL /Hired crane will be provided by BHEL (including extended hours), free of charge.
	3. Contractor shall provide the fuel for BHEL provided cranes Hired for his use.

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Chapter V- Time Schedule

5.0	TIME SCHEDULE & MOBILIZATION
5.1.	Mobilization:
	Initial Mobilization
5.1.1.	<p>After issue of LOA (through Fax/courier/email) the contractor shall report to the Construction Manager/Site In-Charge of BHEL at site within one week (7 days) from date of LOA for Kick-off meeting regarding mobilization of manpower, T&Ps and date of start of work and detailed completion program etc.</p> <p>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.</p>
	Commencement of contract period
5.1.2.	<p>The date of commencement of contract period shall be from June'2026 tentatively. The commencement date shall be the mutually agreed between the bidder and BHEL engineer. In case of discrepancy, the decision of BHEL engineer will be final.</p> <p>BHEL Engineer will certify the actual date of start of work after adequate mobilization of manpower, major equipment and another T&P by the contractor. In case of discrepancy, the decision of BHEL shall be considered to be final and binding to contractor.</p> <p>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.</p> <p>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.</p>
	Schedule of Completion:
5.2.	<p>The contract period for completion of entire work under scope shall be as mentioned hereunder, from the date of commencement of work at site.</p>

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S.No.	Package	Contractual Schedule (Month)
1.	<p>“Erection, Testing, Commissioning, Trial Operation & Handing Over of Boiler and auxiliaries & associate integral piping, pumps/Fans Ducts, Chimney & Auxiliaries etc., BOP systems fixing of hangers & supports, NDT, application of lining, Insulation, supply & touch-up painting, Stencilling & Labelling etc., Material handling & Management system and Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site for erection and Material handling & Management system including Supply and Installation of items as per BOQ for FOR “265 TPH STEAM GENERATION PACKAGE</p>	17 Months

5.3. The schedule of important milestones is as follows:

5.3.1. Boiler & Aux, Chimney & Aux, and all associated equipment ,piping ,pumps, Fans, Duct etc power cycle piping etc		
SL No.	Milestones	Tentative Schedule w.r.t date of start of work
1	Boiler Erection Start (BES)	1 st Month
2	BOP Erection start	2nd Month
3	Pipe Rack Structure Erection	3 rd Month
4	Completion of Ceiling Girder& Roof Structure erection	4 th Month
5	Stack/Chimney Erection Start	5th Month
6	Completion of DRUM Lifting	6 th Month
7	Deaerator Erection Start	6 th Month

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8	Completion of Water pumps Erection for DM water & Balance BOP auxiliaries	8 th Month
9	Completion of Stack/Chimney Erection	11 th Month
10	Boiler Hydro Test-drainable	12 th Month
11	Boiler Light Up (BLU)	15 th Month
12	Chemical cleaning	15 th Month
13	Steam Blowing	15 th Month
14	SH & RH Spray system readiness	16 th Month
15	Soot Blower and LRSB readiness	16 th Month
16	Safety Valve Floating	17 th month
17	Synchronization on Fuel system	17 th month
18	Full Load Operation	17 th Month
19	Completion of Trial Run Operations	17 th Month
20	Completion of Facilities	17 th Month

5.3.1.	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.
5.3.2.	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
5.3.3.	Contractor shall make all possible efforts to expedite the activities, in case of delay of any intermediate milestone, to maintain overall project completion schedule.
5.4.	COMPLETION OF WORK AND COMMENCEMENT OF GUARANTEE PERIOD
5.4.1.	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, labour 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.

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5.4.2.	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.
5.4.3.	Commencement of performance guarantee shall be as per clause no. 2.24 (Performance Guarantee for Workmanship) of General Conditions of Contract. The commencement of guarantee period for the quality of the workmanship shall start from the date of Trial operational acceptance of facilities OR Handing Over to the customer, whichever is earlier. The guarantee period of twelve months shall commence from the date of completion of all works as certified by the BHEL site engineer.
5.4.4	<p>Protection of Work: The contractor shall have total responsibility for protecting his works until it is taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of other party not being under his supervision or control, the Contractor shall make his claim directly with the party concerned.</p> <p>If disagreement, conflict, or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be rectified. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes</p>
5.5.	The contractor shall submit a detailed area/structure wise L3 schedule within 10 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 each 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.
5.6.	<p>The under mentioned Records/ Log-books/ Registers applicable to be maintained.</p> <ol style="list-style-type: none"> 1. Hindrance Register. 2. Site Order Book. 3. Test Check of measurements. 4. Records of Test reports of Field tests. 5. Records of manufacture's test certificates. 6. Records of disposal of scraps generated during and after the work completion.
5.7.	Control and monitoring of progress of work

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5.7.1.	Refer forms F -14 to F-15 of volume I D (Forms & Procedure). Plan and review will be done as per the formats.
5.7.2.	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.
5.7.3.	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.
5.7.4.	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.
5.7.5.	Progress review meetings will be held at site during which actual progress during the week visa-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.
5.7.6.	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.
5.7.7.	The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.
5.7.8.	The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard. Non-submission of report would be considered as no shortage of materials.
5.7.9.	The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.
5.8.	The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details: -
a	Progress photographs in colour.
b	Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.
c	Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan.

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d	Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis /Helpers, grinder-men, gas cutters, electricians, crane operators and helpers. Data shall be split up under the work areas like TG, Boiler (pressure parts, structures), Piping, Rotating machines, etc.
e	Consumables report giving consumption of all types of gases and electrodes during the previous month.
f	Availability report of cranes.
g	Safety implementation report in the format.
h	Pending material and any other inputs required from BHEL for activities planned during the subsequent month.
i	<p>Contractor shall raise their RA Bills along with supporting documents (such as Measurement sheet, Quality and HR Document – Vetted by Customer Etc if required.) and checklist Irrespective of the value of the invoice amount, the supplier/ contractor should necessarily upload the invoice details on BHEL SUVIDHA portal at https://suvidha.bhel.in/suvidha/, prior to despatch/raising invoice. All documents as per contract checklist, along with additional documents (if any), must be uploaded on the portal. It is mandatory that tax invoices with a net amount (including taxes) exceeding Rs five lakhs uploaded on the portal are digitally signed using a Class 3 Digital Signature Certificate (DSC) issued by a licensed Certifying Authority. Submission of invoice document in hard copy is allowed for invoices with a net amount (including taxes) equal to and upto Rs five lakhs in case the requirement for digitally signed invoice is not explicitly mentioned in the contract checklist.</p> <p>The Invoice will not be accepted in absence of the above</p>

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Chapter VI- Terms of payment

6.0 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 the Package: Payment shall be regulated progressively as mentioned in Table 6.1 to 6.33.21 (**For Section A of SOQ**)

Progressive Payment for Boiler and auxiliaries, & associate integral piping, Chimney & it's Auxiliaries, pumps/Fans/motor Ducts, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stenciling & Labelling etc against monthly running bills will be made upto **75 %** of the value of the erected tonnage w.r.t Cl.8 on Pro-rata as per SL no 6.1 to 6.33.21 of the following table.

Pro rata payments (75%)														
Sl no	Sub packages----	S t r u c t u r e s	Press ure part	Non- pressure part(Boiler +APH +Misc)		Ro tat ing M/ c(F an +Cr an es +M isc)	Insulat ion	Piping System/Pumps/Tanks					Stack(Chim ney)	Comm issioni ng Consu mable s/Che mical
				3	3(AP H)			5.1/5.2 /5.3/5. 4	6.1/6.2 /6.3	6.4	6.5/6.6/6. 7(H&S,Pu mps&Tan ks	6.8(Aace ss Platf orms)		
6.1	On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position)	15 %	15%	18 %	--	11 %	--	14%	14 %	15%	15 %	14%	15%	
6.2	Placement in position	14 %	10%	12 %	--	18 %	18%	18%	18 %	25%	25 %	18%	19%	
6.3	Alignment/Final fitup	17 %	13%	13 %	--	18 %	15%	10%	10 %	15%	15 %	10%	17%	
6.4	Welding/bolting/fixing/Torque check/tightness check of bolts	17 %	13%	16 %	--	18 %	17%	9%	9 %	20%	20 %	9%	19%	
6.5	Completion of non-destructive examination - Radiography/PAUT/TOFD as per approved FQP/EWS (if not	2 %	8%	1 %	--	--	--	5%	5 %			5%	5%	

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	applicable, then this portion to be paid along with subsequent billing)													
6.6	Making support viz. safe access / approach, platform, doing necessary griding / buffing, arranging LT power point, proving illumination, providing unskilled manpower, etc. to the satisfaction of BHEL engineer for conducting NDT / Stress relieving/ heat treatment.	3 %	1%	--	--	--	--	--	--		--	--		
6.7	Completion of non-destructive examination - Hardness testing as per approved FQP / EWS.	1 %	1%	--	--	--	--	--	--		--	--		
6.8	Completion of Stress relieving/ heat treatment as per approved FQP / EWS	2 %	4%	--	--	--	--	4%	4%		4%	--		
6.9	Completion of the Boiler floors (Pro-rata floor wise payment permissible)	4 %	--	--	--	--	--	--	--		--	--		
6.1	Completion of attachment welding, fin welding, supports	--	3%	--	--	--	--	--	--		--	--		
6.1 1	Completion of roof skin casing & Al cladding works (Al cladding applicable for Insulation only)&Completion of other Insulation work	--	4%	--	--	--	25%	--	--		--	--		
6.1 2	Hangers & supports etc wherever necessary as per drg	--	1%	15 %	--	--	--	10%	10 %		10%	--		
6.1 3	Equipment trial operation	--	--	--	--	10 %	--	--	--		--	--		

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6.1 4	Hydraulic test/pneumatic test	--	2%	--	--	--	--	3%	3%			3%	...	
6.1 5	Floating of lines, final adjustment of supports for cold and hot values (if not applicable, this portion to be clubbed along with hydraulic test/pneumatic test)	--	--	--	--	--	--	2%	2%			2%	--	
6.1 6	Air Pre-Heaters from the total amount payable for the PGMA weight at tonnage rates, payment will be regulated as under:	--	--	--	--	--	--	--	--			--	--	
6.1 7	Completion of support steel squareness and levelling, expansion arrangement, housing panel erection and alignment, erection, alignment and welding of pedestals	--	--	--	9%	--	--	--	--			--	--	
6.1 8	Completion of erection, alignment and welding of support bearing, guide bearing, rotor post, bottom and top centre sections, hot and cold end connecting plates	--	--	--	11%	--	--	--	--			--	--	
6.1 9	Completion of erection and alignment of modules	--	--	--	13%	--	--	--	--			--	--	
6.2	Completion of erection, alignment and welding of pin rack assembly and drive assembly	--	--	--	12%	--	--	--	--			--	--	
6.2 1	Completion of seals setting	--	--	--	14%	--	--	--	--			--	--	
6.2 2	Erection, alignment and welding of lube oil systems, cleaning device, fire sensing device, deluge and water wash lines,	--	--	--	13%	--	--	--	--			--	--	

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	observation port and lighting assemblies and other accessories													
6.23	Completion of APH	--	--	--	1%	--	--	--	--			--	--	
6.24	Air preheater trial run	--	--	--	2%	--	--	--	--			--	--	
6.25	Commissioning Consumables & Chemicals													
6.26	Supply of chemical & Consumables material as per site requirement													75%
6.27	VOID	--	--	--	--	--	--	--	--			--	--	
6.28	VOID	--	--	--	--	--	--	--	--			--	--	
6.29	VOID	--	--	--	--	--	--	--	--			--	--	
6.3	VOID	--	--	--	--	--	--	--	--			--	--	
6.31	VOID	--	--	--	--	--	--	--	--			--	--	
6.32	VOID	--	--	--	--	--	--	--	--			--	--	
6.32	VOID	--	--	--	--	--	--	--	--			--	--	
		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%

6.33	STAGE/MILESTONE	25% payment of balance tonnage erected on pro rata w.r.t Cl no.8
	PAYMENTS (25%)	
6.33.1	Completion of air & gas tightness test	1%
6.33.2	Completion of air & gas tightness test for furnace.	1%
6.33.3	Boiler hydraulic test (drainable)	1%
6.33.4	Boiler Hydraulic test (non-Drainable)	1%

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

6.33.5	Clean air flow test	1%
6.33.6	Boiler light up	1%
6.33.7	ABO/chemical cleaning	1%
6.33.8	Steam blowing	1%
6.33.9	Safety valve floating	1%
6.33.10	Readiness for Fuel Firing	1%
6.33.11	Fuel Firing	1%
6.33.12	Full load	1%
6.33.13	Trial operation of unit	1%
6.33.14	Completion of sheet covering for Boiler roof, burner roof, lift shaft cladding, completion of gutters	1%
6.33.15	Completion of all drains and vents to respective locations and placement of instrument if any after steam blowing	1%
6.33.16	Completion of Painting works/stenciling etc	1%
6.33.17	Area cleaning, temporary structures cutting/removal and return of scrap	1%
6.33.18	Punch List points/pending points liquidation	2%
6.33.19	Submission of 'As Built Drawings' & protocols/ documentation	2%
6.33.20	Material Reconciliation	2%
6.33.21	Completion of Contractual Obligations	2%
	TOTAL FOR	25%
	STAGE/MILESTONE	

Above **25%** payment for **Boiler and auxiliaries, & associate integral piping, Chimney & auxiliaries, pumps/Fans Ducts, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stencilling & Labelling etc** will be made on pro-rata basis common to all shall be released on achievement of the above stage / milestones events (as per Cl no 6.33 to 6.33.21 of the above table) for the balance tonnage erected w.r t .
Cl 8

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

6.34	VOID										
6.35	<p>Contractor supplied items that goes as permanent part of the system (SECTION B of SOQ): Progressive payment:</p> <p>6.35.1-Interim Payment (95%) Interim bills in the form of monthly running bills prepared by the contractor shall be based on the quantities executed and measured.</p> <p>6.35.2 5% of the item rate shall be released after submission of the quality check formats / documents as per the quality plan for the quantum of work billed and duly certified by engineer.</p> <p>6.35.3-The payment for SN-10 of section B will be released 100% upon completion of work and certified by site -in charge</p>										
6.36	<p>Progressive payment for material handling (SECTION-C of SOQ) will be released on prorata basis as below</p> <p>6.36.1- Interim Payment (90%) Interim bills in the form of monthly running bills prepared by the contractor shall be based on the quantities executed and measured.</p> <p>6.36.2-5% of the item rate shall be released after submission of documents for completion of following activities and duly certified by engineer</p> <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 80%;">Area cleaning, temporary structures cutting/removal and return of scrap</td> <td style="width: 20%; text-align: center;">2%</td> </tr> <tr> <td>Punch List points/pending points liquidation</td> <td style="text-align: center;">2%</td> </tr> <tr> <td>Material Reconciliation</td> <td style="text-align: center;">2%</td> </tr> <tr> <td>Mandatory spares Handover</td> <td style="text-align: center;">2%</td> </tr> <tr> <td>Completion of Contractual Obligation</td> <td style="text-align: center;">2%</td> </tr> </table>	Area cleaning, temporary structures cutting/removal and return of scrap	2%	Punch List points/pending points liquidation	2%	Material Reconciliation	2%	Mandatory spares Handover	2%	Completion of Contractual Obligation	2%
Area cleaning, temporary structures cutting/removal and return of scrap	2%										
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Material Reconciliation	2%										
Mandatory spares Handover	2%										
Completion of Contractual Obligation	2%										
6.37	VOID										
6.38	VOID										
6.39	Progressive Payment/ Final Payment: The payments for works under the scope of this contract shall be as per clause of General Conditions of Contract and SCC.										
6.40	<p>Documents required for RA Bill:</p> <p>GST Complied Invoice of the work done as per approved BBU.</p> <p>WAM -6 for RA Bill.</p> <p>Jointly signed Measurement sheet.</p> <p>Power of Attorney before submission of Bill.</p> <p>Validity of Bank Guarantees as applicable under the contract.</p> <p>Monthly HSE Compliance Certificate certified by BHEL- Safety</p>										

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

	Material reconciliation statement if any along with RA Bill (Monthly basis).
	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.
	Documents required for Final Bill:
	The final bill is drawn as soon as the entire work is completed. From the final amount due, all amounts already claimed up to the previous running account bill will be deducted. It should be ensured that in the final bill the following additional particulars have been provided:
6.41	Final Bill in WAM-7 Format. 'No claim' certificate from the contractor. Clearance certificates where ever applicable viz. Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department, factory inspector/IBR Authority etc. Final Material re-conciliation statement duly approved by BHEL. Indemnity Bond as per prescribed format. Deviation statement showing the difference between the actuals and as per the contract. Final Delay Analysis.
6.42	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. BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS
- V. Final bill shall be submitted after completion of works and upon material reconciliation along with all prescribed formats
- VI. Contractor (Bidder) has to provide all possible support such as Scaffolding, area illumination, surface preparation, approach, wrench/sky climber with operator etc. the NDT agency as a part of the scope of this contract. In case, any defect is identified, repair work shall be done by contractor (Bidder) at no extra cost to BHEL. Cost incurred for such type of additional NDT (RT, CRT, PAUT & UT) arising due to workmanship defect of contractor (Bidder), shall be debited to contractor (Bidder) without overhead. Engagement of separate agency for NDT by BHEL, shall not vacate

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

contractor (Bidder) from their responsibility of workmanship till warrantee period. Repair in weld joints, as and when required, shall be attended by the contractor (Bidder).

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7.0	Chapter-VII: Taxes and Duties
7.1	<p>The contractor shall pay all (save the specific exclusions as enumerated in this clause) taxes, fees, license, charges, deposits, duties, tools, royalty, commissions, other charges, etc. which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes/duties, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.</p> <p>However, provisions regarding GST on output supply (goods/service) and TDS/TCS as per Income Tax Act shall be as per following clauses.</p>
7.2	GST (Goods and Services Tax)
8.2.1	GST as applicable on output supply (goods/services) are excluded from contractor's scope; therefore, contractor's price/rates shall be exclusive of GST. Reimbursement of GST is subject to compliance of following terms and conditions. BHEL shall have the right to deny payment of GST and to recover any loss to BHEL on account of tax, interest, penalty etc. for non-compliance of any of the following condition.
8.2.2	The admissibility of GST, taxes and duties referred in this chapter or elsewhere in the contract shall be limited to direct transactions between BHEL & its Contractor. BHEL shall not consider GST on any transaction other than the direct transaction between BHEL & its Contractor.
8.2.3	Contractor shall obtain prior written consent of BHEL before billing the amount towards such taxes. Where the GST laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL shall have the right to adopt the appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor.
8.2.4	Contractor has to submit GST registration certificate of the concerned state. Contractor also needs to ensure that the submitted GST registration certificate should be in active status during the entire contract period.
8.2.5	Contractor/Vendor has to issue Invoice/Debit Note/Credit Note indicating HSN/SAC code, Description, Value, Rate, applicable tax and other particulars in compliance with the provisions of relevant GST Act and Rules made thereunder.

Technical Conditions of Contract (TCC) for Boiler & its auxiliaries Works

8.2.6	Vendor has to submit GST compliant invoice within the due date of invoice as per GST Law. In case of delay, BHEL reserves the right of denial of GST payment if there occurs any hardship to BHEL in claiming the input thereof. In case of goods, vendor has to provide scan copy of invoice & GR/LR/RR to BHEL before movement of goods starts to enable BHEL to meet its GST related compliances. Special care should be taken in case of month end transactions.
8.2.7	Vendor has to ensure that invoice in respect of such services which have been provided/completed on or before end of the month should not bear the date later than last working day of the month in which services are performed.
8.2.8	<p>Subject to other provisions of the contract, GST amount claimed in the invoice shall be released on fulfilment of all the following conditions by the Contractor: -</p> <ol style="list-style-type: none"> a. Supply of goods and/or services have been received by BHEL. b. Original Tax Invoice has been submitted to BHEL. c. Contractor/ Vendor has submitted all the documents required for processing of bill as per contract/ purchase order/ work order. d. In cases where e-invoicing provision is applicable, vendor/contractor is required to submit invoice in compliance with e-invoicing provisions of GST Act and Rules made thereunder. e. Contractor has filed all the relevant GST return (e.g. GSTR-1, GSTR-3B, etc.) pertaining to the invoice submitted and submit the proof of such return along with immediate subsequent invoice. In case of final invoice/ bill, contractor has to submit proof of such return within fifteen days from the due date of relevant return. f. Respective invoice has appeared in BHEL's GSTR - 2A for the month corresponding to the month of invoice and in GSTR-2B of the month in which such invoices has been reported by the contractor along with status of ITC availability as "YES" in GSTR-2B. Alternatively, BG of appropriate value may be furnished which shall be valid at least one month beyond the due date of confirmation of relevant payment of GST on GSTN portal or sufficient security is available to adjust the financial impact in case of any default by the contractor. g. Contractor has to submit an undertaking confirming the payment of all due GST in respect of invoices pertaining to BHEL.
8.2.9	Any financial loss arises to BHEL on account of failure or delay in submission of any document as per contract/purchase order/work order at the time of submission of Tax invoice to BHEL, shall be deducted from contractor's bill or otherwise as deemed fit.
8.2.10	TDS as applicable under GST law shall be deducted from contractor's bill.

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

8.2.11	Contractor shall comply with the provisions of e-way bill wherever applicable. Further wherever provisions of GST Act permits, all the e-way bills , road permits etc. required for transportation of goods needs to be arranged by the contractor.
8.2.12	Contractor shall be solely responsible for discharging his GST liability according to the provisions of GST Law and BHEL will not entertain any claim of GST/interest/penalty or any other liability on account of failure of contractor in complying the provisions of GST Law or discharging the GST liability in a manner laid down thereunder.
8.2.13	In case declaration of any invoice is delayed by the vendor in his GST return or any invoice is subsequently amended/alterd/deleted on GSTN portal which results in any adverse financial implication on BHEL, the financial impact thereof including interest/penalty shall be recovered from the Contactor's due payment.
8.2.14	Any denial of input credit to BHEL or arising of any tax liability on BHEL due to non-compliance of GST Law by the Contractor in any manner, will be recovered along with liability on account of interest and penalty (if any) from the payments due to the Contactor.
8.2.15	In the event of any ambiguity in GST law with respect to availability of input credit of GST charged on the invoice raised by the contractor or with respect to any other matter having impact on BHEL, BHEL's decision shall be final and binding on the contractor.
8.2.16	<p><u>Variation in Taxes & Duties:</u></p> <p>Any upward variation in GST shall be considered for reimbursement provided supply of goods and services are made within schedule date stipulated in the contract or approved extended schedule for the reason solely attributable to BHEL. However downward variation shall be subject to adjustment as per actual GST applicability.</p> <p>In case the Government imposes any new levy/tax on the output service/goods after price bid opening, the same shall be reimbursed by BHEL at actual. The reimbursement under this clause is restricted to the direct transaction between BHEL and its contactor only and within the contractual delivery period only.</p> <p>In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer but before opening of the price Bid, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of price bid. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.</p>

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7.3	<p><u>Income Tax:</u></p> <p>TDS/TCS as applicable under Income Tax Act, 1961 or rules made thereunder shall be deducted/collected from contractor's bill.</p>
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[7.4 BOCW Act & Cess Act](#)

7.4.1 BOCW Cess is not to be borne by contractor for this contract. Refer Annexure-I for BOCW Act & Cess Act.

Annexure-I:	
Bidder may please note that the sub-contractor/bidder of BHEL engaging building or construction worker in connection with building or other construction work, are required to follow the procedures enumerated below:	
1.	It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
2.	It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities.
3.	It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work.
4.	It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may, by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.

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5.	It shall be sole responsibility of the contractor as employer to get registered every Building Worker, who is between the age of 18 to 60 years of age and who has been engaged in any building or other construction work for not less than ninety days during the preceding twelve months as Beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996.
6.	It shall be sole responsibility of the contractor as employer to maintain all the registers, records, notices and submit returns under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
7.	It shall be sole responsibility of the contractor as employer to provide notice of poisoning or occupation notifiable diseases, to report of accident and dangerous occurrences to the concerned authorities under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the rules made thereunder and to make payment of all statutory payments & compensation under the Employees' Compensation Act, 1923.
8.	It shall be the responsibility of the sub-contractor as employer to make payment/deposit of applicable cess amount on the extent of work involving building or construction workers engaged by the subcontractor within a period of one month from the receipt of payment. It shall also be responsibility of the Contractor to furnish BHEL on monthly basis, Receipts/ Challans towards Deposit of the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder along with following statistics: <ul style="list-style-type: none"> i) Number of Building Workers employed during preceding one month. ii) Number of Building workers registered as Beneficiary during preceding one month. iii) Disbursement of Wages made to the Building Workers for preceding wage month. iv) Remittance of Contribution of Beneficiaries made during the preceding month
9.	BHEL shall reimburse the contractor the Cess amount deposited for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.

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10.	It shall be responsibility of the Building Worker engaged by the Contractor and registered as a beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board , within the fifteen days from such deduction.
11.	Bidders may please note that though the quoted price is exclusive of BOCW (which will be reimbursed by BHEL as per sub-clause 9 above) , however, If at any point of time during the contract period, non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder is observed, BHEL reserves the right to deduct the applicable cess (1%) on the contract value and penalty (if any, imposed by Cess Authorities) from the payables on account of non-compliance.
12.	The contractor shall declare to undertake any liability or claim arising out of employment of building workers and shall indemnify BHEL from all consequences / liabilities / penalties in case of noncompliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.

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CHAPTER-VIII ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (SOQ)

8.0 Summary of Weights

Note to weight schedule:	
1	The Weights/Quantities/dimensions mentioned 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 clause 2.14 of General Conditions of Contract

Weight Schedule			
SL NO	Category	Rate Schedule	Tentative Weight (In MT)
1	STRUCTURE (BOILER +Pipe Rack& Deaerator)	1	1,240.81
2	Pressure Parts	2	567.732
3	Non-Pressure Part	3	706.81
4	BOILER-ROTATING EQUIPMENT	4	117.3
5	INSULATION- (WOOL +REF+IRON+AL)	5.1/5.2/5.3/5.4	257.18
6	Piping System		
7	Power cycle piping AS(P91)	6.1	64.31
8	P11,P12,P22&CS	6.2	262.24
9	SS Piping	6.3	24.97
10	Misc. Piping Items	6.4	68.2
11	Hanger & Supports, Pumps& Tanks	6.5/6.6/6.7	52.2
12	Access Plat Forms	6.8	80
13	FPS Piping	7	77.21
14	Chimney	8	450
	Total Weight (IN MT)		4083.46

Detailed (PGMA wise) weight of BOQ for Boiler, structure, , Piping System, Hangers& Supports, Pumps & Tanks, Chimney , Rot. M/c, Insulation: -

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PGMA	MS	PGMA_DESC_SHORT	Weight in KG	Prod.Area	Unit	CATEGORY	Rate Schedule Identifier
35010	DL	Foundation Materials-Boiler	6510	OS	HPV P	Structure	1
35110	DL	Main Columns Left	15510	OS	HPV P	Structure	1
35120	DL	Main Columns Right	19800	OS	HPV P	Structure	1
35440	DL	Horizontal Beams	116325	OS	HPV P	Structure	1
35510	DL	Column Bracings-Front Bracing	11415	OS	HPV P	Structure	1
35520	DL	Column Bracings-Side Bracing	11280	OS	HPV P	Structure	1
35530	DL	Column Bracings-Rear Bracing	10320	OS	HPV P	Structure	1
36110	HT	Columns Near Air Pre Heaters	10080	OS	HPV P	Structure	1
36210	DL	Main Floor 1st Level	20400	OS	HPV P	Structure	1
36220	DL	Main Floor 2 Level	14400	OS	HPV P	Structure	1
36230	DL	Main Floor 3rd Level	27705	OS	HPV P	Structure	1
36240	DL	Main Floor 4th Level	28080	OS	HPV P	Structure	1
36250	DL	Main Floor 5th Level	27780	OS	HPV P	Structure	1
36390	DL	Miscellaneous Platforms	6165	OS	HPV P	Structure	1
36391	DL	MISCELLANEOUS PLATFORM	7425	OS	HPV P	Structure	1
36610	HT	Boiler Roof Structure	47820	OS	HPV P	Structure	1
36611	HT	Boiler Roof Sheeting	11085	BOI-BHEL	HPV P	Structure	1
36810	DL	Floor Grills And Guard Plate	50280	BOI-BHEL	HPV P	Structure	1
36820	HT	Stairs And Ladders	5805	OS	HPV P	Structure	1
36850	DL	Handrails And Hand Rail Post	12480	OS	HPV P	Structure	1

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39012	DL	Foundation Materials I.D.Duct Supports	1545	OS	HPV P	Structure	1
39140	LU	Cols Frames Near I.D.Fan	7260	OS	HPV P	Structure	1
39301	LU	Struc And Platform For Fans	2085	OS	HPV P	Structure	1
39302	LU	Struc For Motor Hood Covering	2085	OS	HPV P	Structure	1
39303	LU	Monorail Beams For Fans	6255	OS	HPV P	Structure	1
39820	LU	Stairs	585	OS	HPV P	Structure	1
39850	LU	Hand Rail And Hand Rail Posts	330	OS	HPV P	Structure	1
Total Weight of Boiler Structures in MT			480.81				
PGMA		DESCRIPTION	WEIGHT in MT	Prod.Are a	BHEL UNIT	CATEGORY	Rate Schedule Identifier
		Structural steel works including all labour, material, equipments, transportation, handling,touch up painting etc. at any level as per specification, drawings and as directed by engineer - in - charge.					

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2301 -A	<p>Taking delivery of structural elements from BHEL stores / store yard, loading, transportation, unloading, Erection and alignment of structural steel of Grade E250 / E350 quality BR / B0 rolled section / built up section / combination of both conforming to IS:2062, pipes of grade Yst 310 conforming to IS:1161/ IS:1239, chequered plate conforming to IS: 3052, mild steel rounds, monorails, stays, safety chains, ladders, MS grating etc. in columns, beams, gantry girders, bunkers, silos, hoppers, roof trusses, portals, laced purlins, space frames, hangers, struts, monorails, galleries, stiffeners, wall beams, sheeting runners, brackets, stub columns, bracings, cleats, trestles, base plates, splice plates, chequered plate flooring, decking and seal plates, steel frame grid over false ceiling, walkway platforms, ladders, stairs, stringers, treads, landings, hand-rails etc all complete for all levels, as specified and directed.</p>	730		HPEP	Structure	1
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2311 -A	Taking delivery of bolts, washers from BHEL stores / store and fixing in positing of high strength structural bolts (of property class 8.8 and product grade `C' as per IS: 1367) and conforming to IS: 3757 and high strength structural hardened and tempered nuts (of property class `8' as per IS:1367) conforming to IS:6623 with hardened and tempered washers as per IS:6649 etc. up to and inclusive of 39 mm diameter and upto 300 mm long for structural steel work etc all complete.	30		HPEP	Structure	1
	Total Structures & bolts for Erection in MT	760				
	Overall Weight of structures (Boiler+Pipe rack /Deaerator)in MT	1,240.81				

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PGMA	MS	PGMA_DESC_SHORT	Weightin KG	Prod.Area	UNIT	CATEGORY	Rate Schedule Identifier
04114	DL	Upper Drum + Intl Id 49-60	70635	SHOP	HPV P	Pressure Parts	2
04144	DL	Drum Suspension	780	SHOP	HPV P	Pressure Parts	2
04210	DL	Lower Drum + Intl Id Upto 36	28050	SHOP	HPV P	Pressure Parts	2
04988	HT	Drum-Commisioning Spares	15	BOI-BHEL	HPV P	Pressure Parts	2
05155	HT	Inlet Side Lower Ww Header	3405	SHOP	HPV P	Pressure Parts	2
05251	HT	Outlet Side Upper Ww Header	4020	SHOP	HPV P	Pressure Parts	2
05879	HT	Ww Distribution Bottom Header	570	SHOP	HPV P	Pressure Parts	2
06430	HT	Front Ww Burn Pnl	7695	SHOP	HPV P	Pressure Parts	2
06613	HT	Floor Ww Pnl	9810	SHOP	HPV P	Pressure Parts	2
06620	HT	Roof Ww Pnl	11805	SHOP	HPV P	Pressure Parts	2
06640	HT	Rear Ww Pnl	8670	SHOP	HPV P	Pressure Parts	2
06649	HT	Rear Boiler Ww Pnl	9690	SHOP	HPV P	Pressure Parts	2
06650	HT	Side Ww Pnl	27135	SHOP	HPV P	Pressure Parts	2
07200	HT	Furnace Tubes	19140	SHOP	HPV P	Pressure Parts	2
07201	HT	Riser Tubes	6570	SHOP	HPV P	Pressure Parts	2
07202	HT	Supply Tubes	6480	SHOP	HPV P	Pressure Parts	2
07211	HT	Boiler Bank Tubes	86775	SHOP	HPV P	Pressure Parts	2
07212	HT	Boiler Sidewall Tubes	5295	SHOP	HPV P	Pressure Parts	2
07431	HT	Riser Tube Support	1725	OS	HPV P	Pressure Parts	2
07601	HT	Pressure Seals	3675	OS	HPV P	Pressure Parts	2

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

07989	HT	Tools For Tube Expansion	90	SHOP	HPV P	Pressure Parts	2
07992	HT	Imported Electrodes	60	BOI- BHEL	HPV P	Pressure Parts	2
07993	HT	Consumables & Erection Materials	1725	SHOP	HPV P	Pressure Parts	2
08100	HT	Furnace Buckstay	45	OS	HPV P	Pressure Parts	2
08313	HT	Furnace Floor Supports	3195	OS	HPV P	Pressure Parts	2
08320	HT	Furnace Roof Support	2250	OS	HPV P	Pressure Parts	2
08700	LU	Ex.Movement Measurement Componnts.	270	OS	HPV P	Pressure Parts	2
09001	HT	Seal Boxes For Furnace Opening	2460	OS	HPV P	Pressure Parts	2
09002	HT	Seal Boxes For Instrument Inserts	795	OS	HPV P	Pressure Parts	2
09003	LU	Material For Instrument Inserts	390	OS	HPV P	Pressure Parts	2
10174	HT	Vertical Spaced Sh Centre Inlet Header	4845	SHOP	HPV P	Pressure Parts	2
10178	HT	Vertical Platen Sh 1nlet Header	3690	SHOP	HPV P	Pressure Parts	2
10274	HT	Vertical Spaced Sh Centre Outlet Heade	6615	SHOP	HPV P	Pressure Parts	2
10278	HT	Vertical Platen Sh Outlet Header	4230	SHOP	HPV P	Pressure Parts	2
11274	HT	Sh Vertical Spaced Coil + Attachment	33810	SHOP	HPV P	Pressure Parts	2
11278	HT	Vert Platen Centre Sh Coil Assy+Attach	14145	SHOP	HPV P	Pressure Parts	2
12803	HT	Sh Steam Cooled Spacer Tubes	240	SHOP	HPV P	Pressure Parts	2
12850	HT	Sh Conn Pipes-Saturated	3990	SHOP	HPV P	Pressure Parts	2
12852	HT	Sh Desh Links	3585	SHOP	HPV P	Pressure Parts	2
12900	HT	Sh Desh	1260	SHOP	HPV P	Pressure Parts	2
12992	HT	Imported Electrodes	15	BOI- BHEL	HPV P	Pressure Parts	2
12993	HT	Consumables & Erection Materials	615	SHOP	HPV P	Pressure Parts	2

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

18001	LU	Furnace Roof Skin Casing	2400	OS	HPV P	Pressure Parts	2
19104	HT	Coil & Suprt Of Plain Tube Eco	40680	SHOP	HPV P	Pressure Parts	2
19701	HT	Inlet Eco Headers	1260	SHOP	HPV P	Pressure Parts	2
19702	HT	Outlet Eco Headers	1515	SHOP	HPV P	Pressure Parts	2
19850	HT	Eco Feed Pipe	1830	SHOP	HPV P	Pressure Parts	2
19851	HT	Eco Links To Drum	2430	SHOP	HPV P	Pressure Parts	2
19901	HT	Eco. Supports & Suspensions	1440	OS	HPV P	Pressure Parts	2
19903	HT	Eco. Miscellaneous Components	135	OS	HPV P	Pressure Parts	2
19992	HT	Imported Electrodes	30	BOI-BHEL	HPV P	Pressure Parts	2
20304	SY	Wall Box Non Pressurised For Rb	120	VALVES	HPV P	Pressure Parts	2
20331	LU	Rotary Soot Blower Elect.Operated-Flp	420	VALVES	HPV P	Pressure Parts	2
20511	SY	Da Head Valve Assy	60	VALVES	HPV P	Pressure Parts	2
20621	SY	Blowing element for (SS) for RB	60	VALVES	HPV P	Pressure Parts	2
20721	SY	Blowing Element For Rb (Upto 480 C)	60	VALVES	HPV P	Pressure Parts	2
20803	SY	Wall Box Assembly For Lrsie	495	VALVES	HPV P	Pressure Parts	2
20831	SY	Single Motor Drive Lrsb	5460	VALVES	HPV P	Pressure Parts	2
20988	SY	COMMISSIONING SPARESFOR SOOT BLOWER	2	VALVES	HPV P	Pressure Parts	2
20998	SY	Special Tools For Soot Blowers	15	VALVES	HPV P	Pressure Parts	2
21600	SY	Soot Blower Piping And Fittings	2340	SHOP	HPV P	Pressure Parts	2
21601	SY	Sootblower Piping Supports	2940	SHOP	HPV P	Pressure Parts	2
21700	SY	Bulked Bps Components For Sb Piping	570	BOI-BHEL	HPV P	Pressure Parts	2
21800	SY	Sb Valves (Bhel)	405	VALVES	HPV P	Pressure Parts	2

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

21850	SY	Soot Blower Safety valve (BHEL)	30	VALVES	HPV P	Pressure Parts	2
21987	SY	Commissioning sprs for SB SV	5	VALVES	HPV P	Pressure Parts	2
21992	SY	Imported Electrodes	15	BOI-BHEL	HPV P	Pressure Parts	2
24350	HT	Boiler Filling Piping	975	SHOP	HPV P	Pressure Parts	2
24351	HT	Hangers And Supports Of Blr Filling Pipe	270	OS	HPV P	Pressure Parts	2
24400	HT	Boiler Trim Piping And Fittings	10590	SHOP	HPV P	Pressure Parts	2
24401	HT	Boiler Trim Piping Supports	5190	SHOP	HPV P	Pressure Parts	2
24420	LU	Safety Valve Esc Pipe&Drain - Indl Blr	2430	SHOP	HPV P	Pressure Parts	2
24425	LU	Silencer Support-Safety Valves	4215	SHOP	HPV P	Pressure Parts	2
24435	LU	SIncr&Suprt-Starting Vent - Indl Blr	1905	SHOP	HPV P	Pressure Parts	2
24440	HT	Sample Cooler And Supports	810	SHOP	HPV P	Pressure Parts	2
24460	HT	Valves (Bhel) Indl Blr	6465	VALVES	HPV P	Pressure Parts	2
24465	HT	Valves & Fittings (Sd) Indl Blr	1380	BOI-BHEL	HPV P	Pressure Parts	2
24475	HT	Headers For Trim Piping	750	SHOP	HPV P	Pressure Parts	2
24480	HT	Erv And Safety Valves(Bhel)	660	VALVES	HPV P	Pressure Parts	2
24485	LU	Safety Valve/Erv Silencers(Bhel)	9135	VALVES	HPV P	Pressure Parts	2
24700	HT	Bulked Bps Components For Trim Pipes	225	BOI-BHEL	HPV P	Pressure Parts	2
24955	SY	Lapping Tools For Sv&Erv	30	VALVES	HPV P	Pressure Parts	2
24960	SY	Lapping Tools For Conventional Valves(45	VALVES	HPV P	Pressure Parts	2
24987	LU	Commg Spares For Safety Valves/Erv	5	VALVES	HPV P	Pressure Parts	2
24988	LU	Commg Spares For Imported Sub-Dely	5	BOI-BHEL	HPV P	Pressure Parts	2
24989	LU	Commg Spares For Conventional Valves	15	VALVES	HPV P	Pressure Parts	2

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

24992	LU	Imported Electrodes	15	BOI-BHEL	HPV P	Pressure Parts	2
24993	HT	Consumables & Erection Materials	5	SHOP	HPV P	Pressure Parts	2
24994	SY	Name Plates	135	BOI-BHEL	HPV P	Pressure Parts	2
		HP Dosing System	10000		HPV P	Pressure Parts	2
Total Weight of Boiler Pressure parts in MT			520.232				
Sl.No	Equipmen t	Dimension	Weighti n MT		BHE L UNIT	CATEGOR Y	Rate Schedul e Identifier
	<i>Deaerator</i>						
	Header Assly.	L 6600 x W 2300 x H 2900	47.5		HPEP	Pressure Parts	2
	Storage Tank Assly.	L 17000 x W 4300 x H 4500					
		Total Weight opf Deaerator in MT	47.5				
		Overall Weight of Pressure Parts (Boiler+ Dearator)in MT	567.732				

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGM A	MS	PGMA_DESC_SHORT	Weighti n KG	Prod.Area	UNIT	CATEGO RY	Rate Schedul e Identifie r
2822 0	LU	Doors	1545	OS	HPV P	Non pressure Parts	3
4110 0	LU	R-Burner Assy With Oil Gun	30	BOI-BHEL	HPV P	Non pressure Parts	3
4111 0	LU	Wind Box For R-Burner Assembly	6825	OS	HPV P	Non pressure Parts	3
4139 0	LU	Oil Gun Vice Assy And Rack	345	BOI-BHEL	HPV P	Non pressure Parts	3
4145 0	LU	Pipe Type Igniter	270	BOI-BHEL	HPV P	Non pressure Parts	3
4198 8	LU	Oil&Gas Burner Commissioning Spare	5	BOI-BHEL	HPV P	Non pressure Parts	3
4200 1	LU	Pneumatic Fittings	180	BOI-BHEL	HPV P	Non pressure Parts	3
4200 2	LU	Steam Blow Materials	1845	OS	HPV P	Non pressure Parts	3
4200 5	LU	Instrument Fittings	75	OS	HPV P	Non pressure Parts	3
4202 0	LU	Hfo Pump Set	20055	BOI-BHEL	HPV P	Non pressure Parts	3
4203 0	LU	Hfo Heater Set	21045	BOI-BHEL	HPV P	Non pressure Parts	3
4212 0	LU	Piping, Pump House-Fuel Oil	7530	OS	HPV P	Non pressure Parts	3
4212 8	LU	PIPING,PUMP HOUSE STEAM - IBR	30	SHOP	HPV P	Non pressure Parts	3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

42150	LU	Piping, Operating Floor Hfo & Tracer	3600	OS	HPV P	Non pressure Parts	3
42152	LU	Piping,Opr'G Floor Lfo	1725	OS	HPV P	Non pressure Parts	3
42154	LU	Piping,Opr'G Floor Drain Oil	1065	OS	HPV P	Non pressure Parts	3
42156	LU	Piping,Opr'G Floor Fuel Gas	75	OS	HPV P	Non pressure Parts	3
42157	LU	Piping,Opr'G Floor Atm Air	885	OS	HPV P	Non pressure Parts	3
42158	LU	Piping,Opr'G Floor Steam-lbr	1620	SHOP	HPV P	Non pressure Parts	3
42165	LU	Piping,Gas Ignitor Fitting	4515	OS	HPV P	Non pressure Parts	3
42170	LU	Piping,Oil Burner Fitting	1800	OS	HPV P	Non pressure Parts	3
42176	LU	Piping,Gas Burner Fitting	5370	OS	HPV P	Non pressure Parts	3
42200	LU	Subdelivery Fuel Oil System	14115	BOI-BHEL	HPV P	Non pressure Parts	3
42300	LU	Bhel Valve F.O. System	1980	VALVES	HPV P	Non pressure Parts	3
42358	LU	Bhel Valve,Opr'G Floor Stm-lbr	240	VALVES	HPV P	Non pressure Parts	3
42700	LU	Bps Fasteners	1500	BOI-BHEL	HPV P	Non pressure Parts	3
42988	LU	Oil&Gas System Commissioning Spare	15	BOI-BHEL	HPV P	Non pressure Parts	3
42992	LU	Imported Electrodes	45	BOI-BHEL	HPV P	Non pressure Parts	3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

43004	LU	Assy Comp Scanner & Gun Air System	75	OS	HPV P	Non pressure Parts	3
43104	LU	M/C Comp Scanner & Gun Air System	30	SHOP	HPV P	Non pressure Parts	3
43200	LU	Subdel,Ignitor&Scanner Air System	240	BOI-BHEL	HPV P	Non pressure Parts	3
48012	LU	Rect Duct Bet F.D Fan And Airheater	25440	OS	HPV P	Non pressure Parts	3
48015	LU	Supportsetcbet F.D Fan And Airheater	4290	OS	HPV P	Non pressure Parts	3
48019	DL	Foundation Materials	3525	OS	HPV P	Non pressure Parts	3
48200	LU	Instrument Tappings On Ducting	1245	OS	HPV P	Non pressure Parts	3
48202	LU	Rect Ductsairheater To Windboxduct	30705	OS	HPV P	Non pressure Parts	3
48205	LU	Supportsetcairheater To Windboxduct	3525	OS	HPV P	Non pressure Parts	3
48207	LU	Flowmeters For Secondary Air Flow	4230	OS	HPV P	Non pressure Parts	3
48382	HT	Rect Duct Economiser To Airheater2nop	30795	OS	HPV P	Non pressure Parts	3
48385	LU	Supportsetceconomiser To Airheater2nop	2595	OS	HPV P	Non pressure Parts	3
48492	LU	Rect Duct Ind Draft Fan To Chimney	28050	OS	HPV P	Non pressure Parts	3
48494	LU	Expn Piecesind Draft Fan To Chimney	6315	OS	HPV P	Non pressure Parts	3
48495	LU	I.D.System Duct Supports	2715	OS	HPV P	Non pressure Parts	3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

48499	LU	Chimney Wall Frame For Embedding	570	OS	HPV P	Non pressure Parts	3
48700	LU	Bulked Bps Components	315	BOI-BHEL	HPV P	Non pressure Parts	3
48993	LU	Erection Materials	2205	OS	HPV P	Non pressure Parts	3
48997	LU	HR GLASS DIA109mm X 5MM THK IPP:48:09200	2		HPV P	Non pressure Parts	3
99100	SY	Fan Handling Equipment	1545	BOI-BHEL	HPV P	Non pressure Parts	3
99400	SY	APH Ele., SCAPH handling arrangement	225	BOI-BHEL	HPV P	Non pressure Parts	3
Total Weight of Boiler Non Pressure Parts in MT			246.967				

PG MA	PGMA_DESC_SHORT	Weight IN MT	Prod.Area	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	TAPH	357		BAP /RANI PET	Non pressure Parts	3
	SCPH	4.2			Non pressure Parts	3
Total Weight of TAPH&SCPH		361.2				

PG MA	PGMA_DESC_SHORT	Weight IN MT	Prod.Area	BHEL UNIT	CATEGORY	Rate Schedule Identifier
S.No.	Item	Qty (Nos)	Size (L X W) mm			

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

1		LP Dosing Skid (Hydrazine)& Eye Wash and Safety Shower	2.4	3.5m X 2.2m	HPEP	Non pressure Parts	3
		Total Weight of skid in MT	2.4				
PG MA		PGMA_DESC_SHORT	Weigh t IN MT	Prod.Area	BHE L UNIT	CATEG ORY	Rate Sched ule Identif ier
	A	OFF-Base Natural Gas system					
	1	Gas Conditioning Skid(Natural Gas Scrubber)	6.7		HPEP	Non pressure Parts	3
	2	(Natural Gas Steam Heater)	6		HPEP	Non pressure Parts	3
	3	Gas Condensate KOD	13		HPEP	Non pressure Parts	3
	C	FUEL OIL System					
	1	Fuel Oil Forwarding Pump skid including lube oil skid	9		HPEP	Non pressure Parts	3
	2	Fuel Oil drain tank 2.0 M3 with Drain Transfer Pumps	4		HPEP	Non pressure Parts	3
	3	(Fuel Oil Electric Heater)	6		HPEP	Non pressure Parts	3
	4	(PFO Steam Heater)	6		HPEP	Non pressure Parts	3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

	5	Cathodic Protection	-	-		Non pressure Parts	3
	6	Electric Tracing	-	-		Non pressure Parts	3
		Total Weight	50.7				
PG MA		PGMA_DESC_SHORT	Weight IN MT	Prod.Area/ SIZE	BHEL UNIT	CATEGORY	Rate Schedule Identifier
		RRL Hoses Type A (internal) 15 m long-70 Nos.	0.35		HPEP	Non pressure Parts	3
		MS Hose boxes 18 Guage (internal)-25 Nos.	0.25	.75X.6X.25	HPEP	Non pressure Parts	3
		MS Hose boxes 18 Guage (external)-10 Nos.	0.1	.75X.6X.25	HPEP	Non pressure Parts	3
		Water monitor (75 mm size, nozzle hose 38 mm) along with branch pipe and an isolation valve-06 Nos.	0.3	75mm	HPEP	Non pressure Parts	3
		Total Weight(FIRE PROTECTION SYSTEM : ERECTION BOQ FOR WATER BASED FIRE)	1				
PG MA		PGMA_DESC_SHORT	Weight IN MT	Prod.Area/ SIZE	BHEL UNIT	CATEGORY	Rate Schedule Identifier

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries
Works

	Inert Gas Cylinder with pneumatic valve-52'Nos.	13.2 6		HPEP	Non pressure Parts	3
	Discharge Hose-52nos	0.04 68		HPEP	Non pressure Parts	3
	Check Valve-52nos	0.01 04		HPEP	Non pressure Parts	3
	Contact Pressure Gauge Unit-48nos	0.03 36		HPEP	Non pressure Parts	3
	Release Unit with Solenoid, CPG & Actuator-04nos	0.01		HPEP	Non pressure Parts	3
	Leak / Bleeder unit-04nos	0.00 03		HPEP	Non pressure Parts	3
	Non Return Valve-02nos	0.00 02		HPEP	Non pressure Parts	3
	Hi-flex hoses-56nos	0.01 79		HPEP	Non pressure Parts	3
	Ball Valve with dual action pneumatic actuator-02nos	0.03 4		HPEP	Non pressure Parts	3
	Pressure Relief device-01nos	0.00 04		HPEP	Non pressure Parts	3
	Pressure Gauge-01nos	0.00 06		HPEP	Non pressure Parts	3
	Discharge Nozzle-40nos	0.02 68		HPEP	Non pressure Parts	3
	Pressure Regulator - 01nos	0.00 4		HPEP	Non pressure Parts	3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries
Works

		Solenoid valve-nos	0.00 06		HPEP	Non pressure Parts	3
		Restrictor-02nos	0.00 72		HPEP	Non pressure Parts	3
		T-Piece for Pilot Line- 48nos	0.00 6		HPEP	Non pressure Parts	3
		Cros for Pilot Line-04nos	0.00 08		HPEP	Non pressure Parts	3
		Total Weight(FIRE PROTECTION , DETECTION AND ALARM SYSTEM)	13.4596 1				
PG MA		PGMA_DESC_SHORT	Weight IN MT	Prod.Area/ SIZE	BHE L UNIT	CATEG ORY	Rate Sched ule Identif ier
		CO2/Clean agent type type Fire Extinguishers (4.5kg)-52nos	0.91		HPEP	Non pressure Parts	3
		Pressurized water type (operated by CO2 cartridge type) - 9 Lit.- 03nos	0.05		HPEP	Non pressure Parts	3
		DCP/Clean agent type Fire Extinguishers (6kg)- 31nos	0.33		HPEP	Non pressure Parts	3
		Mechanical Foam type Fire Extinguishers (9 Lit.)- 13nos	0.16		HPEP	Non pressure Parts	3
		Fire Buckets-09nos	0.03		HPEP	Non pressure Parts	3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

		Total Weight(FIRE PROTECTION , DETECTION AND ALARM SYSTEM)	1.47				
PG MA		PGMA_DESC_SHORT	Weight IN MT	Prod.Area/ SIZE	BHEL UNIT	CATEGORY	Rate Schedule Identifier
		<i>Gland Steam Condenser</i>					
		Complete Assly.	4.1	L 5100 x W 1300 x H 1200-in MM	HPEP	Non pressure Parts	3
		<i>Blow Down Cooler</i>					
		Complete Assly.	22.5		HPEP	Non pressure Parts	3
		<i>Steam Turbine oil Cooler</i>					
		Per Cooler	3.02	L 3500 x W 750 x H 1800in MM	HPEP	Non pressure Parts	3
		Total Weight	29.62				
		Overall weight Non Pressure PARTS	706.8				1

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGM A	DESCRIPTION	WEIGH T in MT	Prod.Are a	BHEL UNIT	CATEGOR Y	Rate Schedul e Identifier
	FD FAN 01(Motor Driven)	37.75		RANIPE T	ROTATING MACHINE	4
	FD FAN 01 (Motor)	7		BHOPAL	ROTATING MACHINE	4
	FD FAN 02(Turbine driven)	37.75		RANIPE T	ROTATING MACHINE	4
	FD FAN Drive turbine	4.8		RANIPE T	ROTATING MACHINE	4
	Total Weight in MT	87.3				
PGM A	DESCRIPTION	WEIGH T in MT		BHEL UNIT	CATEGOR Y	Rate Schedul e Identifier
	EOT Crane for BFP Area (20/5 T)(14.0 x 7.0 x 3.0)QTY-01 NO	30		HPEP	ROTATING MACHINE	4
	Overall Weight of Rotating Machines in MT	117.3				

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PG/PGMA/WORK ORDER WISE WEIGHT SCHEDULE(INSULATION)							
PGMA	M S	PGMA_DESC_SHORT	Weight in KG	Prod.Ar ea	UNIT	CATEGORY	Rate Schedu le Identifier
30215	LU	Main Boiler	3435	OS	HPV P	Insulation-Wool	5.1
30223	HT	Gas Distribution Baffles	3225	OS	HPV P	Insulation-Wool	5.1
33021	LU	Blr Pr Parts Mineral Wool	11715	BOI-BHEL	HPV P	Insulation-Wool	5.1
33321	LU	Air Ducts Mineral Wool	34410	BOI-BHEL	HPV P	Insulation-Wool	5.1
33924	SB	Misc Eqpts Asbestos Materials	90	BOI-BHEL	HPV P	Insulation-Wool	5.1
		Total Weight Insulation-Wool for boiler in MT	52.875				
		Total Weight Insulation-Wool for Piping in MT	57	BOI-BHEL	HPE P	Insulation-Wool	5.1
		Overall Weight Insulation-Wool for Boiler & Piping in MT	109.875				

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGM A	M S	PGMA_DESC_SHORT	Weight in KG	Prod. Area	BHEL UNIT	CATEGORY	Rate Schedule Identifier
33201	LU	Main Blr Formed Refractory Is8	15480	BOI-BHEL	HPVP	Insulation-Bricks,Pourable& castables	5.2
33210	LU	Main Blr Castable Refractory Gr A	57195	BOI-BHEL	HPVP	Insulation-Bricks,Pourable& castables	5.2
		Total Weight of Insulation - Bricks,Pourable& castablesfor boiler in MT	72.675				
		Total Weight of Insulation - Bricks,Pourable& castablesfor Chimney in MT	-	BOI-BHEL	BAP/RANIP ET	Insulation-Bricks,Pourable& castables	5.2
		Overall Weight of Insulation - Bricks,Pourable& castables in MT	72.675				

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGMA	MS	PGMA_DESC_SHORT	Weight in KG	Prod.Area	UNIT	CATEGORY	Rate Schedule Identifier
31010	HT	Skin Casing Comps Welded To Pressure P	735	OS	HPVP	Insulation -Iron Parts	5.3
31108	LU	Bank Tube Skin Casing	3015	OS	HPVP	Insulation -Iron Parts	5.3
32010	HT	Fixing Comp For Blr Pr Parts Insul	2910	OS	HPVP	Insulation -Iron Parts	5.3
32310	LU	Fixing Comp For Air Ducts Insul	11010	OS	HPVP	Insulation -Iron Parts	5.3
33970	LU	Misc Eqpts Expanded Metal	465	BOI-BHEL	HPVP	Insulation -Iron Parts	5.3
Total Weight of Insulation -Iron Parts for boiler in MT			18.135				
		Total Weight of Insulation -Iron Parts for Piping in MT	25		HPEP	Insulation -Iron Parts	5.3
		Overall Weight of Insulation Iron Parts for Boiler & Piping in MT	43.135				

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGM A	M S	PGMA_DESC_SHORT	Weight in KG	BHEL UNIT	CATEGORY	Rate Schedule Identifier
33975	LU	Misc Eqpts Sealing Compound	105	BOI-BHEL	HPVP	Insulation-Aluminium Cladding sheets 5.4
37010	LU	Blr Outer Casing Components	3090	OS	HPVP	Insulation-Aluminium cladding sheets 5.4
37810	LU	Blr Outer Casing	3300	BOI-BHEL	HPVP	Insulation-Aluminium cladding sheets 5.4
		Total Weight of Insulation Aluminium cladding sheets for boiler in MT	6.495			
PGM A	M S	PGMA_DESC_SHORT	Weight in KG	BHEL UNIT	CATEGORY	Rate Schedule Identifier
		Total Weight of Insulation Aluminium cladding sheets for Piping in MT	25	BOI-BHEL	HPEP/HYD	Insulation-Aluminium cladding sheets 5.4
		Overall Weight of Insulation Aluminium cladding sheets for Boiler & Piping in MT	31.495			

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGMA	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	AS (P91)(IBR)	64.31	HPEP	Power cycle Piping AS(P91)	6.1

PGMA	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
-	AS (P22)(IBR)	0.67	- HPEP	HP Piping including P11,P12,P22,CS	6.2
-	AS (P11)	0	- HPEP	HP Piping including P11,P12,P22,CS	6.2
-	CS(IBR+NIBR)	261.57	- HPEP	HP Piping including P11,P12,P22,CS	6.2
-	Total Weight(P11+P22+CS)	262.24	-		

PGMA	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	SS Piping (NIBR)	24.97	HPEP	SS Piping	6.3

Technical Conditions of Contract (TCC) for Boiler & it's auxiliaries Works

PGMA	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	MISC PIPING ITEMS- SPECIALITIES (VENT SILENCERS, STEAM TRAPS, STRAINERS, STEAM MANIFOLD)	40	HPEP	Misc Piping Items & Misc Valves	6.4
PGMA/SL NO	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
1.1	Control Valves - <u>Sizes:</u> • 1"- #600 : 1 No • 1.5"- #1500 : 2 No • 2"- #300 : 1 No • 3"- #300 : 3 No • 3"- #1500 : 1 No • 4"- #300 : 2 No • 4"- #1500 : 2 No • 6"- #300 : 3 No • 6"- #600 : 4 No • 6"- #1500 : 2 No • 8"- #300 : 4 No • 8"- #1500 : 2 No • 16"- #300 : 1 No • 18"- #300 : 1 No	22	HPEP	Misc Piping Items & Misc Valves	6.4
1.2	Pneumatic on off ball Valves • 1"- #300 : 1 Nos • 6"- #600 : 1 Nos	0.7	HPEP	Misc Piping Items & Misc Valves	6.4
1.3	De-Superheaters - <u>Sizes (Steam pipe size):</u> 6": 2 no.	1	HPEP	Misc Piping Items & Misc Valves	6.4

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	8": 1 no				
	1.5 - #600 : 2 no.				
	1 - #600 : 1 no				
1.6	Pressure safety valves	4.5	HPEP	Misc Piping Items & Misc Valves	6.4
	Total Weight of valves & Desuperheater	28.2			
	Overall weight of Misc piping Items & Valves	68.2			

PGMA/SL NO	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	HANGERS & SUPPORTS	110	HPEP	Tanks	6.5

PGMA/SL NO	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	Pure Condensate collection Flash Tank-1nos	2	HPEP	Tanks	6.6
	Suspect Condensate collection Flash Tank-01 nos	2.5			
	Overall Weight of Tanks	4.5			

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PGMA	SL NO	DESCRIPTION	WEIGHT in MT	Dimension	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	1	Various Types of Pump					
	i)	Boiler Feed Pump-Motor Driven-01 NOS		For Pump & Drive assembly: 6.5X2.6X3.7	HPEP	Pumps	6.7
			20	For LO skid: 3.5X2X1.5			
	ii)		Boiler Feed Pump-Turbine Driven				
	a)	Pump + Coupling Assembly-01NOS	10	3.5 X 2.6 X 3.7	HPEP	Pumps	6.7
	b)	Turbine +Gear Box+ Lube Oil Skid-01NOS	7		HPEP	Pumps	6.7
	iii)	DM Water Transfer Pump-Motor Driven-01NOS	5	2.5 X 1.75 X 2.0	HPEP	Pumps	6.7
	iv)	DM Water Transfer Pump-Drive Turbine Driven-01NOS	5	3.5 X 2.0 X 2.0	HPEP	Pumps	6.7
	v)	Blowdown Transfer Pump-02NOS	1	0.9X0.7X4.5	HPEP	Pumps	6.7
						HPEP	Pumps
	vi)	Steam Trap Drain Transfer Pump--02NOS	1	1.0 x 1.0 x 1.5	HPEP	Pumps	6.7
	vii)	Suspect Condensate drain transfer pump-02NOS	1	1.0 x 1.0 x 1.5	HPEP	Pumps	6.7
	viii)	Polished Condensate	2	2.0 x 1.25 x 1.5	HPEP	Pumps	6.7

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	Booster Pump-02NOS					
ix)	Portable Submersible Pump (Dewatering purpose)-02NOS	0.1	0.5X0.5X2.0	HPEP	Pumps	6.7
x)	Oily waste Water Pump (Dewatering purpose)-02NOS	0.1	1.0 X 1.0 X 1.0	HPEP	Pumps	6.7
	Overall Weight of Pumps in MT	52.2				

PGMA/SL NO	DESCRIPTION	WEIGHT in MT	BHEL UNIT	CATEGORY	Rate Schedule Identifier
	ACCESS PLATFORMS	80	HPEP	Access Platforms	6.8

Sl.No	SYSTEM DESCRIPTION	Unit	Qty	Total Weight (T)	Category	Rate Schedule Identifier
A. Water Based FPS						
I	Hydrant System					
1	CS PIPES (ABOVE				FPS - Piping	7

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		GROUND / TRENCHES)					
	1.1	200 NB	Mt s.	45 0	19.3 5	FPS - Piping	7
	1.2	150 NB	Mt s.	35 0	9.80	FPS - Piping	7
	1.3	100 NB	Mt s.	12 0	1.92	FPS - Piping	7
	1.4	80 NB	Mt s.	60	0.44	FPS - Piping	7
	1.5	50 NB	Mt s.	0	-.00	FPS - Piping	7
	2	Wrapping & Coating matrl.	Sq mt	12 00	0.30	FPS - Piping	7
	3	CS Gate Valve				FPS - Piping	7
	3.1	200 NB	No s.	6	0.76	FPS - Piping	7
	3.2	150 NB	No s.	58	4.41	FPS - Piping	7
	3.3	100 NB	No s.	2	0.09	FPS - Piping	7
	3.4	80 NB	No s.	2	0.05	FPS - Piping	7
	4	SS Hydrant valves (external)	No s.	10	0.15	FPS - Piping	7
	5	SS Hydrant valves (internal)	No s.	25	0.50	FPS - Piping	7

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10	Branch pipe, nozzle & coupling (internal)	No s.	25	0.25	FPS - Piping	7
12	Pipe Fittings	Lot	1	6.36	FPS - Piping	7
13	Structural steel(plates, ISMC 50/75/100)	Lot	1	0.35	FPS - Piping	7
II	MVW Spray System for Fuel skids					
1	Automatic Deluge valve assembly with all accessories				FPS - Piping	7
	100 NB	No s	4	0.22	FPS - Piping	7
2	Isolation Valve for Deluge valve (Gate valves)				FPS - Piping	7
	100 NB	No s	12	0.53	FPS - Piping	7
3	Y - Type strainer			-.00	FPS - Piping	7
	150 NB	No s	4	0.18	FPS - Piping	7

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4	Piping (Over Ground Pipe)				FPS - Piping	7
4.1	100 NB G.I. Pipe	Mt s	30 0	4.80	FPS - Piping	7
4.2	80 NB G.I. Pipe	Mt s	32 4	3.89	FPS - Piping	7
4.3	65 NB G.I. Pipe	Mt s	0		FPS - Piping	7
4.4	50 NB G.I. Pipe	Mt s	20 0	1.80	FPS - Piping	7
4.5	40 NB G.I. Pipe	Mt s	0		FPS - Piping	7
4.6	25 NB G.I. Pipe	Mt s	24 0	0.60	FPS - Piping	7
4.7	Spray Nozzles	No s	17 6	0.09	FPS - Piping	7
6	Q B Detector	No s	18 0	0.05	FPS - Piping	7
6.1	80 NB - MS	Mt s	18 0	2.16	FPS - Piping	
6.2	50/65 NB - MS	Mt s	15 0	1.35	FPS - Piping	
	Total Weight			60.39		
Sl.No	SYSTEM DESCRIPTION	Unit	Qty	Total Wei	Category	Rate Schedule

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					ght (T)		Ident ifier
18	Pipes	Mt rs.					
i	100 NB	Mt rs.	12	0.19 284	FPS - Piping	7	
ii	80 NB	Mt rs.	20 6	2.32 78	FPS - Piping	7	
iii	65 NB	Mt rs.	10	0.08 63	FPS - Piping	7	
iv	50 NB	Mt rs.	12 4	0.67 456	FPS - Piping	7	
v	40 NB	Mt rs.	82	0.33 21	FPS - Piping	7	
vi	25 NB	Mt rs.	24	0.06	FPS - Piping	7	
vii	20 NB	Mt rs.	15	0.02 535	FPS - Piping	7	
viii	15 NB	Mt rs.	15	0.01 95	FPS - Piping	7	
19	Pipe Fittings	Lot	1	0	FPS - Piping	7	
20	Pipe Supports	Lot	1	3.5	FPS - Piping	7	
21	Cylinder Manifolds 100NB(ASTM A	Mt rs.	14	0.59 08	FPS - Piping	7	

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		106 Gr.B SCH-XXS)					
	22	DV manifold	No s.	1	0.01	FPS - Piping	7
	23	Pilot Line Manifold	No .	1	9	FPS - Piping	7
					16.8		
					2		
					77.20		
					625		
		Total Weight in MT					
		Overall Weight (FPS -Piping)					

PGM A	M S	PGMA_DESC_SHOR T	Weigh t in MT	BHEL UNIT	CATEGOR Y	Rate Schedul e Identifier
		Chimney & Accessories	450	BAP/RANIPE T	Chimney	8.1/8.2

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Note:-

1	A material breakup under category Structure, Pressure Parts, Non Pressure Parts, rotating machinery, insulation, Piping, , , APH etc. 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.
2	Besides indicated in the weight schedule, there is likely hood of addition product groups integral to the system. 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.
3	Above Rate Schedule are based on envisaged material specification. Payment shall be made on the basis of material specification of actual material received and erected at site irrespective of allocation in the weight schedule. BHEL's decision in this regard shall be final.
4	The erection & dismantling of temporary piping, pumps, dummy plates & blanks, valves, pressure gauges and other miscellaneous equipment required for the test for pre-commissioning and commissioning activities like hydraulic test, chemical cleaning, steam blowing etc. are covered in this contract and shall be carried out as a part of work. Weight for the same will be based on jointly measured quantity and corresponding standard weights, except contractor scope materials/equipment. No payment will be made for the equipment brought by the Contractor such as pumps etc and foundations made by the Contractor for temporary systems. 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. No Extra Payment shall be made for the same.
5	Fixing components for insulation: The scope of works covers welding of all attachment on the pressure parts, ducts, pipe, etc for fixing insulation & refractory.
6	The erection and dismantling of air blowers and connecting pipes and ducts, providing blanks / dummies at the required locations and conducting gas tightness test is in the scope of the contractor and shall be carried out within the quoted rate.
7	Payment for CONTROL VALVES / STEAM TRAPS/ FLOW NOZZLES / ORIFICES & OTHER VALVES AND FITTINGS (except temporary system valves) will be made as per the quoted / accepted tonnage rate of piping category in which these materials is installed.

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Chapter-IX: 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.)

9.0 GENERAL

9.1 The intent of this specification is to provide services for execution of project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services/ facilities to complete the work or portion of work awarded to him. The quoted/ accepted rates/ lump sum price shall deem to be inclusive of all such contingencies.

9.2 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.

9.3 **Site Visit by the Bidder:** - The bidder shall, prior to submitting their 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.

9.3.1 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

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information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

- 9.4** 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.
- 9.5** Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies / personnel on ISO 9001 – latest Standards.
- 9.6** Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like Civil, Electrical, instrumentation, BOP, etc., to commence their work from / on the equipment 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.
- 9.7** 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.
- 9.8** The boiler shall be erected as per relevant provisions of latest Indian Boiler Regulations (IBR) and amendments/addendums thereof, if any. Contractor shall submit a copy of license to undertake construction / repair of Boilers & Piping issued by Boiler inspectorate before commencement of Pressure Parts / Piping Erection.
- 9.9** Contractor should obtain the formal statutory clearance **from Chief Inspector of Boilers** to carry out erection & Welding of piping (piping, special tanks, IBD Tanks, CBD tanks any other tanks applicable) under IBR purview. Arrangement for the visit of Boiler inspector for field inspection, hydraulic test etc., is in the scope of contractor, and necessary drawing / details only will be given by BHEL. If applicable/required, all boiler, piping layout drawings received from BHEL for pipeline erection to be submitted to Boiler Inspector for approval. After approval of the above drawing, Erection of pressure parts, pipe line to be started
- 9.10** All necessary **certificates and licenses, permits , clearances, Inspection** to carry out this work from the respective **IBR authorities/statutory/ local authorities/ etc** are to be arranged by the Contractor, at his cost in time to ensure smooth progress of work and render all assistance, service required in this regard.
- 9.11** All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to the account of the Contractor. However, any registration, statutory inspection fees lawfully pay-able under the provisions of the Indian Boiler Regulations and any other statutory laws

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and its amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the customer, shall be to the account of the customer. Should any such inspection or registration need to be re-arranged due to the fault of the Contractor, the additional fees for such inspection and/or registration shall be borne by the Contractor. Inspection fee and registration fee as mentioned in Chapter VIII of Special Conditions of contract shall be paid by BHEL.

- 9.12** 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.
- 9.13** 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 (5%) from contractor's bills.
- 9.14** 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.
- 9.15** Contractor shall erect and commission all the equipment 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.
- 9.16** The Contractor shall perform any services, tests etc. which may not be specified but nevertheless, required for the completion of work within quoted rates.
- 9.17** The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.
- 9.18** 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.
- 9.19** All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipment / components for checking and cleaning, surface preparation as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc. as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the Contractor as part of the work within the quoted rates.

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- 9.20** The Contractor shall take delivery of the components, equipment, 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 after usage shall be submitted to the BHEL and reconciled periodically.
- 9.21** Plant materials should not be used for any temporary supports / scaffolding/ preparing preassembly bed etc. The details of equipment 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 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.
- 9.22** 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.
- 9.23** Layout of field routed, **fine fittings, boiler trim piping, oil system 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 in boiler and oil system 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.
- 9.24** Fixing and seal welding of **thermowells & plugs before Hydro test/ steam blowing** of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermowells after hydro test/steam blowing of lines as part of work.
- 9.25** In installation of various equipment 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 to their respective permanent hangers/ suspensions/ supports as incidental to work.
- 9.26** Interconnection/ hook-up, if any, with the existing system shall form part of work. Such interconnections, hook-ups 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.
- 9.27** 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

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further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.

- 9.28** 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.
- 9.29** 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.
- 9.30** Gases like argon, oxygen, acetylene etc that are required for erection related activities shall be arranged by the Contractor at his cost. For T-91 material if any site weld joints argon as per grade-3 of is 5760: 1998 with oxygen and water vapour restricted to max 6 ppm each and with argon purity level of minimum 99.99% shall be arranged and used by the Contractor. The supply should accompany test certificate for the batch indicating individual element 'ppm' level and overall purity level. Contractor should arrange to verify the purity of argon at site as required by BHEL/Customer
- 9.31** **It shall be the responsibility of the contractor to preserve the Boiler as per BHEL's requirement. Contractor shall arrange necessary connector, nipple, regulator, header and piping for usage of such gas from cylinders. However, Nitrogen gas if required for the initial charging of Fuel shall be in the scope of the contractor.**
- 9.32** **All chemicals required for testing, preservation, chemical cleaning / acid cleaning/any lubricants, required for trial runs of the equipment shall be the scope of contractor within the quoted price unless otherwise specified in TCC. Filling up of Lubricating oil/Greasing of equipment shall be the scope of this contract within the quoted price. For boiler lit up / Trial Operation, fuel will be supplied by BHEL/customer.**
- The Chemical requirement will be as per details in document of M/s BPCL (attached). The type and qty of Chemical may vary as per site requirement and customer approval. The contractor has to supply all the chemicals as per site requirement and customer approval.**
- 9.33** 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.
- 9.34** 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.
- 9.35** Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.

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- 9.36** 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.
- 9.37** 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.
- 9.38** Neutralization pit for Chemical cleaning shall be made by Contractor. After completion of job pit has to be dismantled and area is to be levelled before handing over of area to owner. Dismantling of temporary piping & Cleaning of the area, erected by bidder, is in the scope of contractor.
- 9.39** 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 cost with applicable overheads if there is any failure on the part of contractor in this respect.
- 9.40** 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.
- 9.41** On completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and levelled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor with 5% overhead. The decision of BHEL Engineer in this regard is final.
- 9.42** 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.
- 9.43** Any damage of the landscape by contractor's team to such utilities will be penalized and contractor shall be responsible for cost/making good for such damages.
- 9.44** Contractor at his cost shall lay all necessary temporary piping including cutting and edge preparation, install the pumps, blanks, valves, Pressure gauges etc. required for the test. Required pipes, valves, plates etc., will be given by BHEL.
- 9.45** **SITE INSPECTION**
- 9.45.1 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

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extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

9.45.1 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.

9.45.2 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 with 5% overhead, 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.

9.46 UTILITY POINTS

9.46.1 Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N₂) if any etc., shall be indicated in the P & I diagram. Contractor to locate the utility points as advised by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with 'BILL OF MATERIAL' to BHEL for approval.

9.46.2 The utility points shall be located at convenient point to handle and to be terminated with brass / bronze valve with suitable connection for hose pipe.

9.47 DOCUMENTATION

9.47.1 Contractor has to maintain documents regarding erection, alignment, welding, joints, NDT and other erection data as per the FQP (min 05 Copies). These shall be required at different stages of erection and commissioning for statutory clearances as well as during handing over to Customer.

9.47.2 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.

9.48 Statutory approval

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- 9.48.1 Necessary approval for drawings, documents, Load Testing, license of hoists, Boiler lifts, Misc cranes .FANs,, different buildings erected by bidders has to be arranged for getting statutory fitness certificates, drawings/documents from Statutory agency/IBR/Third party inspectors/Gound inspection without any extra commercial implication on BHEL treating as normal scope of work.
- 9.48.2 Contractor has to provide assistance during commissioning & Load test of equipment if any with manpower, load shifting, etc.
- 9.48.3 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.
- 9.48.4 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 Owner/BHEL, 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.
- 9.49 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.
- 9.50 Dewatering**
- Dewatering of Low Lying areas like -Boiler working areas, other low lying areas (as per scope applicability) till handing over to customer is in bidders scope for which vendor has to arrange and maintain adequate no. of Diesel & electrical pumps of suitable capacities, operators, necessary manpower with sufficient quantity of suction & discharges hoses, pipes, Clamps, cables, Electrical panels/starters, diesel, consumables without any extra commercial implication on BHEL treating as normal scope of work. Dewatering pumps will be required to run to ensure job progress is not hampered & if required pumps are to be run on round the clock basis on working days & holidays, Sundays.
- 9.51 Housekeeping/Area Cleaning**
- The contractor has to do area cleaning on every date on daily basis. Non-compliance of the above cleaning shall call for penal recovery limited to **Rs.2,000.00 on each instance** and at the same time, cleaning of the area shall be done by BHEL at Cost recovery basis with **5%** overheads. 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. in the various work fronts.

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9.52 Approach platforms, fixtures

9.52.1 Erection of Platforms (with grating, railing, toe-guards and stairs) for safe approach and operation of auxiliaries and valves, as per BHEL and customer requirement etc. is to be carried out by contractor. Structural shall be issued by BHEL for this on free of cost basis. Payment/ payment terms of such work shall be done as per Rate schedule

9.52.1 Steel items like angles, scaffoldings which are temporary in nature and is required for erection of structural members like bracings Tie beams, are to be arranged by vendor treating it as normal scope of work without any cost implication on BHEL.

9.53 Assistance during commissioning of panels, Equipment, system, actuators for valves (motor operated/pneumatic), gates, dampers

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, for the 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 number 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 are treated as vendor's normal scope of work without any extra commercial implication on BHEL.

9.54 Agency has to fix Anchor Fastener for various support works for permanent/temporary supports related to his scope of job, materials will be supplied by BHEL.

9.55 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.

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Chapter-XI: Welding Schedule

10.0 Following points may be noted with respected to the Welding schedule

Erection/Final Welding Schedule of subject Project shall be made available during Erection. Document Enclosed with this specification is issued only for general understanding about the scope of work and does not entitle contractor of any compensation on account of any changes in final WS issued by BHEL during execution of works at site.

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Chapter-XI: Foundations & Grouting

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.)

11.0 PREPARATION OF FOUNDATIONS AND GROUTING

- 11.1** Building foundations and other necessary civil works for supporting structures, equipment 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 BHEL instruction.
- 11.2** Minor adjustment of foundation level, dressing and chipping of foundation surfaces and blue-matching (wherever required) for of all equipment 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. All minor adjustments of foundation level, dressing and chipping of foundations as required, minor enlarging the pockets in foundations, cleaning using compressed air, etc., for achieving proper levels & erection of equipment/ plants, will be within the scope of work/specification.
- 11.3** It shall be contractor's responsibility to check the various equipment 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.
- 11.4** Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipment. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nut's movement. If required cleaning of the threads to be done with proper dies.
- 11.5** While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping, contractor has to arrange additional packer plates as per requirements provided BHEL Engineer allows it. When required by manufacturers, the embedded sub-sole plates shall be scraped and checked with Prussian blue to get the required contact with frames. The required packer plates shall be provided by BHEL free of cost. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare **packers and shims by gas cutting / chiseling / grinding and de-burr the same. However, machining of the packers wherever necessary, shall be arranged by contractor.**

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- 11.6** Contractor shall ensure perfect matching of packer plates including machining, scraping and blue matching with foundation by dressing the foundation, as well as perfect matching between the packer plates and the base plate of equipment to the satisfaction of BHEL Engineer. If required the packer plates may have to be aligned and fixed on the foundations using special high strength, non-shrinking and quick setting grouts. The minimum thickness below the packer plate should be 20mm. The material required for this has to be arranged for by the contractor at his cost
- 11.7** All temporary foundations and anchor points required for installing erection Equipments 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.
- 11.8** 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 based on the foundations including shear lug provisions / openings.
- 11.9** **Required Neutralization pit for Chemical cleaning shall be in scope of work. any other work to be executed for completion of neutralizing pit shall be in the scope of work. After completion of job, dismantling of pit shall be in scope of work. No Extra payment shall be made to the contractor for the aforementioned work.**
- 11.10** Contractor shall carry out scrapping and blue matching of embedded plates/ packers of rotating equipment. Chipping and the levelling 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.
- 11.11** Complete grouting of structures, equipment, 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. While grouting the contractor has to ensure that all the matching joints which are not to be grouted shall be kept free from the grouting mixture by applying tape or any other alternative method approved by Engineer. If required, decoupling 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. 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.

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- 11.12** After the grouting has finally set and cured, alignment of structure, equipment, alignment of shafts of rotating machines, the slopes of all bearing pedestals, centering of rotors with respect to their sealing bores, coupling etc. involved shall be checked again to verify for any disturbance or any other reason. If required, de-coupling of equipment 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.
- 11.13** 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.
- 11.14** Total grouting of the columns / equipment including pocket grouting, grouting at the gap between foundation, base plates top surface of column / equipment, anchor/ foundation bolts, beneath base, base hollows, etc. 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 non-shrink cement shall be arranged by the contractor at his cost. The quoted rate shall be inclusive of the same.
- 11.15** 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.
- 11.16** 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.
- 11.17** 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.
- 11.18 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.

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Chapter-XII: Material Handling & Management services(Project Material handling, transportation to Erection Site and Site Storage)

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

SCOPE OF WORK

1.0 Material Handling services: The scope of work in general are receipt of project material, unloading, storing, preservation, issuing of material with proper documentation and providing & maintaining the site office set up materials at BPREP, BPCL BINA Project as on and when required basis for the Contract period.

Identification of equipment at storage yard, technical assistance for checking and making the shortage/damage reports are under the scope of this tender specification along with the supply of all consumables (slippers, wooden planks, supports, Tarpaulins) tools & tackles (Farana Crane, Slings etc.) and all type of manpower (Crane operator, supervisor. Store keeper, Rigger, helper etc) required for Material handling.

- 1) It is not the intent to specify herein all details of material. Any item related to this work not covered, but necessary to complete the system will be deemed to have been included in the scope of the work.
- 2) Site testing wherever required shall be carried out for all standard T& P's
- 3) The contractor shall take full responsibility for satisfactory handling of Material & reconciliation under overall guidance of BHEL and shall locate any cause of malfunction and rectify the same for proper operation.
- 4) The work shall be executed under the usual conditions without affecting project work and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall cooperate 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.
- 5) 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.
- 6) All necessary certificates and licenses required to carry out this work are to be arranged by the contractor expeditiously at his cost.
- 7) The contractor shall note that whenever required items/materials shall be unloaded at erection site / assembly yard by the prescribed route without disturbing and causing damage to other works in

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the most professional manner. All items, Hardware, etc., shall be stored in appropriate manner as per instructions of BHEL engineer.

- 8) Contractor shall remove all scrap materials periodically generated from his working area in 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.
- 9) 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
- 10) The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances.
- 11) If any item or equipment not covered but requires to be unloaded, same shall be carried out by the contractor. Unit rate shall be considered for payment purpose. The unit rates quoted by the contractor shall be uniform for all the items.
- 12) Scope of work covered under this specification requires quality workmanship & Material Management. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, Consumables & etc in his possession. He shall also have adequately trained, qualified and experienced engineers, supervisory staff and skilled personnel.
- 13) The manpower deployed by contractor shall match with above scope of works
- 14) Contractor shall deploy adequate Manpower for Material Management to meet scope of works and Minimum manpower & T&P's shall be available at site on continuous basis to meet the daily site requirements.
- 15) The scope of various material to be handled, indicated in this contract is indicative only. Bidder shall unload all the material pertaining to this Project as specified in chapter- X
- 16) Maintenance: During hiring period, maintenance & cleaning of the Porta cabin and accessories shall be in the scope of bidder.
- 17) Exclusive person along with Laptop / Desktop PC/with Internet connection shall be deployed for documenting the material receipt and issuing.
- 18) Wooden slippers/Concrete slippers & other materials required for preservation of the equipment at the stores and at the site are in the scope of the contractor.
- 19) The tentative list materials to be handled are tabulated below

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SL NO	ITEM
1	BOILER & Auxillaries
2	Pipe Rack & DeaeratorMaterials
3	Rotating Equipment & APH)
4	Pumps & Cranes
5	Valves & Tanks/lp Dosing system
6	Electrical and C&I materials
7	Fuel Oil System
8	FDPS Materials
9	Piping System materials
10	GSC /Deaerator/cooler
11	Chimney& Misc Materials
12	DM tank Materials
13	AC & Ventilation system
14	Other Misc. Materials of BHEL

2.0 List of minimum major Tools & Plants to be deployed by the contractor:

- I. All T&Ps & Consumables /Operator/Diesel/fuel etc. are to be arranged by the contractor at his cost.

Sl. No.	DESCRIPTION OF EQUIPMENTS	Tentative Deployment	Tentative Duration	QUANTITY	REMARKS
1.0	Crawler Crane/Tyre mounted Mobile Crane (Telescopic boom, hydraulically operated with Turret function)-50 MT or more	1st Month	Till contract period or as decided by BHEL Engineer.	01	To be deployed as per instruction of BHEL Engineer.
2.0	Pick & carry type tyre mounted mobile crane (Farana)- 23MT or more Note: Hydra is not allowed.	1st Month	Till contract period or as decided by BHEL Engineer.	01	To be deployed as per instruction of BHEL Engineer.
3.0	Crane - Forklift 5 Ton capacity with 3M lift Double mast type	1st Month	Till contract period or as decided by BHEL Engineer.	01	To be deployed as per instruction of BHEL Engineer.

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4.0	Tractor with trolley unit integrated with a hydraulically operated trolley/trailer, designed for material handling. minimum capacity 10 MT	1st Month	Till contract period or as decided by BHEL Engineer.	01	To be deployed as per instruction of BHEL Engineer.
5.0	TRAILER-20MT	Need basis	Need basis	01	To be deployed as per instruction of BHEL Engineer.
6.0	WOODEN SLEEPERS Assorted sizes-(3' ft x 6" x 6" or as per BHEL instruction)	1st Month	Till contract period or as decided by BHEL Engineer.	600	As per instruction of BHEL Engineer.
7.0	SLINGS, 'D'-SHACKLES, MAX PULLER. - 01 MT TO 10MT	1st Month	Till contract period.	15 PAIRS	To be deployed as per instruction of BHEL Engineer
8.0	SLINGS, 'D'-SHACKLES, MAX PULLER, PULLEY BLOCKS, HYDRAULIC JACKS, ETC ABOVE 10 MT.	Need basis	Need basis	As required.	To be deployed as per instruction of BHEL Engineer, WITH TEST REPORTS
9.0	SPANNER SETS RING/D	1st month	Till contract period.	TWO SET. UP TO 56 MM	To be deployed as per instruction of BHEL Engineer
10.0	Tarpaulin (waterproof and fire-resistant) 300 Gram/sq meter (GSM) Assorted Size as per BHEL requirement	As per BHEL instruction	As per BHEL instruction	3.0 Lac Square feet.	Mentioned quantities to be deployed as per Instruction of BHEL Engineer.

NOTE

- I. Contractor shall bring all the T&Ps required for material handling. The T& P mentioned against T& P CHAPTER is different from T&P For material handling. In no case the T& P For E&C Will be used For Material Handling.
- II. Contractor shall provide Operator, Fuel, consumables, manpower (rigger/slinger/helper as required) etc. for complete operation for Cranes/ T&Ps to be deployed by contractor, for execution of work as per their scope, within the quoted rates and no separate payment shall be made for the same.
- III. End cap of various coils, pipes etc. if required, to be re- installed, the same shall be supplied and installed by the contractor within the total quoted rate in this tender.
- IV. MEASURING AND MONITORING DEVICES (MMD): AS PER REQUIREMENT TO BE FINALISED AT SITE, CONTRACTOR SHALL MEET THE REQUIREMENTS AS PER BHEL INSTRUCTION/MANNUAL ETC.

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- V. Contractor has to unload all project materials within the quoted rate .
- VI. If contractor fails to provide mentioned resources as per requirement, for a continuous period of 15 days or more, BHEL shall have the right to deploy it on behalf of contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads.

3.0 List of minimum IT infrastructure for Record keeping

The contractor under this contract shall complete induction of following categories of resources within the quoted item rates, to ensure establishment of proper materials management at the project site.

- a) Computers and printers with latest up-gradation, memory and compatible with BHEL computers/LAN equipment to be installed/used within BHEL site office – **Computer – 03 sets & printer cum scanner – 1sets, Photocopier machine-1No. & Hard disk – 02 no (for monthly backup of records)**. Computers and printers are envisaged for various Material Management activities such as record keeping/data entry done by bidder's staff. These resources (i.e. computer/ printer cum scanner/ photocopier machine/ hard disk) shall remain contractor's property/ownership for all legal/technical purposes. The resources as mentioned above shall remain at BHEL offices during the contract period/ extended period (if any). These shall be taken back by the contractor after completion of job or when requirement is over, as certified by BHEL Engineer, whichever is earlier. This facility has to be provided as directed by BHEL till completion of job or as decided by BHEL, as mentioned above.
- b) The contractor shall provide above resources for carrying out functions/operations as stated above. The no. of resources indicated above is tentative and actual deployment may vary based on work load and site requirement. The requirement schedule shall be finalized in the beginning of the contract period/extension period with Engineer In charge. Contractor shall ensure availability of resources during extension period as well. This does not absolve the contractor from his responsibility towards the satisfactory execution of the job.

NOTE-

If contractor fails to provide mentioned resources as per requirement, for a continuous period of 15 days or more, BHEL shall have the right to purchase it on behalf of contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads.

4.0 List of minimum Manpower for Record keeping& Material management

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- **Store keeper with Computer knowledge** (MATERIAL RECEIPT/ UNLOADING, COLLECTION/ BOOKINGS/ DETAILED VERIFICATION & PRESERVATION) -**01nos**
- **Supervisory staff** (MATERIAL ISSUE, RECORD KEEPING (BOILER, ELEC, C&I, MRC, ASSISTANCE IN INSURANCE CLAIMS, AND T&Ps ETC.))-**01nos**
- **Unskilled Manpower** (Riggers/Housekeeping/other misc. Material handling works)-**Minimum-07 no's**
- **Security Guard**- As per requirement

The no. of Manpower resources indicated above is tentative and actual deployment may vary based on work load and site requirement. The requirement schedule shall be finalized in the beginning of the contract period/extension period with Engineer In charge. Contractor shall ensure availability of resources during extension period as well. This does not absolve the contractor from his responsibility towards the satisfactory execution of the job.

In case the contractor does not deploy or delays deployment of above said manpower with reference to specific instructions from BHEL, BHEL will recover non-refundable penalty per man-day @ Rs 500/-

NOTE-

If contractor fails to provide mentioned resources as per requirement, for a continuous period of 15 days or more, BHEL shall have the right to deploy it on behalf of contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads.

5.0 Re-stacking/re-arranging

Over a period of time, restacking/rearranging of the materials stacked earlier may arise due to various reasons. The handling of such items will also be in the scope of this contract. The restacking/ re-handling may be necessitated for any equipment/ materials covered within this work specification. Contractor shall deploy necessary resources like manpower, T&P, equipment etc. to carry out this exercise including proper inscription of identification marks if needed. No separate payment will be made for this.

6.0 Transportation to erection site and Site Storage ((All the works mentioned hereunder shall be carried out within the accepted rate of E&C of respective items unless otherwise specified.)

- I. 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 / Equipment from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the

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- 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.
- II. The storage yard is located within the Main Plant Boundary.
 - III. Transportation of all items including vendor 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.
 - IV. Loading 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.
 - V. The equipment / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
 - VI. 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.
 - VII. 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.
 - VIII. Contractor shall plan and transport equipment, 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.
 - IX. 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. In case it is necessary to shift and restack 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. Contractor shall maintain register/diary for location and quantity of materials transported from BHEL/Customer Store/Yard and unloaded at site/ preassembly area.
 - X. All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.
 - XI. 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.
 - XII. 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

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- interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.
- XIII. 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.
- XIV. 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 weightment basis in consultation with
- XV. BHEL Engineer and a receipt obtained for material accounting purposes. Scrap materials shall be sorted section-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. In case if wastage is beyond permissible limit, recovery shall be applicable as per penal rate based on fresh material market rate as determined by BHEL Engineer In-charge.
- XVI. All lifting tackles including wire ropes, slings, shackles etc. used by the contractor shall be got approved by BHEL Engineer at site before they are actually put on the work. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damage to other equipment and personnel. All equipment/structure shall be adequately supported and protected to prevent damage during handling and erection. The history cards for major equipment to be maintained by the contractor.

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Chapter-XIII: 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.)

13.0 Erection

13.1 Brief list of System / sub-system to be erected by the contractor & approximate weight of individual structure, equipment, PGMA's and number of welding joints mentioned in this Tender Specification are meant for giving general idea to the tenderer only about magnitude of the work involved. This is tentative and should not be taken for billing or any other claims. All weights for such purposes will have to be taken from design documents only (shipping list). This section also gives general idea about various components to be erected with expected accuracy level. However, the contractor shall get the correct details from the engineer to avoid mistakes and rework.

13.2 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 of 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. Following among others shall form part of contract in contractor's scope:

- a) Scaffolding with material and rigging operations,
- b) Machine/ flame/ electric cutting, grinding, welding, radiography and stress relieving & wrap inspection by Holiday detector.
- c) Fitting, Fettling, Filing, Straightening, Chamfering, Chipping, Scrapping, Reaming, cleaning, checking, levelling, blue matching, aligning and assembly
- d) Machining, Surface grinding, drilling, doweling, shaping
- e) Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication
- f) Insulation and painting

13.3 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.

13.4 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 draws at the rate prescribed by manufacturing units.

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- 13.5** 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.
- 13.6** Approach road in the vicinity of erection area are to be maintained by Contractor.
- 13.7** In the case of structural members / ducts 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 connects the joints at no extra cost.
- 13.8** All piping items including pipes, 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. No separate payment will be made for the edge preparation of pipes, Standard fittings such as bends, Tees etc.
- 13.9** 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. For 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.
- 13.10** 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 BHEL engineer instruction. No extra cost shall be paid.
- 13.11** Welding of all thermo wells, 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.
- 13.12** 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.
- 13.13** Wherever hanger and support materials are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the system on temporary supports to ensure the progress of work. 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.
- 13.14** 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 is within the quoted / accepted rate.
- 13.15** All the equipment /material to be taken inside the plant building shall be cleaned thoroughly before taking them inside. The contractor shall clean, wherever necessary and paint inside surfaces of the

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equipment like coolers, oil tanks, Rubber expansion joints and other components as per instruction of BHEL Engineer during erection within the quoted rate.

- 13.16** 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.
- 13.17** Any fixtures, scaffolding materials, approach ladders, concrete block supports, steel structures required for temporary supporting, pre-assembly, checking, welding, lifting & handling during preassembly and erection and during application of insulations shall be arranged by the contractor at his cost.
- 13.18** **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.

13.19 **BRIEF FEATURE OF STEAM GENERATOR & AUXILIARIES**

Steam Generator is Main equipment including all related auxiliary equipment, Piping's, Fans/Pumps/Motors etc. Scope includes Erection, alignment and welding, bolting, fastening, grouting as applicable of:

1. Boiler structure
2. Water cooled furnace complete with separators, water wall, headers, steam generating tubes, furnace bottom hoppers, drains, observation ports, etc.
3. Super heaters including safety valves with silencers, motorized main steam stop valves with integral bypass valve, start-up vents, air vents, nitrogen connections, etc. Re-heaters including safety valves with silencers, drains, air vents, etc.
4. In line, bare tube economizer, including vents, drains etc.
5. De-superheating spray system: Sprays for Super heaters and Re-heaters.
6. Steam soot blowing system including long fully retractable rotary blowers for super heater, reheater and economizer; Sweep action soot blowers for regenerative air preheater along with necessary accessories. Soot blower System will be complete with drains, entire piping, fittings, control valves, safety valves etc.
7. Complete draft plant for the balanced draft system
 - a) Forced draft fans with drives, associated auxiliaries and accessories.
 - b) Induced draft fans with drives, associated auxiliaries and accessories.
 - c) Primary air fan with drives, associated auxiliaries and accessories.
 - d) Air pre-heater

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- e) Air and Gas duct work with necessary metallic expansion joints, dampers and support steel work up.
- f) Duct stiffening devices, mating flanges, access doors and brackets, supporting structure as applicable.
- 8. Fuel oil system will cater to Light Diesel oil (LDO) firing requirements of each Steam Generator. Fuel oil burners will be complete with diffusers, tips extension pipes, atomizers, burner shut off valves, flexible hoses and all other ancillaries.
- 9. Valves, dampers etc. with actuators
- 10. Hoists and cranes as applicable
- 11. Thermal insulation & refractory.
- 12. Ducts and dampers
- 13. support Structure
- 14. Roof Sheeting
- 15. Backstay
- 16. Seal Boxes & Skin Casing
- 17. Ignitor System
- 18. valves (As applicable)
- 19. Insulation supplied (As applicable)
- 20. Fuel Oil Pump House equipment (As applicable)
- 21. Mics. permanent approach platforms. (As applicable)
- 22. soot blowers
- 23. HP Dosing System

13.20 DEAERATOR: Installation & Commissioning of deaerator along with Erection of Deaerator structure is in the scope of bidder.

13.21 Other Items:

- 1. **Welders**—high-pressure welders. All consumables shall be in contractor scope. No separate payment shall be made in this regard.

13.22 Erection of Boiler & Its Auxiliaries and Rotating Machines

13.22.1 Preparation of pre-assembly bed is very much essential for pre-assembly of MBLs, columns, ceiling girders, panels, coils etc. on consolidated ground and to avoid sagging and shrinking the temporary supports are to be provided. The pre-assembled component should have minimum three supports to avoid sagging.

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- 13.22.2 The column and girder pieces are to be measured individually to check for camber, sweep etc. The level markings on the columns to be checked before erection. The verticality stickers are to be fixed over individual column pieces on both the flanges (90 degrees apart in two places). Arranging these stickers shall be done by the contractor.
- 13.22.3 Tier by tier erection method is to be followed. Columns are to be tied up with horizontal and diagonal bracing in each tier before proceeding to next level. Log sheets are to be maintained in line with log sheets which are available with BHEL. After grouting the first-tier columns, second tier erection is to be taken up. Adequate curing of the grout is to be ensured. Verticality of the columns is to be ensured either by plumb bob or theodolite. The tolerance shall be as indicated in BHEL's erection drawings. Care should be taken while erecting the vertical and diagonal bracings to maintain the work points as per drawing. Necessary lubricant for the girder pin assembly should be applied as per drawing within the quoted rates.
- 13.22.4 The following measuring and test equipment with proper calibration certificates are to be made available by the contractor before taking up the structural and other pressure parts erection. Steel tapes minimum 5M, 30M in sufficient numbers, torque wrench, bolt tension calibrator, torque wrench with calibration, temperature recorder, two theodolites with one second accuracy etc. Periodic calibration of the measuring instruments is to be done once in six months and certificate for the same to be submitted to BHEL for records.
- 13.22.5 Detailed procedure available with BHEL site office should be collected before taking up the job by the contractor for pre-assembly of ceiling girders. Bolting is to be carried out by contractor. During preassembly at ground, Seal weld may be required at Girder split splice location for ensuring stability and alignment.
- i. Blue match on Girder Splice plates to be done.
 - ii. Structural Framework and other preparatory works for ceiling girder pre-assembly are to be done.
 - iii. Suitable equipment for splice bolt hole reaming (only by mechanical means not by heat) and bolt tightener is to be used.
- 13.22.6 Camber, sweep and twist are to be checked. The tolerances for individual piece camber and sweep, individual length, level of girder assembly, flatness of the web, out of squareness of assembly, overall length of the assembly etc. to be ensured before taking up the job. Major deviation if any observed should be intimated to BHEL for getting the resolution before proceeding further.
- 13.22.7 Suitable crane to be used for handling / lifting the ceiling girder will be provided by BHEL. Levelled area will be provided by BHEL for erection. However, backfilling and consolidation, if further required, shall be carried out by the contractor, at no extra cost. Necessary plates/sleepers required for marching and operation shall be provided by the BHEL for BHEL owned/deployed cranes. Positioning of the crane is to be decided in consultation with BHEL.

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- 13.22.8 The erection of the welded beams, rolled beams, boiler roof frame assembly etc. to be taken up along with ceiling girders immediately as the crane moves from first girder to the last. The silencers of various safety valves also to be erected in the respective bays. The completion of the roof sheeting should follow to create a comfortable working space in the boiler cavity giving protection to all work men from rains and sun. It is expected that the contractor will complete the same before pressure parts erection. The materials for boiler roofing and side cladding etc. will be supplied by BHEL and contractor has to erect the same at the quoted /accepted tonnage rate.
- 13.22.9 The tightening procedures for HSFG bolts are to be obtained from BHEL at site before taking up the work. Normally it is done by turn of nut method. Torque wrenches also can be used. The bolted joints will be checked jointly by BHEL/Customer engineers for required tightness and retightening is to be done as per requirement. The tightened bolts will be marked with colour paints (*Paint in scope of Contractor*). Facility for random checking by torque wrench will have to be done. The required calibrated torque wrench will be provided by the contractor.
- 13.22.10 Some platform materials, approach ladders, suspension materials etc. will be supplied in running meters. The contractor has to fabricate these materials wherever they are supplied in running meters to the required size / shape, to be welded and erect them within the quoted rates.
- 13.22.11 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 clamping type ladders. No temporary welding on any structural members is permitted except under special circumstances with the prior approval of BHEL. The necessary materials for the ladders are to be arranged by bidder within quoted rate. Any ladder supplied by the manufacturing unit for this purpose will be issued to contractor free of cost and the same is to be returned once the platforms are completed. In case it is absolutely necessary then the contractor shall cut the temporary structure and rectify the column as directed by the engineer.
- 13.22.12 Scrap disposing chutes are to be provided by the contractor within the quoted rate at different areas like along the boiler main column and duct supporting structures. Material for the scrap chute will be provided by BHEL.
- 13.22.13 Certain adjustments in length of steel /pipe/tube members may be necessary while erecting high pressure pipelines of boiler and piping (pre-fabricated lines) and the contractor should remove the extra lengths to suit the final layout after preparing edges afresh and adopting specified heat treatment procedures at no extra cost, The prepared edges in pressure parts shall be applied with weldable primer as preservation and supply of the primer is in contractor scope.
- 13.22.14 Ducts / expansion pieces are dispatched to site in loose walls / plates and these are to be assembled at site before erection. (Walls with stiffeners in welded condition will be provided).
- 13.22.15 All the dampers, valves, lifting equipment, power cylinders, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre-commissioning. The bearings of dampers shall be properly cleaned, serviced and lubricated before commissioning

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- at no extra cost. Even after commissioning, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract without any extra cost to BHEL.
- 13.22.16 In case of any class of work for which there is no such specifications as laid down in the contract such as 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.
- 13.22.17 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain a reliable and complete pipe installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and Payment/ payment terms of such work shall be done as per Rate schedule. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost.
- 13.22.18 All valves will have to be checked, cleaned, lapped or overhauled in full or in part before erection, after chemical cleaning and during commissioning as may be necessary.
- 13.22.19 Adjustments like removal of ovalities in pipes and opening or closing the fabricated bends of all piping including high pressure piping to suit the layout shall be considered part of work and the contractor is required to carry out such work free of cost, as per instructions of BHEL, which shall include specific heat treatment procedures etc.,
- 13.22.20 Pipes are sent in standard length and will be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. few Bends may have to be fabricated at site adopting specified heat treatment procedures, wherever required at no extra cost. Only cold cutting methods are to be employed for cutting of pipes and tubes irrespective of the size and material. Gas Cutting, if any, will be allowed only in CS LP piping as per instruction of BHEL Engineer.
- 13.22.21 **The enclosed welding schedule is tentative and for reference only. The applicable welding schedules will be issued during erection of work at site.**
- 13.22.22 Attachment welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., both for regular measurements and performance testing to be provided on boiler / its auxiliaries or pipelines covered with in scope of this tender, will also be the responsibility of the contractor and the same will be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, (a) Product group (PG)/Shipping List under which these items are released are not covered in the scope of this tender, (b) Items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package.
- 13.22.23 The contractor shall fabricate piping, install lube oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system, carry out the pressure test of oil coolers etc.,

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- 13.22.24 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Sponge ball test shall be carried out for all tubes before erecting the same. Bigger size pipes should be cleaned with flexible wire brush, wherever necessary. 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.
- 13.22.25 All attachment welding including those for insulation and refractory work coming on the pressure parts shall have to be done by the contractor. The hooks are suitable for stud welding machines. Contractor's quoted rate shall include all these contingencies. Attachment welding on pressure parts shall be done by qualified and certified welders only. Welding of Insulation hooks at site shall be welded on the fins by manual welding / stud welding machines.
- 13.22.26 It is the responsibility of the contractor to do the alignment, checking, etc., if necessary, repeatedly to satisfy BHEL Engineer / Customer Engineers with all the necessary tools and tackles manpower, etc., without any extra cost. The alignment will be complete only when jointly certified so, by the BHEL Engineer & Customer. Also, the contractor should ensure that the alignment is not disturbed afterwards.
- 13.22.27 Burner tilt mechanism will be checked for freeness, serviced and adjusted, if necessary to obtain optimum tilt before and after installation.
- 13.22.28 Additional platforms for approaching different equipment as per the site requirement, which may not be indicated in drawings, shall be assembled and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for erection of structures. 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 the requirement.
- 13.22.29 Complete penetration of water wall (Panel to panel) tube to tube and fins welding shall be achieved either by single side or double side welding. The decision of BHEL Engineer is final.
- 13.22.30 The bidder may require to cut fins further to a maximum length of 1000 mm for alignment and welding of tube to tube in water wall/spiral wall panels and welding of fins on both sides after completion of panel to panel welding within the quoted rate. No extra payment will be made for the above works. Additional fins cutting as required for proper fit up of the joints shall be preferably to be done at ground during pre-assembly. **NO FINS CUTTING IS PERMITTED BY GAS CUTTING; ONLY GRINDING/ CUTTING WHEEL SHALL BE PERMITTED TO CUT THE FINS.**
- 13.22.31 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.
- 13.22.32 Certain extra lengths of various tubes/pipes and fabricated ducts are provided as erection allowance and the same have to be cut/adjusted to suit the site conditions and layouts or certain small lengths may have to be added for adjustments to suit the site conditions. For any mismatch while matching the joints in tubes, the cutting, adjusting, re welding, addition spool pieces should be done by the contractor to match site conditions without any extra payment.

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13.22.33 Assistance for calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting to actuators coming under various groups shall be provided by contractor within the quoted rates.

13.22.34 Hanger rods are shown in the pressure parts arrangement drawing for boiler. Any cutting / welding and required heat treatment and necessary NDT of such hanger rods will be done by the contractor. The hangers for pressure parts will be tested for even distribution of load with the help of torque wrench.

13.22.35 Skin casing sheet for covering the boiler roof panels, and other areas will be supplied as fabricated items. Any cutting and re-fabrication to suit the site conditions shall be carried out within the quoted rates.

13.22.36 For all the site routed piping as-built drawings are to be submitted by the contractor immediately after erection. The Number of site welds indicated for site routed piping is approximate. It is to be noted that piping for fine fittings, trim piping, oil system soot blower system shall be supplied mostly in running meters which will be erected and all joints are to be welded as per the drawings/site routing within the quoted rates by the bidder.

13.22.37 Hydraulic test of SCAPH if required has to be carried out on the ground before lifting it to the position.

13.22.38 Seal boxes should be reinforced with insulation pins as per drawing releases in attachment drawings and after that all seal boxes to be painted with bituminous paint of IS158 by the bidder. The required paint shall be supplied by the bidder within the quoted rate.

13.22.39 Grab Bars for accessing into the furnace area shall be provided in each seal box as per drawings.

13.22.40 Heavy component lifting:

- i. Before lifting the heavy components like header, panels, burner assemblies, down comer pipes etc. soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the winch. The end caps provided at shop for various stubs are to be removed during final fit up only.
- ii. While Lifting the headers, lifting lugs or shell portion of the headers only to be used. The temporary supports to be removed prior to hydraulic test. While erecting the temporary supports, care should be taken so that they do not affect the erection of permanent supports. Tack welding of suspension rods with bearing plates to be done after final adjustment. Details for welding of bearing plates can be referred in the drawings/check list.
- iii. **The boiler drum has to be lifted by Strand jack method, the contractor has to arrange the same within the quoted rate. NO separate payment will be made for this purpose.**

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- iv. Equal loading of the hangers is to be ensured. Ring headers are erected before erection of water wall bottom hopper panels. Headers are to be arrested before welding to panels/headers/tubes/coils as the case may be. Sequence of welding to be followed while welding higher size joints.
- v. Each water wall tube is provided with an orifice assembly in the bottom ring header. Orifice adopter is welded inside the header and welded at shop. After chemical cleaning operations, the orifice assemblies are to be erected at site as per directive of engineer and drawings.
- vi. Erection of various components is taken up from top to bottom. Planning has to be done every month in consultation with the engineer. Pre-assembly of seal boxes for the peep hole openings, pressure tapping, soot blowers etc. can be done on the ground before erection, if feasible. The burner blocks are to be erected in convenient position before closing the furnace with panels. For panel to panel erection and welding panels erection attachments are supplied by units. Furnace alignment with respect to boiler /furnace axis is very vital and important. The alignment is to be achieved. Details to be checked with engineer.
- vii. The gaps between coils and steam cooled / WW panels /between coils etc. to be maintained in line with drawing. Please check up the permissible tolerance before taking up the work.
- viii. Preassembly of end bars with crown plates including stress relieving for coil assemblies.
- ix. The required accuracy level to be ensured before welding as per drawing. Necessary radiography/NDT along with heat treatment to be done.
- x. pump motor installation is taken up only after completion of system pipe work supports. When mounted the pump should accommodate movement in the pipe without imposing excessive loads on the casing and branches. Sufficient clearance should be available beneath the motor to facilitate removal during maintenance. It is to be assembled as per the directions available with engineer.
- xi. Ensure completion of the maintenance hoists meant for pumps immediately else the area may be used by other agencies for laying the cables for various equipment coming in that area, inadvertently and they have to be removed later. Heat exchanger installation is also to be completed and necessary cooling water lines, thermocouples, pressure gauges etc. to be completed. The power cable connection made to the pumps should ensure free down ward expansion of the boiler at the level.
- xii. Down comer pipes erection can be done by carrying out preassembling the pipes whatever feasible as per availability. The suction manifold received in loose pieces and to be pre-assembled in the floor nearby. After welding the suction manifold, it is to be

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- positioned, aligned and then only the down comers from the steam separator/ drum are to be connected.
- xiii. Before taking up the erection of any item, pre-erection checks to be carried out like width and length of the item, availability of flexible connectors, damages on the coils, permanent bows if any, sponge test for the coil and completion of ground inspection by inspector of boilers as deemed. Ensure the removal of the transportation supports in each coil prior to erection.
 - xiv. Erection of LTRH/ Economizer coils as applicable can be done by preassembling the upper and lower coils. Pre-erection checks like width, length etc., and sponge test of coils for thoroughness to be done before erection. Required hanger tubes erection to be completed before LTRH / Economizer coils erection.
 - xv. Check for the gaps between SH steam cooled front wall and Eco/SH horizontal assemblies, gap between SH steam cooled rear wall and SH horizontal assemblies/ eco assemblies, spacing between rear WW arch and pendant assemblies and finish SH coils. Detailed drawings are to be referred during execution. The items indicated are suggestive only.
 - xvi. Check for the inner space between eco coils, LTRH, RH and SH coils as per drawing
 - xvii. Ensure proper completion of steam cooled spacers. Check for clearances for soot blower lance tubes.
 - xviii. Ensure that soot blower lance tube in 0 dead travel position unless until charged. Radiant roof skin casing sheets are to be welded after application of castable refractory.
 - xix. 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.
 - xx. Ensure removal of drains plugs provided in the silencers, the gap between exhaust pipe and roof is sealed properly.
 - xxi. DWLGs to be erected as per drawing. Joint protocol to be made for its correct erection with supports.
 - xxii. Other tapping points meant for monitoring the level should be erected and protocol is to be made. Maximum use of the pads and lugs welded on the steam separator/drum to be used for giving supports.
 - xxiii. Sample coolers are to be erected preferably in clean area. All the lines should be air blown before termination on both ends. Sockets are to be used for sampling lines. **TIG welding must be used for sampling lines instead of arc welding.**

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- xxiv. All the drain lines should have sufficient slope towards drain. Provide expansion loops in all the vents and drains as per the drawings. Electrometric relief valve controller is supported separately in column so that the vibration from boiler is not transmitted. Provide pre-compression springs where required to take care of the load. All the motor operated valve stems should be vertical preferably. All the valve packing with asbestos base to be lubricated once in 6 months till handing over. Necessary gland packing will be supplied by BHEL.
- xxv. Transport binders on all coils are to be removed.
- xxvi. Gas distribution baffles and vibration snubbers, mechanical spacer bars etc. are to be erected as per drawings.
- xxvii. Buck stays are pre-assembled and raised to their respective elevations and hung prior to erection of furnace walls. Before fixing them to furnace walls, ensure completion of panel to panel welding and voids in the buck stay region. The necessary scalloped bars/plates/pads are to be welded after levelling. Ensure completion of vertical buck stays including support hangers, links. The erection of leveller channels with guides to be completed.
- xxviii. All the furnace guides to be erected as per drawing keeping gap as mentioned for free boiler expansion.
- xxix. The necessary connection to the wind box is to be completed in all respects as per drawing. If any drain holes are envisaged, the same to be provided. No pipe line supports should be taken from the buck stays without getting the approval from engineer.
- xxx. Sagging of roof tubes results in condensate stagnation during shut down. Hence ensure that radiant roof and back pass roof tubes are erected without sagging.
- xxxi. Total boiler is to be examined in all levels for free expansion. All the arrestors are to be removed. Expansion indicators are to be erected in various levels as per drawing / instruction of engineer.
- xxxii. Some of the few important locations for voids filling: -
- Around penetration for pendent surfaces and radiant roof/SH screen tubes/second pass roof tubes
 - Between loose front WW tubes above front upper panels and below radiant roof
 - Gap between radiant roof tubes at the junction of front wall
 - Extreme rear arch tubes and side WW/extended WW panels

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- Extreme SH screen tubes and SH extended steam cooled walls
- Gaps between tubes /nipples in the steam cooled rear, side and front wall and respective headers
- Extreme tubes of front and side WW lower panels
- Side WW/extended side WW and extreme tubes of radiant roof
- Extended side steam cooled wall and extreme tubes of SH screen tubes
- Steam cooled side wall and extreme tubes of second pass roof
- Between tubes in upper corner tubes
- Between tubes in lower transition tubes
- Gap between tubes/nipples of side WW lower header at the ash hopper throat region
- Voids due to lifting slots in fusion/fin welded panels
- Voids due to erection slots in fusion/fin welded panels
- Fusion/fin welded panel fin slits at the panel tube-tube butt joint locations
- **The above list is suggestive only. Voids are to be closed suitably to retain refractory in position and to achieve the gas tightness**

13.22.41 Erection of Boiler structures and points to be taken care of for achieving verticality of Boiler columns.

- a. The column pieces are pre-assembled and site match marks to be provided.
- b. Pre-assembly checks to detect and deviations in the columns like length, camber sweep, twist etc.
- c. Checking of foundations for its levels distance, diagonal, distance etc.
- d. Proper tightening of the foundation bolts.
- e. Erection of columns tier by tier and box by box. Grouting to be done immediately after 1st tier erection.
- f. Ensuring the availability of guy ropes, etc. during column erection and removal of guy ropes after ensuring the verticality of columns.
- g. Using calibrated theodolite for verticality measurement of columns.
- h. Tightening of HSFG(High strength friction grip bolts to be done by turn of nut method only after ensuring the verticality of the columns.
- i. Measuring adjacent diagonals of the ceiling girders after its erection.
- j. Ensuring the verticality of the columns before and after the steam separator erection.

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13.22.42 The fans shall be checked for blade clearance and other vital tolerances. The Flow control devices in fans like IGV/Damper units shall be serviced.

13.22.43 Necessary assistance for balancing of equipment during trial run shall be provided by the contractor.

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

13.23 MAIN SUPPORTING STRUCTURES, EXTERNAL STRUCTURES, Misc, STAIRWAYS, GALLERIES & PLATFORMS & HANDLING ARRANGEMENT

In some cases, the structural material will be supplied in random lengths, which have to be fabricated to suit the requirement as incidental to work. Also, it may sometimes be necessary to remove some of the erected members to facilitate erection of bigger/ pre-assembled equipments. In such cases, the removal and re-erection of such members as agreed by the BHEL Engineer, will have to be done by the Contractor as incidental to work.

13.23.1 Contractor shall arrange materials required for temporary cat ladders & working platforms during erection of columns, platforms and other structural components. Such arrangements shall, as far as possible, be only of clamping & bolting type, as welding on columns etc will not be permitted. After the completion of work these shall be removed.

13.23.2 All the hand rails and toe guards shall be provided as per drawings and site requirement. hand rails supplied in running lengths shall be suitably cut, edge prepared and welded. Also, hand rails/ guards may have to be provided from the safety point of view in certain places though not indicated in the erection drawings. The weld joints of hand rails shall be ground smooth to flush finish.

13.23.3 Electro-forged floor grills will be supplied for this project. These may have to be cut to suit requirement. Cutting shall be done only by mechanical cutters only and not by gas cutting. Cold galvanizing compound is to be applied on the cut surface/edge. Cold galvanizing paint supply is in Contractor scope.

13.23.4 Fixing of floor grills shall be done by self-tapping screws and not by weldable studs. Special purpose electrically operated hand tools are available in the market for this, which drills, taps and fixes the screws in a single operation. Supply of necessary self-drilling-cum-tapping screws and fixing clips are in contractor scope. Contractor shall deploy the drilling cum fixing machine required for this purpose as a regular scope of work.

13.23.5 The Contractor shall also install additional platforms of permanent nature for approaching different equipment as per the site requirement and to meet O&M requirements, though these may not be indicated in the erection drawings. Materials required for such platforms will be

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supplied by BHEL in random sizes on free issue basis. These have to be fabricated to suit the requirement. Payment only for erected weight as certified by BHEL engineer shall be made at the rate applicable for structures. No payment is envisaged for fabrication of such structures.

13.24 OTHER PRODUCTS AND SYSTEMS AND COMMON REQUIREMENTS

- a) Ducts / expansion bellows (metallic & non-metallic) are normally supplied in loose components / segments and these are to be assembled and welded/ jointed at site before erection. The fabric portion of non-metallic expansion joints (NMEJ) namely bolster, fabric belt and canopy shall be installed by Contractor under supervision/guidance of equipment supplier/BHEL for the first few cases. Contractor shall ensure that all subsequent NMEJ are assembled with due care and proper procedure.
- b) Suspensions for ducting will be supplied in running lengths, which shall be cut to size and adjusted as required. Ducts / expansion bellows are dispatched to site in loose wall plates / pieces and these are to be assembled and welded at site along with stiffeners etc., before erection within the finally accepted rates. All joints connecting duct expansion piece and dampers shall be seal welded on inside as well as on outside.
- c) Ducts/ expansion bellows (metallic & non-metallic) are normally supplied in loose wall plates/ segments and these are to be assembled and welded at site before erection. Correction of ovalities/ distortion of ducts, expansion bellows etc occurred during transportation/ handling are to be carried before erection as part of work. Erection of mechanical components of non-metallic joints is included in the scope of work.
- d) All joints connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be made leak proof and tested as per technical instruction / requirement.
- e) All welded joints should be painted with anticorrosive paint / primer immediately after completion of all work (incl radiography and stress relieving works). Necessary paints and other consumables for the above work are in the scope of the Contractor.
- f) Hangers and suspensions, support steels for ducts and other equipments, piping etc will be supplied in running/random lengths/ sizes, which shall be cut to suitable sizes and adjusted as required.
- g) Touch up and preservative painting of all components issued to and/or erected by Contractor shall form part of scope of work. The Contractor shall arrange all paints, primer and consumables, T&P and facilities.
- h) Agency shall supply self-tapping screw for entire scope of work of different sizes as required at site.
- i) Arranging paints, primers for touch-up painting (as applicable) as per tender specification for all erected materials is in the scope of contractor.

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13.25 ROTARY MACHINES: Certain rotating machinery after initial runs and commissioning of the equipment have to be hot aligned as per the instructions of BHEL engineer. Cleaning fans, ducting etc., free of extraneous steel, scaffolding materials electrodes, all foreign materials etc., before trial run of rotating machinery, and at various stages of pre-commissioning activities as per BHEL engineer's instruction, is within the scope of work.

13.25.1 Some of the rotating equipment and electrical motors are provided with protective greases only. Contractor shall arrange for cleaning of the same with kerosene or some other reagent. If necessary, dismantling some of the parts of the equipment would be necessary. He shall arrange for regreasing / lubricating them with recommended lubricants and for assembling back the dismantled parts, at quoted rate. Lubricants will be supplied free of cost by BHEL. However, recommended grease to be arranged by the contractor.

13.25.2 After initial trial of rotating equipment, control and power cabling for motors and other equipment / instrumentation shall have to be disconnected for checking alignment and re-setting / realignment / hot alignment. Contractor shall have to arrange for disconnecting control and power cabling as per BHEL engineer's instructions and clearance and reconnect the control and power cabling after realignment. Before final alignment of rotating equipment, if require associated piping may also to be disconnected and again to be assembled after correction of any piping pull. Quote tonnage rate shall be inclusive of the above.

13.25.3 Packer plates supplied may have to be machined to the correct dimensions. It may also be necessary to blue match the same with each other/ with equipment / with foundations as per BHEL instructions

13.25.4 Contractor shall arrange changing of preservative oil in the gearboxes, journal and other bearing assemblies of rotating equipment when in storage areas or after erection of equipment as the case may be as per the instructions of BHEL engineer. Necessary lubricants / oil will be supplied by BHEL and the same will be drawn by contractor from BHEL / Customer 's stores and transporting to site. No additional payment will be made for such works even though supply of lube oil might have been made under regular dispatch-able unit number against product group main assembly (PGMA) and appearing in the shipping list. Prior to the commissioning of the equipment, oil should be drained and collected in drums provided by BHEL and returned to BHEL / Customer 's stores.

13.25.5 The fans and other rotating machines shall be checked for clearances and other vital tolerances.

13.25.6 Non-specified jobs at the interface / terminal points like bolting welding, gasket changing etc. have to be done by the contractor within the quoted price.

13.25.7 Actuators / drives of dampers, gates, powered vanes etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.

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- 13.25.8 All rotating machines and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary by dismantling and refitting before erection. If, in the opinion of Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.
- 13.25.9 All the shafts of rotating equipment shall be properly aligned to those of the matching equipment within design tolerances All bearings, shafts and other rotating parts shall be thoroughly cleaned and suitably lubricated before starting.
- 13.25.10 All the motors and equipment shall be suitably doweled after alignment of shafts with taper / parallel machined dowels as per the direction of the Engineer. Dowel pins required are to be machined by the contractor at his own cost. However, the materials for dowel pins shall be issued by BHEL free of cost.
- 13.25.11 Certain instruments like pressure gauges, pressure transmitters, temperature gauges, flow switches and indicators, etc., are received in assembled condition as integral part of equipment. Contractor shall be responsible for safe receipt, installation and custody of these instruments supplied mounted on skids / equipment. The calibration of skid / equipment mounted instruments shall be arranged by BHEL through other agency engaged for C&I. Contractor will be informed by BHEL engineer about the details of C&I agency. The contractor shall coordinate with the C&I agency for removal, calibration and re-installation of the instruments. Though C&I agency will remove and reinstall the instruments after calibration, the contractor for this package will maintain the list of all the instruments removed & reinstalled. Instruments prior to removal and after reinstallation shall be considered in custody of the contractor for this package.
- 13.25.12 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 equipments. Contractor shall dismantle such instruments and re-erect whenever required prior to commissioning. Sometime this may have to be handed over to store or instrumentation contractor.
- 13.25.13 The contractor shall completely erect and test all the piping systems, covered in the specification including sampling lines up to and including sample coolers, hangers & supports, valves and accessories in accordance with the drawings furnished. This includes all necessary bolting, welding, pre-heating, stress relieving, testing, cleaning and touch up painting. System shall be demonstrated in condition to operate continuously in a manner acceptable to the Engineer. Welding shall be used throughout for joining pipes except where flanged, screwed or other type joints are specified or shown on the drawings. All piping shall be erected true to the lines and elevation as indicated in the drawings.

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- 13.25.14 The contractor shall ensure lowering of pipes in position with adequate precautions as to avoid any damage to either material or men. Only the anchoring points earmarked for the purpose of lowering the pipes are to be used.
- 13.25.15 It is possible that a few flanges may not be matching. The contractor shall be required to cut and re-weld the same as and when required without any additional cost.
- 13.25.16 Wherever piping erected by the contractor is connected to equipment / piping erected by the other agencies the joint at the connecting point shall be the responsibility of the contractor who is erecting the piping under this specification.
- 13.25.17 BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting/chiselling / grinding/machining and de-burr the same. However, machining of the packers wherever necessary shall be arranged by the contractor.
- 13.25.18 All lifting tackles including wire-ropes slings, shackles, used by the contractor, shall be got approved by BHEL Engineer. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damages to equipment and personnel. Calibration/fitness testing certificates from recognized agency are to be submitted to BHEL site office for equipment/instrument/appliances to be used, as per requirement of BHEL/ISO system. Expenditure on such works forms a part of the scope of work.
- 13.25.19 The contractor shall erect scaffoldings/Temporary platforms supports etc required during erection before the permanent supports are erected. These should be of adequate capacity and shall never be overloaded. These should be replaced when not found suitable during erection work. All structure materials required for the above shall be arranged by the contractor at his own cost. No such material shall be supplied by BHEL in any case. Welding of temporary supports, cleats etc on the columns shall be avoided. In case of absolute necessity, contractor shall take prior approval from BHEL Engineer. Further, any cutting or alteration of member of the structure or platform or other equipment shall not be done without specific prior approval of BHEL Engineer.
- 13.25.20 Mechanical erection works associated with the power cylinders, valves, valve actuators etc., coming under various groups shall be provided by contractor within the finally accepted rates.
The Erection
and commissioning of all electrically operated valves, actuators and dampers is covered within the scope of this specification.

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13.25.21 The contractor shall carry out trial run of all motors including checking the direction of rotation in the uncoupled condition. Checking of alignment and recoupling of the motor to the driven equipment as per instructions of BHEL engineer and to their satisfaction. All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. Vendor shall all necessary MMDs including the motorized insulation testers for the above test.

13.25.22 The contractor shall fabricate pipe, special bends etc., threading and welding as required for installing lube oil system and carry out the acid cleaning of the fabricated piping. The contractor shall also service the lube oil system, carrying out the hydraulic test of oil coolers etc.

13.25.23 Contractor shall carry out kerosene testing of all bearing housings of various rotating equipment like pumps, fans etc., as per BHEL engineer's instructions. Performance of hydro test of oil coolers of rotating machines and hydro test of other equipment as per BHEL engineer's instructions is included in the scope of work. Forced lube oil system of motors or rotating equipment form parts of the work under this specification.

13.25.24 Erection & Commissioning of EOT Crane-Notes:

- i. A separate Contractor (Supplier of EOT Crane) shall carry out the Erection & Commissioning including load test of the above Crane. **However, the required Test loads along with cradle, slings etc. for Crane shall be arranged by the Contractor/Erection agency as required [Total Dead Requirement 25 T (Max) *(i.e., 20 x 1.25) at the location of crane where the testing is to be carried out within the quoted rate of Rotation equipment. No separate payment will be made for this purpose.**
- ii. Arrangement of Inspection agency [TPI certification] is by Crane supplier.
- iii. For EOT Crane, following activities are in Site/Erection agency scope [Exclusion from Crane Supplier Scope]:
 - a) Unloading of materials at Site
 - b) Movement of material from unloading location to storage yard/Stores
 - c) Storage & Preservation of Material at Site [Following need to be taken care while storing & preserving material]
 - d) All Electrical & C&I equipment (such as Panels/Cables/Motors/DSL/AC/Remote etc.) and Mechanical Items (such as Rope/ Brake etc.) shall be stored in proper packing condition, in properly closed area with dust free & rainproof environment.
 - e) Other items such as Structural steel can be stored in open area, however due care shall be taken that area is prevented from water stagnation and kept on sleepers. Also, they shall be covered

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- in proper packing condition with tarpaulin to cover the complete material for dust free & waterproof environment.
- f) All other materials of Crane shall be stored under closed area with dust free & rainproof environment.
 - g) Maintenance shall be as per O&M instructions.
 - h) Internal movement of material from storage yard/Stores to actual site location of crane installation
 - i) Facilitation & Coordination of necessary facilities & Utilities required (Electricity & Water etc.) during E&C of Crane to vendor.
 - j) Lifting of Girder, CT Trolley (Crab), DSL, Rails during E&C is under the scope of Crane vendor/Supplier.
 - k) **First Fill of Consumables/Lubricants etc. is in Site Erection agency/Contractor within the quoted rate. No Separate Payment will be made for this purpose.**

13.26 CEILING GIRDER Arrangement drawing: Attached

- 13.26.1 Pre-checks of ceiling girder before Assembly-Identify Girder Top & Bottom pieces – Check Work order / PGMA / DU No, girder designation etc. Place girder pieces on levelled bed in sequence for bolting. Use lifting lugs provided in the web of the girder during all handling operations. Buff clean the seating surfaces, check and repair damages if any on machined surfaces of individual pieces, by grinding before bolt placement.
- 13.26.2 Verticality of the web of both top and bottom pieces of the girder shall be checked by plumb and piano wire method. Check the bolt hole size verticality and co-axiality with “GO” and “NO GO” gauges.
- 13.26.3 Post-checks of ceiling girder before assembly - Matching ends of top piece and bottom piece of ceiling girder shall be butted over whole length with a clearance not exceeding 0.2mm and held tightly together in hand snug tight condition.
- 13.26.4 Ensure the horizontal plane of Girder assembly by verifying the centre line of girders to be at the same level by water level method.
- 13.26.5 Check the squareness of the girder compartment by verifying the spacing between the girders and diagonals between work points.
- 13.26.6 Centre line alignment of welded beams, rolled beams shall be within 2 mm.

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13.26.7 Bolting methodology of the ceiling girder to be followed.

13.26.8 To ensure the monolithic behaviour in Ceiling girders splice (split location), it is mandatory to adopt Fit- Bolt concept

13.26.9 In case of any damage in surface of the “flange to be bolted” - Damage in surface of the flange to be bolted has to be repaired by grinding and Splice protection sheet to the required thickness after confirmation from Engineering. Splice protection sheet / structure is the part of ceiling girder.

13.26.10 **Procedure for Blue matching** - Buff clean the seating surfaces and blue match girder Top piece with bottom piece to ensure minimum 80% contact area in the locations where the gap exceeds 0.2mm. Use lifting lugs provided in the web of the girder during all handling operations.

13.27 Piping System

- All statutory approvals including IBR shall be obtained by the erection agency.
- Necessary approvals for IBR Pipe Spool fabrication shall be obtained by Erection Agency.
- Erection Agency to obtain the final IBR approval from CIB, State of Madhya Pradesh, where Erection takes place.
- MISC piping items consists of the piping items such as the traps, strainers, bellows, silencer , steam manifold etc.
- Painting (Supply & Application) as per Customer Specification and approved painting schedule for both IBR and Non IBR Piping is in the scope of the Erection Agency.
- Preparation of all the documentation for Quality & Inspection, testing, AS-built drawings etc as suggested by the Site engineer shall be in the scope of erection agency.
- Pipe shoe (i.e saddles & trunnion),saddle fabrication and welding of pipe shoe to the Main Pipe including welding of shoe pad is in the scope of Erection Agency. Necessary plates, pipes shall be supplied loose.
- Spring Hangers and Rigid Hangers will be supplied in assemblies / part-assemblies. Modification of hanger rods (if required) to adjust the Hanger length . suit to site requirement, is in erection agency/Contractor scope. Erection weight for hanger and supports include the installation of the auxiliary structure for the pipe supports.
- Fabrication (i.e. including surface preparation and painting) and Installation of Auxiliary Structure for Pipe Supports is in the scope of Erection Agency. Necessary Structural Steel and Plates shall be supplied loose.
- Surface preparation of Structural Steel supplied for Pipe is in the scope of Erection Agency. Supply & Application of Primer and painting for the structural steel is also in the scope of Erection Agency.
- In general, Embedded steel plates / Concrete pedestals with a steel plate are provided on the Grade/ Floor/ Wall/ Slab / Ceiling for Pipe Supports. However, if such provision is not made because of any reason, where a pipe support is envisaged, then a steel plate shall be provided with the help of Anchor fasteners by Erection Agency. The plate will be supplied by HPEP. Procurement of Anchor Fasteners and Installation of Steel Plate with the help of requisite machinery shall be in the scope of Erection Agency.

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- The Material required for temporary supporting are to be arranged by Erection Agency. No usage of the structural steel supplied for the auxiliary structures shall be made for this.
- Insulation materials (rockwool & calcium silicate), Aluminium Cladding & other Insulation Ancillaries will be supplied by BHEL Erection agency to note that there is calcium silicate insulation for approximately 50m of the main steam line length. Application of thermal Insulation for Piping and instrumentation (like impulse lines etc) is in the Scope of Erection Agency.
- Access platforms wherever required as per Piping Layout/ as per final site conditions, are in the scope of Erection Agency/Contractor as per **SUIT TO SITE CONDITIONS. NO SEPARATE DRAWINGS SHALL BE FURNISHED.** Sketch shall be prepared by the erection agency and approval shall be taken from Site engineer for all the access platforms. Fabrication (i.e including the surface preparation, painting) from the raw steel structures is in contractor scope.
- Final piping hook-up at all the Terminal Points are in the Scope of Mechanical erection contractor
- NB 65 & below piping shall be site routed by Erection Agency. Indicative routing of these lines shall be prepared by contractor and approval for the same shall be taken from site engineer.
- Gaskets for all the commissioning & pre-commissioning activity shall be in scope of Mechanical Erection contractor. No separate payment shall be made for this purpose
- Spring Hanger engaging, disengaging safety valve floating etc are in contractor scope
- Supply & Erection of temporary spools for steam blowing ,Hydro testing etc related to commissioning and pre-commissioning activities are in contractor's scope of activities .
- Suitable consideration for Flanging and de-flanging during Commissioning
- **Supply & Installation of temporary piping for chemical cleaning is in the scope of contractor & no separate payment will be made for this.**
- Instrument tapping for all systems and associated equipment's to be welded/fitted by the contractor with in the quoted price.
-

All Piping (IBR supplied by HPEP) shall be supplied as per the following philosophy:

13.27.1 Pipes will be supplied IN PRE-FAB CONDITION in length of 3 to 7 metres

13.27.2 All Stubs (Pressure tap-offs, Temp tap-offs, Vent & Drain tap-offs and all pipe to pipe tees & stubs) will be supplied loose

13.27.3 All Fittings will be supplied loose .

13.27.4 All Flanges, Gaskets & Stud Nuts will be supplied loose.

13.27.5 All Valves will be supplied loose.

13.27.6 Even though the piping is supplied in pre-fab condition ,if required activities of Cutting of Pipes , Spool preparation, Edge preparations, Drilling etc Welding of Branches & Stubs and the final field welding of Pipe Spools & Fittings and all other erection activities(viz.Flanging, valve erection) as required by respective Piping Isometric and Piping Layout drawings shall be carried out at site and the same are in Erection Agency/Contractor's scope.

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- 13.27.7 Surface Preparation, Supply & Application of Primer and painting as per Customer Specification and approved painting schedule is in the scope of Erection Agency/ Contractor's scope. Necessary set-up for executing painting including the equipment and consumables shall be arranged by the contractor.
- 13.27.8 Welding Electrodes shall not be supplied by BHEL and the same shall be arranged by Erection Agency/Contractor. All welding consumables shall be in erection agency/Contractor scope.
- 13.27.9 Heat treatment wherever required shall be in the scope of erection agency.
- 13.27.10 Preparation of Fabrication Isometrics as per engineering Isometrics shall be in the scope of erection agency.
- 13.27.11 Any modification of the erected piping due to engineering changes shall be done by erection agency/Contractor within the quoted rate .No separate payment will be made for this purpose.
- 13.27.12 All the testing requirements viz. Visual inspection, Radiography, Hydro testing etc shall be in the scope of erection agency/Contractor within the quoted rate .No separate payment will be made for this purpose.
- 13.27.13 Requisite equipment for all the inspection, testing requirements shall be arranged by the erection agency.
- 13.27.14 All the necessary tools and tackles required for erection, inspection & testing shall be arranged by erection agency.

All Piping (NON-IBR supplied by HPEP) shall be supplied as per the following philosophy:

- 13.27.15 Pipes will be supplied IN PRE-FAB CONDITION in length of 3 to 7 metres
- 13.27.16 All Stubs (Pressure tap-offs, Temp tap-offs, Vent & Drain tap-offs and all pipe to pipe tees & stubs) will be supplied loose
- 13.27.17 All Fittings will be supplied loose .
- 13.27.18 All Flanges, Gaskets & Stud Nuts will be supplied loose.
- 13.27.19 All Valves will be supplied loose.

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- 13.27.20 Even though the piping is supplied in pre-fab condition ,if required activities of Cutting of Pipes , Spool preparation, Edge preparations, Drilling etc Welding of Branches & Stubs and the final field welding of Pipe Spools & Fittings and all other erection activities(viz.Flanging, valve erection) as required by respective Piping Isometric and Piping Layout drawings shall be carried out at site and the same are in Erection Agency/Contractor's scope.
- 13.27.21 Surface Preparation, Supply & Application of Primer and painting as per Customer Specification and approved painting schedule is in the scope of Erection Agency/ Contractor's scope. Necessary set-up for executing painting including the equipment and consumables shall be arranged by the contractor .
- 13.27.22 Welding Electrodes shall not be supplied by BHEL and the same shall be arranged by Erection Agency/Contractor. All welding consumables shall be in erection agency/Contractor scope.
- 13.27.23 Heat treatment wherever required shall be in the scope of erection agency.
- 13.27.24 Preparation of Fabrication Isometrics as per engineering Isometrics shall be in the scope of erection agency.
- 13.27.25 Any modification of the erected piping due to engineering changes shall be done by erection agency/Contractor within the quoted rate .No separate payment will be made for this purpose.
- 13.27.26 All the testing requirements viz. Visual inspection,Radiography,Hydro testing etc shall be in the scope of erection agency/Contractor within the quoted rate .No separate payment will be made for this purpose.
- 13.27.27 Requisite equipment for all the inspection,testing requirements shall be arranged by the erection agency.
- 13.27.28 All the necessary tools and tackles required for erection,inspection & testing shall be arranged by erection agency.
- 13.27.29 In some cases, structural material, pipes, ducts, suspension for pipes/ducts, silencer supports, roof cladding structure will be supplied in running lengths which shall be cut to size and adjusted as required. All joints connecting ducts, expansion pieces shall be seal welded on inside and as well outside. Also, it may sometime become necessary to remove any of the erected members to facilitate erection of bigger / pre-assembled equipment. In such as the removal and re-erection of such members as per instruction of the BHEL Engineer, will have to be carried out by the contractor without any extra payment
- 13.27.30 Whenever required the contractor shall arrange for pre-qualification of process task Performers.

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13.27.31 Suspension for piping, ducting etc., will be supplied in running lengths, which shall be cut to suitable sizes and adjusted as required. The adjustment of all hangers & supports erected in both cold & hot conditions for maintaining the proper slopes towards the drain pots and application of cold pull in the piping wherever required is also included in the scope of the contractor

13.27.32 Contractor shall install piping in such a way that no excessive or destructive expansion forces exists in either the cold condition or under conditions of maximum temperature and pressure. All bends, expansion joints and any other special fittings necessary to take care of proper expansion shall be incorporated as per the advice of Engineer. During installation of expansion

13.27.33 All Piping (Fire Protection System& Fire Protection, Detection and Alarm System) & shall be executed as per the following philosophy within the quoted rate.

I. Pipes shall be supplied in commercial length only. Edge preparation for pipes above 50 NB are to be done at site by Erection Agency/Contractor. For pipes below 50 NB sizes threading as required shall be done by contractor. mobilization of Tools required for welding, threading and edge preparation is in the scope of contractor. Erection consumables are in the scope of Contractor. Erection activities like cutting/ threading/welding etc. of conduit/pipe/ISMC/ISA shall be carried out at site as per requirement.

II. SUMMARY ERECTION WORKS TO BE CARRIED AT SITE - FOR UNDER GROUND PIPES

- Cleaning of trenches and compacting the soil to desired depth and width, if pipe not laid in trenches.
- Bedding of trenches are done subsequent to excavating works.
- Wrapping and coating of Pipe strictly as per submitted procedures.
- Fixing Pipes through U-Clamps or any other fixing methods, once pipes are laid on insert plates.
- Welding of Pipes as per Welding procedure specification.
- Carrying out hydrotest for Pipe

III. SUMMARY ERECTION WORKS TO BE CARRIED AT SITE - FOR ABOVE GROUND PIPES

- Installation of insert plate above the pedestals, involving grouting and bolting.
- Placement of pipe above the Insert plate.
- Fixing Pipes through U-Clamps or any other fixing methods, on pedestals.
- Welding of Pipes as per Welding procedure specification.
- Carrying out hydrotest for Pipes

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- IV. Erection activities like cutting/ threading/welding etc. of conduit/pipe/ISMC/ISA shall be carried out at site as per requirement for installation.
- V. Obtaining statutory approvals from TAC, Electrical Inspector or any other local body / Governing Agencies shall be in contractor scope. Documentation required like Layouts, Schemes shall be furnished by BHEL.
- VI. Performance Tests if any for the system shall be in the scope of Erection agency/Contractor within the quoted rate.
- VII. The Wrapping and coating material, Paint & Primer shall be supplied by the contractor within the contractor as per painting schedule.
- VIII. Consumables like rawl plugs, screws, check nuts, nuts & bolts, saddles, saddle bars, cable (nylon) ties, washers, cable tags(strips), etc. which are not covered in the list but required for successful completion of above erection activity shall be supplied by the Contractor within the quoted rate .NO separate payment will be made for this purpose.
- IX. Surface preparation and base coat of primer shall be carried and final painting shall be done after completion of structural steel erection.
- X. Contractor shall arrange all the tools and facilities required for calibration, erection and testing required for Erection & Commissioning activities within the quoted rate .NO separate payment will be made for this purpose.
- XI. supply of Paint material (as required)and Wrapping & Coating matrl (1100 sqmt) shall be in scope of Contractor .
- XII. Marked-up "AS-Built" documents/drawings have to be prepared and provided by contractor to BHEL after E&C to enable submission of contractual 'As-Built" documentation.
- XIII. The erection activity of valve also includes cleaning, servicing and final painting of valves. All counter flanges, bolts, nuts, washer, gaskets etc shall be supplied by BHEL loose (free issue).
- XIV. Any other connected material supply which is not covered in BOM but required to complete the system shall be erected by the vendor and payment in this case shall be made as per applicable item rate.
- XV. 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.
- XVI. 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.

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XVII. The following Tests to be conducted For FPS system within the quoted rate

IV	TESTS TO BE CONDUCTED	Units	Qty.			
1	Hydro Test of all the lines (Charged with water) - 1.5 times of the design pressure	LOT	For 100 % Piping			
2	Radiography - 10 % of the welded joints	LOT	10 % of Butt welded Joints			
3	Holiday test – Underground piping	LOT	For 100 % Piping			
4	Flushing of all the line (Open to atmosphere)	LOT	For 100 % Piping			
5	Die Penetration test for all longitudinal & cross weldings	LOT	100 % of Fillet welded Joints			
6	Dry Film Thickness test for paint	LOT	For 100 % Piping.			
7	TAC approval - for the total system after erection	LOT	For complete System			

13.28 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, lubrication 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/ scrap material supplied by BHEL and erected by contractor as per instruction of BHEL and shall be paid as per accepted tonnage rate for “**Access platforms**”

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13.28.1 Fin /attachment/scallop plates & associated items Cutting, restoration of Tubes, panels of Boiler

During course of erection in boiler pressure parts fin/attachment/scallop plates & associated items cutting to align difference tubes, panels will be required in boilers and this type of activity will be treated as normal scope of work without any commercial implication on BHEL. Even activity may have to be repeated as per job/Site requirement and for this also no extra work payment will be given to vendors as this type of job will be treated as normal scope of work.

13.28.2 Buck Stay Checking & Rectification

Vendor has to carry out inspection, rectification, Cleaning of buck stays along with adjoin areas during erection, commissioning, Operation, trial run has to be done from time to time. Backstay corner link correction after initial erection has to be done and if changes noticed during operation of Unit has to be rectified. For this vendor has to arrange manpower and resources without any extra cost implication on BHEL treating it as normal scope of work. Any surrounding work in connection with inspection, rectification, cleaning of the same will be treated as normal scope of work.

13.28.3 Inspection, cleaning of pressure parts, Furnace, Pent House, Burners, ducts/and subsequent restoration, rectification, normalization.

During erection, pre-commissioning, commissioning, operation, Stabilisation period trial Run - Inspection, cleaning of pressure parts, Furnace, Burners, Pent House, ducts, hoppers, and allied areas are to be carried out. For this vendor has to arrange manpower, T&P, other resources for inspection, cleaning of ash /oil shoots, clinkers and other foreign materials, associated items from boiler & surrounding areas. For this installation of sky climbers, scaffoldings and other requirement/resources/consumables as required are to be arranged by vendors for inspection, cleaning, testing followed by restoration/rectification/normalization. Vendor has to repeat this type of activity no. of times till handing over Unit to customer without any cost implication on BHEL treating these types of jobs as normal cope of vendor's work.

13.28.4 LDO Strainers, LDO Cleaning, LDO Pumps Commissioning/ servicing / Rectification

LDO Strainers, LDO Guns cleaning, LDO Pumps and associated items servicing, rectification, commissioning in LDO Pump house & in Boiler are to be done by Boiler vendor. Vendor has to arrange the scaffolding, Consumables, Diesel, petrol, Cleaning agents, tools, T&Ps for these purposes. For carrying out above activities, draining, cleaning of LDO from Pumps, Strainers and associated items are to be done and contaminated LDO is/are to be collected in drums/containers/dirty oil tanks and for this vendor has to arrange facilities for disposal of the same. Emptying of dirty oil tank/drums/containers, cleaning and disposal of contaminated oil is in boiler vendor's scope. Extra pumps for disposal of contaminated LDO are to be arranged by Contractor. All above activities are required to be repeated in no. of occasions till handing over of

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Unit(s) and are treated as normal scope of work without any extra commercial implications on BHEL.

13.28.5 Corrections like straightening of ladders, tube support plates adjustment / removal of ovulates in pipes and opening or closing the fabricated bends of piping to suit the layout shall be considered part of the work and the contractor is required to carry out such work within finally accepted price / rate as per instructions of Engineer.

13.29 Fabrication, Erection & Commissioning of Chimney & its Accessories

- Height of Chimney -100.5 m(Approx.)
- Weight of Chimney – 450 MT approx.
- Chimney material: Carbon steel (E350). Top shell of thickness approx. 12mm will be of stainless steel
- Bottom shells of thickness 50mm-12mm/Diameter:8m-6m will be sent in 4 splits of 2.5 height each (total 26 shells- refer enclosed sketch). Top shells of thickness 12mm/Dia:3.5m will be supplied in 2 splits of 2.5 mt height each (total 14 shell- ref enclosed sketch)
- Each chimney shell weight will range from **6 MT to 35 MT**
- Structure, Ladders, approach platform etc. are under the scope of work.
- **Refractories and other Insulation work inside Chimney.** The Insulation & refractory work shall be done by a separate Contractor, However the Supply & Erection of necessary Scaffoldings both inside and outside of the chimney has to be done by the Contractor within the quoted rate. No separate payment will be made for this purpose.
- The Supply & Erection of necessary Scaffoldings both inside and outside of the chimney for fabrication & Erection works of chimney has to be arranged by the Contractor within the quoted rate. No separate payment will be made for this purpose.
- The contractor has to deploy Man lifter as per requirement within the quoted rate. No separate payment will be made for this purpose.

The fabrication & Erection Philosophy of the chimney will be as described below

A-Chimney/Stack Fabrication, welding, radiography, PWHT at Fabrication Yard: including Fabrication, welding, radiography, touch up painting (Approx. 100.3Mtr Height)

Note:

1. Fabrication, welding, painting shall be carried out in horizontal position at site as per details given.
2. The Chimney shells will be received in 4 or 2 splits as described above. The contractor has to fabricate the splits into a complete chimney shell. No of shells will be again fabricated into no of erectable single pieces and will be placed for erection (In some cases the individual shells may be placed for erection without welding)

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with another shell-As decided by Site-In charge)). The no of shells to be fabricated into erectable single pieces will be decided by the Site in Charge of BHEL and the contractor must comply with. The contractor has to quote accordingly considering all factors.

3. All the T&P, Temporary Fixtures (Including supply of materials) required for fabrication has to be arranged by the contractor within the quoted rate No separate payment will be made for this purpose.
4. The fabrication & Erection methodology mentioned here is tentative & the final detailed methodology will be provided by BHEL Site -in -Charge during erection & the contractor has to comply with.

B-Chimney/Stack Fabrication, welding, radiography, PWHT at site: Erection, Testing and commissioning of Chimney/stack including Fabrication, welding, radiography, touch up painting (Approx. 100.3Mtr Height)

Note:

1. Erection shall be carried out at site as per details given in TCC.
2. Necessary T&P is in the scope of Vendor.
3. The fabrication & Erection methodology mentioned here is tentative & the final detailed methodology will be provided by BHEL Site -in -Charge during erection & the contractor has to comply with.

13.30 . Loading at storage yard after identification, transporting to site or pre-assembly yard / erection site, unloading at pre-assembly yard / erection site, pre-assembling of equipment's wherever required for inspection or checking, erecting the material, aligning, welding, fastening, supporting, grouting, carrying out the necessary non-destructive testing as may be required, application of Insulation, providing services for trial operation, pre-commissioning activities up to the time of completion of commissioning activities and supply and application of final painting. The contractor should erect and assemble the components as per the drawings issued and the number of components supplied to him will be on the basis of shipping list / completion schedules. Complete pre-assembling of components is in the scope of the contract

13.31 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain are reliable and complete installation as per instructions of BHEL Engineer.

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Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).

- 13.32** Before lifting the heavy components, soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the winch. The end caps provided at shop for various stubs are to be removed during final fit up only.
- 13.33** 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 dismantle such instruments and re-erect whenever required prior to commissioning. Sometime this may have to be handed over to store or instrumentation contractor.
- 13.34** Ducts / expansion pieces are dispatched to site in loose walls / plates and these are to be assembled at site before erection.
- 13.35** No members of the structure / platform should be cut without specific approval of BHEL.
- 13.36** In case any class of work for which there is no such specification as laid down in the contract such as welding of stainless-steel parts, etc. works shall be carried out in accordance with the instructions and requirements of the Engineer at the quoted rates only.
- 13.37** Contractor is strictly prohibited in using the erection components like angles, channels and hand rails for any temporary supporting or scaffolding works. In case of such misuse, a sum as determined by BHEL Engineer will be recovered from contractor's bills.
- 13.38** Contractor shall carryout chipping and blue-matching of foundation concrete with the packer plates. The packer plates shall be supplied by BHEL. Necessary machining wherever required and blue-matching of packer plates shall be carried out by the contractor within the quoted rates
- 13.39 Reconciliation of Material issued by BHEL (free of cost):** 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 permanent works.
- 13.40** 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.
- 13.41** 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.

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- 13.42** 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 steel 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.**
- 13.43** 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.
- 13.44** 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 .

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Chapter-XIV: 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.)

14.0 WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

14.1 The pressure parts, equipment and piping shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard / specification in practice in 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.

14.2 Welding of pressure parts, high tensile structural steel, Piping shall be done by certified high-pressure welders who possess valid certificate and who are approved by BHEL Engineer.

14.3 All welders including tack welders, structural and high-pressure 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.

14.4 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.

14.5 The contractor shall carry out the root run welding of all PP, piping, valves by TIG welding method only (or as specified in applicable procedure/manual issued by BHEL during execution). The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless-steel joints, the contractor shall before and during welding have to purge the pipes with inert gas.

14.6 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 material required for making test pieces will be supplied by BHEL free of cost.

14.7 **Only BHEL approved electrodes and filler wire will 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

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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.

- 14.8 All butt / fillet welds shall be subject to Non-Destructive testing as per the Drawing/Procedures/Welding Schedules/Documents at no additional cost. 100% RT will be applicable to all the circuits however applicable percentage of RT shall be guided by the field welding schedule.
- 14.9 **Non-Destructive Testing (NDT)** - Phased Array Ultrasonic Testing (PAUT) for the materials/items erected by the bidder, if applicable, shall be carried out by contractor within quoted price.
- 14.10 **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.**
- 14.11 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.
- 14.12 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.
- 14.13 All welds shall be painted with anticorrosive red oxide paint once radiography and stress relieving works are over. Necessary consumables and scaffolding etc including paints shall be provided by contractor at his own cost.
- 14.14 Pre-heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, Non-Pressure Parts like Crown Plate support assy, including attachment welding wherever necessary, are parts of erection work and 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.

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- 14.15 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,
- a) 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.
 - b) 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.
 - c) 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.

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.

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 & as per customer BPCL requirement etc.

- 14.16 All radiographs shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetrameter as per ASME or ISO must be used for each exposure.
- 14.17 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.
- 14.18 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.
- 14.19 The contractor shall be fully equipped with radiography equipments, 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.

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- 14.20 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.
- 14.21 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.
- 14.22 In case of radiography of less than 100%, the joints identified by BHEL at random shall be radiographed.
- 14.23 Contractor shall note that 100% radiography (as applicable) will be done at the initial stages on all the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. 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. NDT test as called for in the FQP including LPI, MPI and HT will have to be carried out.
- 14.24 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.
- 14.25 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.
- 14.26 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 HP welders. If the performance of welder is unsatisfactory, he is to be replaced immediately.
- 14.27 Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-submitted for evaluation.
- 14.28 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.
- 14.29 In case of failure of PAUT test result due to defect in joint, the joint shall be cut, re-welded and retested at contractor's cost.
- 14.30 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.

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- 14.31 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 Pressure Parts / piping and equipment erected by him involving high pressure welding at least 30 days prior to the scheduled start of erection work at site. The contractor shall strictly adhere to such schedules.
- 14.32 The contractor shall deploy required number of welders to carry out the all type weld joints. The welding works should not be held up due to shortage / want of I.B.R./H.P. welders.
- 14.33 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 14.34 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.
- 14.35 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.
- 14.36 The field joints are to be radiographed and preheating and post weld heat treatment shall be done as per BHEL procedure and manuals.
- 14.37 The percentage of Radiography are tentative, which may be increased depending upon the quality of joints at the discretion of BHEL.
- 14.38 Penetrometer as per ASME/ISO shall be used for all exposures.
- 14.39 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.
- 14.40 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.
- 14.41 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.
- 14.42 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.
- 14.43 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.

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- 14.44 The welded surface irrespective of place of welding shall be cleaned of slag and painted at the centre with primer paint to prevent corrosion at no extra cost towards this.
- 14.45 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.
- 14.46 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.
- 14.47 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.
- 14.48 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, chemical cleaning, steam blowing etc. to be carried out within the quoted rates. The number of joints to be welded as mentioned in the welding schedule consists of butt welds. All other welds viz. attachment welds on pressure parts/non-pressure parts, fillet welds in non-pressure parts welding in the boiler and Rotating Machines has to be carried out by the bidder within quoted rates.
- 14.49 **For uniform heating and better closed loop control, pre-heating, post heating, controlled rate of heating & cooling and post weld heat treatment cycles for tube specifications SA213T91 & SA213T92 should be carried out using flexible ceramic pads with suitable heating machine.**
- 14.50 **MPI must be done on joints, those are undergone ultrasonic testing.**
- 14.51 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 chinks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.
- 14.52 **List of Penalties on Violations on Quality Provisions**

Sr no	Violation	Penalty in Rs
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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 sent home
5	Use of cold electrodes (Except E6013)	1000 per incident & welder to be sent home
6	Unauthorized welder on job	5000 per incident & welder to be sent home
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.

14.54.1 RECEIPT INSPECTION OF WELDING ELECTRODES / FILLER WIRES

1. All electrodes / filler wires received at site stores shall be segregated for type and size of electrode.
2. Ensure that electrode packets received are free from physical damage.
3. Where electrodes are damaged, the same shall be removed from use.
4. Only electrodes identified in the "Rationalized List of Electrodes" are to be accepted.

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5. Where filler metals are supplied by manufacturing unit, inspect for damages, if any.
6. Ensure availability of relevant test certificates. Refer tables of chemical compositions and mechanical properties for acceptance.
7. Endorse acceptance / rejection on the test certificate.

14.54.2 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 taken into account 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 All types.

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14.54.3 BAKING AND HOLDING OF WELDING ELECTRODES

A. Purpose:

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

B. Procedure:

1. While handling, avoid contact of oil, grease with electrodes. Do not use oily or wet gloves.
2. It is recommended that not more than two days requirements are baked.

C. GTAW Filler Wires:

1. These wires do not require an 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.

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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 250°C
- e. Time of Transfer to holding oven. Activities a, b, c to be recorded before loading into the oven.

14.54.4 NDT and PWHT of Pressure part and integral piping shall be guided by the site erection welding schedule.

14.54.5 Chapter on Quality Assurance from BPCL Contract has been enclosed, with this specification for general understanding of minimum requirement and applicable provisions with respect to Field/Site works may be referred to. All NDE/SR to be carried out at site as per prevailing manual/procedure issued by BHEL during execution of contract within quoted price.

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Chapter-XV: Hydraulic Test

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)

- 15.1 The pressure testing for boiler / piping system shall be carried out as per IBR / Customer / customers' consultant specification / BHEL. Customers' consultant specification forms the part of this tender specification.
- 15.2 All pressure parts and piping systems shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall supply necessary labour and other services and make necessary arrangements to carry out the required tests as per the instructions and directions of the BHEL Engineers.
- 15.3 Soundness of the welds shall be tested hydraulically under the supervision of the BHEL Engineer and Customer, to the pressure indicated in the drawing. Prior to the test, the boiler / piping system shall be inspected by the BHEL Engineer to the extent necessary to ensure compliance with clearance for the test, which will be obtained by the contractor from the Engineer.
- 15.4 As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of IBR inspectorate / 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. These would include hydraulic test of piping, pre-boiler system detergent flushing/chemical cleaning, steam blowing, water washing etc. as instructed by BHEL.
- 15.5 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.

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- 15.6 Contractor has to arrange required pumps with sufficient capacity for filling water in the tubes and pipes for conducting Hydraulic testing. Contractor has to arrange Hydraulic Test pump / Hand Pump at his cost for Hydraulic testing of pressure parts.
- 15.7 Hydraulic testing pumps for HP lines & Boiler shall also be in the scope of Contractor, in line with chapter IV & V above. 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.
- 15.8 In certain places blanking has to be resorted prior to Hydraulic test and spool pieces have to be erected in place of control valves, orifices and other fittings and these spool pieces have to be subsequently replaced with the regular valves/ fittings by the contractor at no extra cost.
- 15.9 For conducting Hydro test / steam blowing internals of valves and NRVs are to be removed, Hydro Test devices are to be fixed and after Hydro Test the internals are to be re-assembled by the contractor as instructed by BHEL without any additional cost.
- 15.10 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 blanks will be provided by BHEL.
- 15.11 The contractor shall see that the water shall not be allowed to accumulate in open trenches where work is in incomplete stage, precautionary works such as blank flanging the open ends of the pipe line and filling the pipe line with water etc. shall be taken as directed by the engineer. Such works shall be to the contractor's account and no separate payment will be made for the same.
- 15.12 The contractor shall carryout the required test on the pipelines such as Hydraulic Test of various piping systems, Ultrasonic Test for weld defects and finding thickness, Dye penetrant test, Magnetic particles test for Weld defects and materials defects etc. All facilities (manpower, materials, equipment, consumables etc.) including proper approaches wherever required shall be provided by the contractor for satisfactory conduction of above tests. Special equipment such as magnetic particle tester, ultrasonic test kit and engineers required for these tests shall be arranged by the contractor along with Qualified technician within finally accepted rates.
- 15.13 In general, Hydraulic testing 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. Only one or two set of 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

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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.

- 15.14 During hydraulic test, the pipes being tested shall be isolated from the equipments to which they are connected.
- 15.15 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.
- 15.16 The following specifications shall also be completed 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 drain 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. The lowest part of the pipe shall always be filled first with water.
 - c. Pressure shall be slowly increased (without shocks) to the stipulated value and maintained as long as required to visually check all joints.
 - d. Following the control specified above the pressure shall be slowly decreased to the design pressure after which the pipe shall be subjected to the peening test, applying knocks every 150 mm approx. especially in the welded joint areas, with a 0.5 – 1.5 kg. Hammer (depending on the pipe wall thickness). The hammer used shall be a round headed one.
 - e. Following the peening test, the pressure shall be increased to the stipulated value and all welded joints shall be visually inspected.
 - f. 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.
 - g. The pressure test is considered satisfactory if no cracks, unjustified pressure reductions, leakages, seepages etc., appear.

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.

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Chapter-XVI: Testing, Pre-Commissioning, Commissioning and Post Commissioning

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.)

16.0 TESTNG, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

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16.1 The Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation. These would include **Air leak test of Boiler, Ducts, hydraulic test of boiler, piping, and flow test, clean air flow test, Gas Distribution Test, chemical cleaning of boiler, water washing, Steam blowing, , full load operation, Trial/Initial Operation, etc.** as instructed by BHEL using contractors own consumables, labour and scaffoldings etc. Air leak test on pressure parts preliminary to hydraulic test by compressed air shall also be carried out to check and rectify the various leakage and defects etc. All the chemicals required for carrying out these activities will be supplied by BHEL free of cost.

16.2 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.

16.3 After completion of erection of furnace, ducts and air heaters, a test shall be performed on the steam generator by the contractor to establish the tightness of the erected equipment from the outlet of Forced Draught (FD) fan through the steam generator up to stack.

16.4 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, chemical cleaning, steam blowing 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. The scope also covers the offsite disposal of effluents of the tests under the scope of this contract as per instruction of BHEL Engineer.

16.5 The contractor shall make all necessary arrangements including making of temporary closures on piping/ equipment for carrying out the hydro-static testing on piping equipment covered as per the scope at no additional cost. The contractor shall carryout the required test on the pipelines such as Hydraulic Test (as per IBR requirement/ instruction of BHEL), of piping systems as per the scope, Ultrasonic Test for weld defects and finding thickness, Dye penetrant test, Magnetic particles test for Weld defects and materials defects etc. All facilities (manpower, materials, equipment, consumables etc.) including proper approaches wherever required shall be provided by the contractor for satisfactory conduction of above tests. Special equipment such as magnetic particle tester, ultrasonic test kit and engineers required for these tests shall be arranged by the contractor along with qualified technician within finally accepted rates.

16.6 All required tests indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests/ activities may not have been listed in these specifications.

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16.7 Chemical Cleaning

16.7.1 **Chemical cleaning** will be carried under the scope of work including Supply & installation of tanks, Pumps, Piping and operation of the system, the Contractor has to extend all support with associate equipment (including providing of a welding power point) for completion of the work.

16.7.2 The welding joints in the temporary pipe lines for acid cleaning and steam blowing are to be welded by HP welders only. Required NDT tests are to be carried out for the above joints as part of work as per customer / BHEL requirement.

16.7.3 While the chemical cleaning operation including the required looping in piping, draining and disposal will be scope of work. After completion of commissioning protocol, the Chemical cleaning set up has to be dismantled from site.

16.7.4 All chemical required for conducting hydraulic test, alkali boil out, acid cleaning/EDTA cleaning, steam blowing etc., will be supplied by bidder, also servicing, dismantling and returning of the same to stores is the responsibility of the contractor.

Broadly the work on temporary systems will be as under:

Supply, Erection etc. of all temporary piping including valves, tanks, electrical control panel and cabling along with insulation and supports for steam blowing; chemical cleaning are to be carried out as part of work. Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities. All the pumps, motors and electrical control panels/ switch gear, valves and actuators will be furnished to the contractor after due servicing.

Dismantling of the temporary equipment, piping and return the same to the BHEL stores as applicable is also included in the scope of work.

The above is only a broad breakup of the temporary works. The engineer at site will make final break up. His decision will be final and binding. The above work under chemical cleaning is within the quoted rate no separate payment will be made for this purpose. For the supply of chemicals payment will be made lumpsum basis as per SOQ under category "Commissioning consumables".

16.8 It shall be the responsibility of the contractor to preserve the boiler as per BHEL's requirement. The required N2 for boiler preservation if required.

16.9 Void

16.10 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance

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required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

- 16.11 In case, any rework is required because of contractor's faulty erection, which is noticed during precommissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.
- 16.12 During commissioning, opening / closing of valves, changing of gaskets, Re-alignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. The finally accepted price /rates shall also include all such work.
- 16.13 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.
- 16.14 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to precommissioning 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.
- 16.15 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 as first fill and subsequent topping up's will be furnished by BHEL.
- 16.16 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.
- 16.17 The valves, dampers, actuators etc. will have to be checked cleaned and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.
- 16.18 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 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.

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- 16.19 All arrangement required for steam blowing including removal, reinstallation and welding installation of steam blowing arrangements, temporary piping including steam blow off piping is included in the scope of work.
- 16.20 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.
- 16.21 All the tests shall be repeated till **boiler / pipelines** / equipments 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 / Boiler Inspector / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost.
- 16.22 Replacing / cleaning of filters of the erected equipments, piping system etc. during pre-commissioning / commissioning stage are within the scope of work.
- 16.23 Contractor shall lay the temporary pipelines with fittings, accessories and erection / commission pumps, valves, fittings, hangers and supports and other installations as instructed by BHEL, Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing / water washing / carboard bursting etc. of piping and other equipments are in the scope of work. 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 equipments 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. Overhauling / cleaning / servicing of valves, pumps, fittings in temporary system, etc prior to the above operations / activities will also be carried out by the contractor at his cost. All the chemicals will be supplied by BHEL free of cost.
- 16.24 Steam blowing lines for Oil piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding have to be arranged by the contractor as a part of the work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.
- 16.25 During steam blowing operations the required manpower shall be arranged by the contractor as per the instructions of BHEL Engineer within the quoted rates. The manpower for the above operation may be required round the clock if necessary. The contractor shall carry out the above operation as per the instructions of BHEL Engineer within the quoted rates.

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- 16.26 During the initial stages of work, trenches for draining water may not be available for alkali flushing or mass flushing for discharging and 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.
- 16.27 After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.
- 16.28 The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces.
- 16.29 Contractor may have to replace old/damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement. Materials will be given by BHEL.
- 16.30 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 on connected equipment steam or oil or water leakage 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. If the insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.
- 16.31 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.
- 16.32 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.
- 16.33 During this period though the BHEL's / Client's staff will also be associated in the work, the contractor's responsibility will be to arrange required tools, man and plants till such time the commissioned units are taken over by BHEL's client.
- 16.34 For conducting gas tightness test, it may be required to erect the blowers and connecting ducts and commission the same for tightness test. It is the responsibility of the contractor to erect the blowers & dismantle once the test is over. Contractor shall carry out the work within the quoted rate and BHEL will provide dummies free of cost for conducting the test.
- 16.35 Contractor has to remove the all temporary supports, structures from inside of ducts and grind the all points after cutting and proper clean the duct and make it free from duct, weldments and burrs.

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- 16.36 Contractor to provide necessary commissioning assistance from pre-commissioning state onwards and up to continuous operation of the unit & handing over to customer. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programs made to achieve the schedule agreed with customer.
- 16.37 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part commissioning assistance for a period of six months after synchronization or till handing over of sets to customer, whichever is earlier.
- 16.38 Commissioning of the Boiler will involve trial runs of all the equipments erected, lighting up of the boiler for refractory drying, blowing of the steam lines, floating of safety valves, flushing of all the lines by air, oil or steam as the case may be, trial run of the fans, Lub. Oil pumps, servicing of all equipments like dampers, actuators, valves etc. and any other works incidental to commissioning. Contractor shall provide required workers along with supervisors with all the requisite tools round the clock and material for all these works, which shall form part of the work to be done.
- 16.39 After synchronization, the commissioning activities and trial/initial operations will continue till 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. The various categories of workers required for pre-commissioning, commissioning and post-commissioning activities are as follows:
- a) Pipe fitters
 - b) HP & structural welders
 - c) Riggers
 - d) Unskilled workers
 - e) Supervisors
 - f) Electricians
 - g) Ladders
 - h) Sheet metal fabricator/fitter
 - i) Any other category of workers as may be required.

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

1. One Engineer in charge for three shifts.
2. Two supervisors per shift for three shifts
3. Three fitters per shift for three shifts

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4. Six helpers per shift for three shifts

16.40 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, T&P Hired, 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.

16.41 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.

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

16.43 The contractor has to provide required man power assistance during pre-commissioning and commissioning checks of motor operated valves, actuators, control valves etc. without any extra charges.

16.44 Borescopic examination of headers etc. to be conducted by contractor as per instruction of BHEL engineer. This requires removal insulation/refractory, cutting of tubes to facilitate the borescopic examination and re-welding, reapplying insulation/refractory etc. are part of work and the same to be carried out within the quoted rate. The Nos. of headers to be examined shall be decided by BHEL/Customer. Borescope shall be provided by BHEL free of cost.

16.45 hoisting equipments are also to be erected and commissioned including load testing by the contractor within the quoted rates. Required manpower including electricians is to be arranged by the contractor for carrying out commissioning of electrical hoist and load testing of electrical hoist. Required loads will be provided by BHEL free of cost. Any minor rectification or for improvement of motor IR valve, arrangement to be made by contractor.

16.46 Contractor shall provide assistance in conducting of performance guarantee test (PG test) of the equipments under the scope of work. Contractor shall install all necessary tapping points; instruments etc and provide necessary assistance within the quoted rates. In case PG test is getting delayed beyond the contract period (normal plus extension if any) due to reasons not attributable to the Contractor, PG test issue will be mutually discussed and decided. However, installation of necessary tapping points, impulse pipes, approaches etc are to be completed by the Contractor.

16.47 The contractor shall carry out all required tests, pre-commissioning and commissioning activities required for the successful and reliable operation of, Boiler, Piping, Rotary machines, etc.

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- 16.48 The '**Initial Operation**'/Trial operation of the complete facility as an integral unit shall be conducted for continuous up to period specified. Upon completion of system checking/tests and as a part of commissioning of facilities, complete plant/facilities shall be put on initial operation for a period of **thirty (30) days or 720 hours** stipulated or as per Customer requirement. During the period of trial operation, all systems in the scope shall operate continuously at full load at designated fuel for a period not less than 72 hours. The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.
- 16.49 Specialized test equipment, if any, shall be provided by BHEL / its client free of hire charges. However, contractor has to take proper care of the equipment issued to him.
- 16.50 Contractor shall conduct the air/gas tightness test of all the ducts, dampers and gates under the scope of work. Erection etc. of blowers and blanks and putty required for conducting air tightness test shall be carried out as part of work. (Putty to be procured by the contractor without any extra cost to BHEL).
- 16.51 It is possible that due to any reason the final supporting may not be completed before conducting Hydraulic Test. The contractor may have to strengthen or install any additional supports as per instruction of BHEL. This work is a part of the work and no additional payment shall be made on this account.
- 16.52 All the shafts of the equipment shall have to be properly aligned to that of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid over-heating of bearings or other conditions, which may tend to shorten the life of the equipment. All bearings, shafts and other rotating parts shall be thoroughly cleaned and lubricated as per recommendations of BHEL engineer.
- 16.53 Lubricating oil units of the rotating machines are to be cleaned thoroughly before pouring of final lubricating oil. Topping up of lubricants during running of the set till handing over to be done by the vendor. Required lubricants both for first filling and topping up are to be supplied by BHEL free of cost. The empty containers of the lubricating oils should be returned to BHEL stores/place indicated by BHEL from time to time.
- 16.54 The instruction of the motor manufacturer regarding storage of the motors and re conservation must be strictly followed without any deviation.
- 16.55 The contractor shall endeavor to complete the work undertaken in all designated areas/system/subsystem in all respect without any punch points including area cleaning along with desired progress of work. However, during commissioning/Initial Operation, punch points shall be consolidated jointly with customer representative(s). It shall be the responsibility of contractor to attend all punch points post commissioning/Initial Operation and resolve the deficiency as may be necessary for handing over the unit to BHEL's Client within 30 days of Initial Operation completion.

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Chapter-XVII: Painting

17.1 Structure/Equipment: All structures shall be supplied from BHEL units/ workshops with finish coats of paint. Therefore, final painting is not applicable in the scope of contractor for Unit supplied items (until specifically mentioned in the tender). However, touch up painting (wherever required), incidental to the work, shall be in the scope of the contractor, including supply of the required paints and primers and associated consumables

Touch-up Painting:

Though the final painting is not there in the scope of the contractor, in case any shop painted structure/component is required to be repainted due to the reasons attributable to the contractor or otherwise such as Mis-handling, damage during erection process/storage, other reasons incidental to the work etc, such re-painting/finish painting of the components/structures shall be in the scope of the contractor including the supply of paints and primers along with all required consumables & deployment of tools e.g wire brush, paint brush, Spray M/c, cleaning agents etc.

Contractor shall carry out surface preparation and touch-up painting work as per BHEL/Customer specification and instruction of BHEL engineer at site.

Paints and painting work carried at site shall confirm to the following codes and standards

Contractor shall satisfy himself, availability of all information in the specifications for proper selection of the paints and ensure their applications as per Codes.

Finish Painting (wherever applicable incidental to touch-up painting & preventive painting)

- a) After the primer coat has dried out, the surface shall be cleaned of dust without scratching or in any way damaging the primer coat. Over this, dry surface finish painting shall be carried out.
- b) Finish painting shall be carried out in two coats. Dry film thickness of each coat shall be as per the recommendation of the primer/paint manufacturer. Minimum thickness including primer and paint coating shall be as per specification.
- c) Paint shall be applied either by brushing or spraying. It shall be ensured that brush marks are a minimum and the requirements of workmanship are as specified in IS: 1477 (for site painting works on systems, structures and components).
- d) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of ready mixed type in original sealed containers as packed by the paint manufacturer. Addition of thinners shall not be permitted.
- e) No painting shall be done in frost/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is 5° C or below.

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17.2 Touch-up painting on damaged areas –

For coatings damaged up to metal surface - Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.

Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush within maximum seven (7) days of application of touch up primer.

17.3 Painting of welded areas / painting of areas exposed after removal of temporary supports / touchup painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.

17.4 Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.

17.5 Painting procedure to be followed for touch-up painting on damaged areas.

17.6 The scope of work includes touchup painting and colour bands, lettering, marking and signs for direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/Customer engineer at site for the equipments / components covered in these specifications.

17.7 In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

17.8 Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents.

17.9 During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, contractor shall repair the same free of cost.

17.10 Specified drying time shall be permitted from one to another coat.

17.11 This work requires working at higher altitudes from ground level to as high as 50 mtr and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

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17.12 Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by Contractor, BHEL shall have the right to recover the cost of such damages from the Contractor.

17.13 Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the Contractor without any extra charges.

Note: -The access platforms & FPS Piping Category Full painting is applicable as per painting schedule. All the FPS piping will be supplied unpainted condition. The supply of paint & consumables is in the scope of Contractor & within the quoted rate.

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Chapter-XVIII: Lining and Insulation

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)

18.0 APPLICATION OF INSULATION AND REFRACTORY

18.1 Handling at site stores / storage yard, Transportation to site of work, Application of refractory & Insulation materials and connected works for Boiler, Auxiliary boiler, ducts etc. Rotary machines and binding and cladding with sheets etc., using their own tools plants, tackles, all consumables, supervisor and men as enumerated in the scope of contract.

18.2 Application of refractory, wool insulation, sheet metal cladding, welding of hooks / supports to hold insulation and refractory's as wherever necessary for all the equipment covered in this contract are to be carried out as per instruction of BHEL Engineer at site. The systems cover under this contract including but are not limited to the following: -

Boiler & its Auxiliaries, Boiler integral piping, piping (P91, P92, HP/LP piping) if any, Non-Pressure Parts, Duct, dampers gates and its support structure, Rotating Equipment, Air Pre-Heaters, ID/FD fans, It also includes connected Boiler ducts, HP&LP piping, temporary acid cleaning and steam blowing piping connected tubes, burners, oil and steam tracing lines complete and fuel and draft plants, all drain lines, traps, flanges, fine fittings, sampling lines, fans and other equipment etc.

18.3 Arrangement of scaffolding for the insulation of Boiler, Piping Chimney& its auxiliaries, all equipment, integral piping etc. is in the scope of this contract within the quoted price.

18.4 All insulations and refractory materials including iron components and other sheets casing materials, etc., required as per drawing will be supplied by BHEL and the same have to be erected / applied as per the drawings and specifications of BHEL by the contractor.

18.5 Clean the Surface to be Insulated from Rust, Dust, Grease, Loose scale, Oil, Moisture, etc. Care shall be taken that flexible insulation is not unduly compressed. After insulating the equipment, the gaps / joints shall be filled with loose wool/ moulded insulation as applicable.

18.6 Painting of inner side of sheet metal covering over the insulation walls with two coats of anticorrosive paint (IS-158) to be applied to the entire satisfaction of BHEL Engineer and application of bituminous sealing compound on cladding/ sheet metal joints shall also be carried out by the contractor. For which the required amount of paint, thinner and other accessories for painting, cleaning the surfaces etc., shall be supplied by the contractor within the quoted rate.

18.7 Supply of Bituminous sealing compound if any shall be in the scope of Contractor.

18.8 It is the responsibility of the contractor to ensure that the insulation and refractory materials and sheet metal covering issued to him for application are well protected against loss or damage or weather

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conditions tending to affect its quality by the provision of close / semi closed sheds at his cost. All the insulation and refractory materials and sheet metal covering etc., issued to the contractor shall be properly stored and handled before application due the same.

18.9 Contractor is liable for the exact accounting of the materials issued to him and any unaccountable losses shall be made good by him. The necessary accounting of the material issued will have to be furnished by the contractor periodically.

18.10 Wherever iron components are to be welded on non-pressure parts, the contractor shall employ only approved structural welders. It shall also be the responsibility of the contractor to arrange for welding hooks, flats, plates, supports and other fixtures also. All consumables tools and plants etc., required for the work shall be arranged by the contractor at their cost.

18.11 Contractor shall observe all precautions for laying and curing of Castable refractory. Any defective works found shall be re-laid by contractor at his own cost including materials.

18.12 Wool insulations are received at site as bonded and un-bonded mattresses in standard sizes. These has to be dressed / cut to suit equipment / site work by the contractor.

18.13 For the insulation of hot air duct, gas duct, ID duct etc., unfaced bonded wool, mattresses are to be used with wire netting on the outside for rigidity.

18.14 Dressing of insulation bricks to suit site conditions curing the refractory concrete applied, sheet cladding over insulations, form the part of this work.

18.15 Removal type of insulation to be provided for valves fittings, expansion joints etc., as per the drawings or as directed by BHEL Engineer.

18.16 All piping insulations shall be carried out in such a manner as to facilitate removal of bolts nuts and washers from the flanges.

18.17 Refractory works at complete combustion chambers, ceiling heat recovery area, burner areas and application of castable refractory wherever specified in drawing or as directed by BHEL Engineer have to be carried out.

18.18 Fabrication of covering sheets may be necessary like preparing the sheets to the sizes and shapes specified in drawings, beading, swaging, beveling of sheets crowning of the sheets if necessary the same to supports over wool insulation with screws as specified in BHEL drawings or as instructed by BHEL engineer.

18.19 Fabrication, fixing or welding of hooks / supports to equipment of boiler parts, piping and other connected equipment to support wool insulation applying of primer paint to welded portion parts

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welding certain supports on parts other than pressure parts to hold refractory's (by engaging approved welders) as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.

18.20 The contractor shall leave certain gap and opening while doing the work as per the instructions of BHEL Engineer to facilitate inspection by Boiler Inspector or doing commissioning to fix gauges, fittings, instruments. Those gaps will have to be finished as per drawings at a later date by the contractor at his cost, as required by BHEL.

18.21 Cladding sheets shall be suitably pressed along with diagonals to form diamond shape so as to improve the strength of the sheets, to avoid humpiness and to give aesthetic look.

18.22 Plates, bars, rods and other materials that are to be cut, and re-welded from the fabricated places to suit erection requirements for which no extra payment will be made to the contractor.

18.23 A logbook shall be maintained by the contractor for the clearance of the area for application of refractory and insulation. If the contractor does the work on his own accord without prior permission the area should be redone at his cost.

18.24 The contractor shall draw only one week's requirement of material for their work from BHEL stores and keep them in their semi-closed shed near to the work area. The materials required for a particular space of work only shall be taken to the work spot. At the end of the day's work the leftover or unused materials shall be taken back to their semi-closed shed for keeping the materials safe. Necessary records shall have to be maintained by the contractor in respect of the above draws / deposits, on daily basis as instructed by BHEL.

18.25 Wastages allowance for the materials issued are envisaged as follows:

- a) Castable refractory - 2%
- b) Insulation bricks & mortar - 2%
- c) Wool/LRB mattresses - 2%
- d) Cladding sheets - 2%

All surplus and all wastage materials will be taken back on weight basis. Surplus, unused and untampered steel shall be sorted section-wise and returned separately at a place directed by BHEL/Engineer within the project area. For return of such materials, contractor will not be entitled to any handling and incidental charges. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be promptly returned to the stores and a receipt obtained for material accounting purposes. In case if wastage is beyond permissible limit, recovery shall be applicable as per penal rate based on fresh material market as determined by BHEL Engineer In-charge.

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18.26 Making structural supporting works for pourable insulation, laying pourable insulation, adhering to all specifications and instructions shall be the responsibility of the contractor.

18.27 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. In the event of his failure to do so, the same will be arranged / removed by BHEL Engineer and the expenses incurred with 5% overhead will be recovered from the contractors.

18.28 Welding of hooks as per pitch, non-pressure parts, applying red oxide paint to the welded portion as directed as per drawings before application of mineral wool mattresses will have to be done by the contractor.

18.29 Applying different layers of mineral wool as directed and as per drawings and specifications for Boiler/ESP, pipelines valves and other vessels and after fixing require holdings materials, suitably if necessary, fabrication of rings etc., and fixing as directed and as per drawings and specifications shall also form part of this work.

18.30 If necessary, the hooks may have to be made from the rods, raw materials supplied in running lengths. The contractor may have to carry out this work also and use the same hooks.

18.31 In case the contractor is required to dismantle and re-erect certain area as and when required for pre-commissioning / commissioning activities the rate as indicated in the rate schedule shall be paid by BHEL for erection. However, for dismantling no extra charge will be paid under any circumstances.

18.32 Wherever additional / clamps, frame works, etc., are required to be fabricated and installed even though not indicated in the drawings shall be fabricated and installed at their cost. Only steel materials shall be given by BHEL free of cost, consumables like electrodes, gases etc., are to be arranged by the contractor at his cost.

18.33 Contractor has to arrange required fire retardant covering material at their cost to protect the insulation materials drawn from BHEL before and after erection.

18.34 Delay in clearance of mechanical equipment and piping for insulations is unlikely to happen. However, if any delay occurs, the contractor shall not claim anything extra, like idle charges.

18.35 Welding of all seal boxes covers after completion of refractory work shall be done by the contractor. No extra charges will be payable for the same.

18.36 Application of Castable refractory between tubes around burners on ceiling and as directed by Engineers and as per detailed drawings and specifications will have to be done by the contractor.

18.37 Welding of iron components directly on pressure parts and HP piping is are to be carried out by certified IBR high pressure welders.

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

18.39 Special type of insulation wool used in penthouse shall not be cut indiscriminately. All chicken mesh, cut bits shall be accounted for.

18.40 The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, gratings etc) shall be of light weight construction. Contractor shall arrange steel pipes & clamps with accessories like base plate attachment, fixing pins, struts etc for scaffolding required for this work. However, BHEL's decision in this regard shall be final and binding. Contractor shall arrange the scaffolding materials in sufficient quantity. In the event of his failure to do so, the same will be arranged / removed by BHEL Engineer and the expenses incurred with 5% overhead will be recovered from the contractors.

18.41 The Contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.

18.42 All attachment welding, including welding of hooks / supports as per pitch both on equipment and piping shall be done as directed by Engineer. If necessary contractor may have to cut the hooks to correct length. Application of red oxide paint including supply of paint on welded portions as directed by BHEL is also included in scope of work.

18.43 The mineral wool mattresses (bonded / un-bonded) / LRB mattresses are received at site in standard sizes. These are to be dressed / cut to suit site requirements by the contractor.

18.44 The contractor should ensure, proper finishing of surface of the insulation, sheeting and cementing.

18.45 The contractor should ensure that the finished surface of the insulation works conforms to the dimensions and tolerances given in the drawings. Aesthetic finish and accuracy of work are most important.

18.46 It is the responsibility of the contractor to ensure that the insulation materials and sheet metal covering issued to him for application are well protected against loss or damage from weather conditions. Closed / semi closed sheds or any other arrangements required for this will be by him at his cost. If any damage occurs to the material due to improper storage or due to any causes attributable to the contractor except for normal breakage or damages allowed in such cases, the cost of such damaged material shall be to the account of the contractor.

18.47 Aluminum sheet cladding will be fabricated to the sizes and shapes specified in drawings. Beading, swaging, beveling of sheets, crowning the sheets if necessary will be carried out by him. Two coats of anti-corrosive black bituminous paint are to be applied on inner surfaces of the cladding. Bitumen sealing compound on the joints if necessary is included in the scope of this work.

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18.48 Aluminum sheet metal cladding over insulation will consists of plain / ribbed / corrugated sheets. The sheets will be supplied in standard sizes. Cutting them to required size, grooving, fabricating bends, boxes etc., for proper covering is contractor's responsibility. Any cutting / bending / welding of fabricated skin casing sheets if required will also covered within the scope of this contract.

18.49 All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc. required will be supplied by BHEL and the same have to be erected/ applied as per the drawings and specifications of BHEL by the Contractor.

18.50 Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipment. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipment/ systems covered under the scope of work.

18.51 The cladding and outer casing are aluminum sheets. All relevant specifications and procedures with regards to beading, sealing etc. for aluminum sheets have to be adhered to.

18.52 Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather. The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by Contractor.

18.53 To take care of bimetal corrosion due to variety of metals in contact of each other viz retainer to support, support to outer casing/cladding, cladding-to-cladding etc, suitable paints specified by BHEL, to be applied and/or neoprene rubber packing/strips or any other insert may have to be fixed as required.

18.54 If during erection and commissioning any of the parts are to be insulated temporarily fixed and then replaced by permanent ones at a later date or if any of the parts are to be removed for modification, rectification, adjustment and then refitted or if some parts are to be opened for inspection and checking and for measurement of metal surface temperature the same may necessitate removal and re-application of insulation and sheet metal cladding, which shall be done by the contractor and the erection rate quoted shall be inclusive of such contingencies.

18.55 Removable type of insulation shall be provided for valves, fittings, expansion joints etc. as per the drawings or as directed by BHEL Engineer.

18.56 All temporary pipelines required during testing, pre-commissioning and commissioning should be insulated as directed by BHEL at no extra cost to BHEL. However, required insulation material shall be issued by BHEL free of cost. Application and removal of insulation is in the scope of contractor within the quoted rates.

18.57 The following works are also included in the scope of this contract: -

- a) Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint will be arranged by Contractor.

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b) Cutting of the wool mattresses in the required shape and application of finishing cement of required thickness wherever required.

18.58 Also, the contractor will demolish all the hutments, sheds, offices, constructed by him and shall clean the debris after the contract is over. In the event of his failure to do so, the same will be arranged / removed by BHEL Engineer and the expenses incurred with 5% overhead will be recovered from the contractors.

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Chapter XIX- Field quality control plan

19.0 Work shall be executed as per approved field quality control plan (FQCP) as per BHEL/Customer M/s BPCL. Submitted FQCP shall be reviewed and approved by BHEL.

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20.0 Chapter XX: HSE (Health, Safety, Environment) and PPE (personal Protective Equipment) Guidelines

1. Contractor shall follow all the HSE guidelines as mentioned chapter IX off SCC and BPCL (Attached)
2. Contractor shall deploy one (1) number of qualified and experienced safety officer for the entire period of contract.
3. Contractor shall submit the biodata of safety officer to BHEL/Customer (BPCL), for approval.
4. In case of any dispute/ contradiction, BPCL HSE rules and guidelines shall prevail.
5. PPEs of Reputed make shall be made available to the workmen as per Chapter IX of SCC.
6. All the vehicle movements/ Loading and unloading shall be done by strictly following the safety norms.
7. FARANA crane shall be used instead of Hydra.

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21.0 Chapter XXI-Obligations of the Contractors

21.1 The contractor shall fully comply with the following enactments:

- a) Contract Labor (R & A) Act, 1970 and rules formed therein under Central Rules.
- b) Minimum Wages Act 1948 (Wage Rates not less than that notified by State Labour Department / Central Labour Dept., / BHEL whichever is higher from time to time).
- c) Payment of Wages Act.
- d) ESI Act, 1948
- e) EPF Act, 1952
- f) Employees' Compensation Act, 1923.
- g) Provisions of Factories Act 1948 & Rules thereof
- h) The inter-state migrant workmen (regulation of employment and conditions of service) Act, 1979
- i) Payment of Bonus Act, 1965
- j) Payment of Gratuity Act, 1972
 - a The contractor shall obtain License from the Assistant Labour Commissioner (Central), or appropriate government if he engages twenty or more workmen.
 - b The Contractor shall produce the following Registers and forms before commencement of work, for verification by the Executing Officer.
 - 1 Form XII - Register of contractors
 - 2 Form XIII - Register of workmen employed by contractor (Rule 75)
 - 3 Form XIV - Employment card issued by contractor (Rule 76)
 - 4 Form XVI - Muster Roll (Rule 78(1)(a)(i))
 - 5 Form XVII - Register of wages (Rule 78(1)(a)(i))
 - 6 Form XVIII - Register of wages-cum Muster Roll (in case of weekly payment)
 - 7 Form XIX - Wage Slip (Rule 78(b))
 - 8 Form XX - Register of deduction for damages or loss (Rule 78(1)(a)(ii))
 - 9 Form XXI - Register of files (Rule 78(1)(a)(ii))

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- 10 Form XXII - Register of advances (Rule 78(1)(a)(ii))
- 11 Form XXIII - Register of overtime (Rule 78(1)(a)(iii))
- 12 Form XXIV - Return to be sent by the contractor to licensing officer (Rule 82(1))
 - a The contractor shall make himself or his representative (supervisor) available at the work spot every day during execution of work, for effective supervision.
 - b The contractor shall attend to all inspections notified/conducted by the Human Resource department, Labour department, P.F. authorities, Inspector of Factories, ESI inspectors, or any other such authorities.
 - c Non-compliance of any provisions under the act/rule/instructions/guidelines shall make the contractor liable for penal action including termination of contract.
 - d Contractor shall furnish in a separate letter his place of residence and postal address. The delivery at the above named place or posting in a Post Box regularly maintained by the Post and Telegraph Department or sending letters registered for acknowledgement of any notice, letter or other communication to the contractor shall be deemed sufficient service there upon he contractor. Change in address shall come into force at any time by an instrument executed by the contractor and delivered to the BHEL official who has signed the contract.
 - e The contractor must satisfy himself by personal study thoroughly the scope of proposed work in detail and all conditions affecting the work before entering into the contract. There shall not be at any time, dispute/complaint of any nature regarding scope of work and interpretation of specifications or any misunderstanding with regard to nature or omission of the work to be done nor shall any application for compensation in terms of time and money shall be accepted by BHEL regarding the above.
 - f Contractor shall in his absence keep competent agent constantly on the works and any directions or explanations given by the "Contract Executing Officer" or his representative to such agent shall be held to have been given to the contractor himself.
 - g Contractor on the advice of BHEL officials shall immediately remove any person employed by him, who may in the opinion of the BHEL official, is incompetent or involves himself in misconduct. Such persons shall not be again employed on the works without written permission of the BHEL official.
 - h The contractor shall give all notices required by the Acts, regulation, bye laws, Legal Acts and pay all fees in connection therewith unless and otherwise arranged and decided in writing with BHEL. He shall also ensure that no attachments are made against materials or work forming part of or for the use of the contractor. In all such cases, contractor shall protect and indemnify BHEL against any claim or liability arising from or based on the

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- violation of any such laws, ordinances, regulations, orders, decrees or attachment either by himself or by his employees.
- i It shall be contractor's sole responsibility to protect the public and his employees against accident from any cause and provide required safety equipment and shall indemnify BHEL against any claims for damages for injury to the person or property resulting from any such accidents and shall, where the provisions of the Employees Compensation Act and Public Liability Act as applicable, take steps to properly insure against any claims thereunder.
 - j In the event of any accident in respect of which compensation may become payable under the Employees Compensation Act, VIII of 1923 whether by the contractor or by BHEL as Principal Employer, it shall be lawful for BHEL to retain out of monies due and payable to the contractor such sum or sums of money as may, in the opinion of BHEL shall be final in regard to all matter arising in this clause.
 - k No work shall be done on Sundays or on other declared Holidays of BHEL without the written permission of BHEL officer in charge of the work. The contractor shall comply with the provisions of the Factories Act 1948 if the same are applicable. No contract labour shall be engaged on any National Holidays.
 - l The contractor shall keep his work place clean and safe to avoid injuries to men and damage to finished products / equipment.
 - m On the occurrence of an accident, which results in the death of any of the workmen employed by the contractor or which is so serious as to be likely to result in the death of any such workmen, the contractor shall within 24 hours of the happening of such an accident intimate in writing to the BHEL official in charge of the work.
 - n The contractor shall indemnify BHEL against all losses or damages sustained by BHEL resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or dues if any and become payable by BHEL, as a consequence of failure, BHEL to give notice under the Employees Compensation Act 1923 or otherwise confirm to the provisions of the said Act in regard to such accident.
 - o The contractor shall ensure adherence to all statutory requirements applicable to BHEL.
 - p The contractor shall ensure abidance by all the labour laws especially including Contract labour (R&A) Act 1970, Payment of Wages Act 1936, Employees Compensation Act 1923, Minimum Wages Act 1948, ESI Act 1948, Payment of Bonus Act 1965, and Provident Fund Misc. Prov. Act 1952, as amended from time to time.
 - q The contractor shall comply with provisions of Provident Fund Misc. Prov. Act 1952 through PF code allotted to him / her.

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- r Notwithstanding the above clause, in case of any financial loss incurred by company on account of contravention of the Provident Fund regulations or any regulations of rule touching the same by the contractor, the contractor shall submit an undertaking to indemnify the company to the extent of the loss incurred by the company.
- s The contractor should engage only those laborers whose age is 18 (eighteen) years or more.
- t The contractor shall not resort to subcontracting under any circumstances without prior permission of BHEL. If found sub-contracting at a later date, BHEL reserves the right to take whatever action it deems fit, including cancellation of the Contract.
- u The contractor shall provide the required safety equipment to the labors engaged by him / her.
- v Contractor shall issue "Employment Card" as per statute to all labour and supervisors covered under the job work contract.
- w The contractor shall be responsible to settle any grievances of the labour deployed by him / her within two weeks.

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Chapter: XXII CHEMICAL Cleaning SCHEDULE

- Chemical Cleaning & Alkali boil Out Schedule will be followed as Per M/s BPCL guidelines (Attached) and BHEL guide lines (will be issued during pre-commissioning & Commissioning activities). Contractor must comply with the above-mentioned guidelines.
- Supply of Chemicals is in the scope of Contractor.

Note:-01

The work of supply & installation of tanks, Pumps, Piping and operation of the system is in the scope, the Contractor has to arrange complete interface requirements with chemical for the completion of the work. Bidder scope includes supply & return piping from pumps outlet at chemical cleaning temporary station to drain pit. Laying of insulation of this temporary piping and tank are to be carried out by the contractor within quoted rate, and required insulation materials will be provided by the contractor. The welding joints in the temporary pipe lines for acid cleaning and steam blowing are to be welded by HP/IBR welders only. Required NDT tests are to be carried out for the above joints as part of work as per customer / BHEL requirement. After completion of Commissioning protocols, the Chemical cleaning set up has to be dismantled by the contractor

Neutralization pit for Chemical cleaning shall be made by Contractor.

After completion of job pit has to be dismantled and area is to be levelled before handing over of area to owner. Dismantling of temporary piping & Cleaning of the area, erected by bidder, is in the scope of contractor.

Note-02 The above set up in Note -01 has to be arranged by the contractor within the quoted rate. No separate payment will be made for this purpose. However, For the supply of chemicals/Commissioning consumables Lumpsum payment will be made under the SOQ.

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Chapter: XXIII Technical Annexure: Drawings & Documents

- Plot plan
- Safety Documents& Technical documents of M/s BPCL
- GA Drawing Boiler
- Painting Schedule (will be issued during execution stage)
- Welding Schedule (will be issued during execution stage)