

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Package-A: Erection, Testing, Commissioning, Trial Operation & Handing Over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist, Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, DG set including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, preparation of foundation, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stenciling & Labelling and installation of items as per BOQ of Unit - 1 at 2x660 MW MSPGCL Koradi BTG TPS, District Nagpur, Maharashtra.

Package-B: Erection, Testing, Commissioning, Trial Operation & Handing Over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist, Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, DG set including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, preparation of foundation, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stenciling & Labelling and installation of items as per BOQ of Unit - 2 at 2x660 MW MSPGCL Koradi BTG TPS, District Nagpur, Maharashtra.

BHARAT HEAVY ELECTRICALS LIMITED



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Chapter-I: Project Information

1.0 Project Information:

Sl. No.	Description	Details
1	Project Title	2X660MW Koradi Thermal Power Station
2	BHEL scope in the project	BTG
3	Customer	Maharashtra State Power Generation Co. Ltd (MSPGCL or MAHAGENCO)
4	Location	Koradi of Nagpur District in Maharashtra Nearest major town is Nagpur (12 kms)
5	Nearest Airport	The nearest airport is Nagpur Airport
6	Nearest major Railway Station	Nagpur Railway Station
7	Access By Road/Major Cities	From Nagpur- Bhopal National Highway (NH-69)
8	Temperature	47.8 °C (High) 3.9 °C (Low)
9	Wind Speed	44m/s

	INSTRUCTIONS TO BIDDERS
1.1.	The Bidder shall visit project site and acquire full knowledge and information about conditions prevailing at site and in & around the plant premises, together with site conditions, transportation routes, various distances, all the statutory, obligatory, mandatory requirements of various authorities and all information that may be necessary

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Chapter-I: Project Information

	for preparing the bid and entering into the Contract. All costs for and associated with site visits shall be borne by the bidder.		
1.2.	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.		
1.3.	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.		
1.4.	The contractor, in the event of this work awarded to him, shall establish an office at site and keep posted an authorized, responsible officer with valid Power of Attorney for the purpose of the contract. Any order or instructions of the `Engineer' or his duly authorized representative, communicated to the contractor's representative at site office will be deemed to have been communicated to the contractor at his legal address.		
1.5.	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.		
1.6.	Bidders may fix up their site visit in consultation with below mentioned contact person:		
	Name:	Sh. Kavindra Shekhar	Sh. Kuldeep Kishore Baa
	Designation:	AGM & Project Director	AGM
	Location:	2x660 MSPGCL Koradi Project	PSWR HQ, Nagpur
	Email:	kavi@bhel.in	kkbaa@bhel.in
	Ph. No.	(+91) 9654 390 909	(+91) 9425927667

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Chapter-II: Scope of Work

2.0	Scope of Works:
2.1.	The broad scope of works includes Erection, Testing, Commissioning, Trial Operation & Handing Over including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, preparation of foundation, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stenciling & Labelling of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist, Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, DG set including installation of items as per BOQ of Unit-1 & 2 at 2x660 MW MSPGCL Koradi BTG TPS, District Nagpur, Maharashtra: 1. Package-A: Unit # 1 - Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet and FGD & auxiliaries as per BOQ 2. Package-B: Unit # 2 - Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet and FGD & auxiliaries as per BOQ
2.2.	Broad area of works includes, but not limited to: - Electrostatic Precipitator (ESP), ducting from ESP outlet to Chimney Inlet and FGD and auxiliaries: i. Electrostatic Precipitator (ESP) and auxiliaries ii. Ducting complete from ESP outlet to chimney Inlet iii. FGD and auxiliaries, FGD ducting iv. Receipt of materials from site store/yard, storage, preservation, erection and commissioning of the system. v. Their preservation and, safe keeping, watch and ward vi. Checking, Dressing, Chipping, Leveling of foundations vii. Pre-assembly, Erection, Alignment of structures, equipment etc. viii. Welding, Heat Treatment, Radiography, UT and Non-Destructive Tests, as per approved documents / FQP. ix. Air Leak test, Air Tightness Test, GD Test and other pre-commissioning tests x. Insulation, touch-up painting include supply of paints, etc. xi. Assistance during PG test as per scope given in the tender.

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Chapter-II: Scope of Work

	xii. Erection testing and commissioning of all Hoists of ESP and FGD area as per scope including load test and certification from Third party inspector. xiii. All required incidental activities 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 xiv. Unit Trial/Initial Operation, resolving any deficiencies observed and Handing over of ESP & Auxiliaries, Ducting and FGD system as per scope xv. Completion of all facilities/systems xvi. Handing over of the ESP, Ducting and FGD system as per scope of work Note: 1. Ordering of Package-A & B as above shall be as mentioned under Instructions to the Bidders in Chapter-XXIV). 2. LOA for each Package - A & B shall be issued separately and each Package shall be considered as separate contract with separate contract period (as specified in Chapter-VI "Time Schedule" of TCC), separate start dates and separate contract value etc. 3. All the records of the contracts viz Measurement of work, progress monitoring, monthly review, performance evaluation etc. shall be maintained for all the contracts separately. 4. Clause of GCC Viz SD, LD, ORC, PVC, Time Extension, Retention amount, Guarantee Period, Quantity Variation, Final Bill, Breach of contract, etc. shall be applicable for each individual package/contract. 5. Package A & B: For each item, item rate shall be derived. Payment shall be made on actual execution of work on item rate basis.
2.3.	The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims pre-assembling of equipment at the preassembly yard with making all necessary arrangements, inspection, preservation, erection, levelling, and other adjustments, Lifting, laying, erection, bolt tensioning, bolt torque tightening, supporting and installation, heat treatment, inspection, NDT including radiography, Air leak/tightness tests and hydrostatic tests by making all necessary arrangements (i.e. dummy plate welding, erection of temporary pipes, etc. as required), water / steam flushing, air drying, nitrogen purging and other testing, cutting, edge / surface

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	preparation, welding, grinding, radiography, LPI/MPI/UT testing wherever needed, carrying out air tightness test using soap solution / kerosene, Vacuum test, light up, assistance during ATT, GD test, Gate and dampers commissioning, FGD commissioning, Ducting Air leak Testing, coal firing, full load operation, 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 Electrostatic Precipitator (ESP) and its auxiliaries, ducting from ESP outlet to chimney inlet and FGD and auxiliaries
2.4.	Scope covers installation of all valves including other miscellaneous in line / on line items, cleaning, air drying, disposal of fluids offsite, reinstatement, preservation of piping and miscellaneous items following Air leak test, GD test, smoke test, kerosene test, painting, insulation, fabrication & installation, all associated incidentals setting and commissioning of pipe supports, guides, anchors, spring supports, temporary/permanent approach/platforms, as required.
2.5.	FGD common systems like Gypsum Dewatering Equipments, Limestone Day silo along with accessories, elevators , Wet Ball Mills , DG set etc. are part of scope and covered in the BOQ. Supervision of Erection & commissioning of FGD DG set shall be done under the supervision of BHEL DG vendor/BHEL ISG Banaglore.
2.6.	The work under this contract shall be carried out as per BOQ Cum Rate Schedule and in compliance of tender conditions including technical specifications and approved drawings/ documents.
2.7.	GENERAL
2.7.1.	Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.
2.7.2.	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.
2.7.3.	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.
2.7.4.	Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and fro the site, fuel, compressed air, water, transit and storage insurance for own T&P and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handing over the works in accordance with the

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Chapter-II: Scope of Work

	stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works
2.7.5.	The area of work shall be cleared of all vegetation, rubbles and other objectionable matter and materials by contractor. No separate payment for these operations shall be made for such works.
2.7.6.	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.
2.7.7.	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.
2.7.8.	All necessary arrangement for safety like Hard Barricading with scaffolding pipes and providing of safety net is in bidder's scope.
2.7.9.	The Customer may depute their representative for checking and supervision of important stages of work. The contractor shall be required to provide all facilities for inspection of works at no extra cost to BHEL. Any defect in quality of work or deviations from drawings / specifications pointed out during such inspection shall be made good by the contractor in the same way as if pointed out by the BHEL Engineer, without any cost implication to BHEL.
2.7.10.	Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that is required for all works including temporary works shall be in the scope of contractor.
2.7.11.	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.
2.7.12.	Medical/First aid centre/medicine purchased for emergency/Doctor purpose along with ambulance services with fuel and operator (round the clock) shall be arranged by BHEL for handling medical emergencies. Cost against these facilities shall be distributed / shared among the vendors working in the Project site proportionately based on contract value (As per HSE plan). However, Contractor shall arrange for the above facilities till the time BHEL provided common facility is operational.
2.7.13.	The complete works shall be carried out as per BOQ cum Rate schedule. If any work covered in the scope of contract cannot be executed using items available in BOQ, additional / extra items shall be made and rates for such items shall be worked out as per GCC. However, contractor shall be bound to execute all the works under the

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	scope of the contract and decision whether an extra item is applicable or not, shall be taken by BHEL Engineer which will be binding on the contractor.
2.7.14.	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.
2.7.15.	In case of any HP/LP pipe is routed along the path of walkways, suitable crossover has to be prepared using structural material issued in running meter. In case any additional is 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 similar item in Rate schedule .
2.8.	Contractor manpower and organization structure
2.8.1.	BHEL reserves the right to reject or approve the list of personnel proposed by the contractor. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not be permitted unless specific & reasonable justification is made. 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.
2.8.2.	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:
2.9.1.	The works to be performed under this contract consist of providing all labour, supervision, material, scaffolding, consumables, construction equipment, tools & plants, temporary works, transportation and all incidental items not shown or specified but reasonably implied or necessary for the proper completion of work in

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	all respects. Testing of all materials 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.
2.9.2.	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.
2.9.3.	The quantities indicated in the tender specification are approximate and are liable for variation at the discretion of BHEL/ requirement of work. The work executed shall be measured and priced as per the unit rate arrived at for each work area as mentioned in the relevant clauses. Quantity variation shall be governed as per GCC clause 2.14.
2.9.4.	It shall be specially noted that, the contractor may have to work round the clock (24x7) or may have to deploy additional manpower/resources to achieve the completion schedules / plans / targets during the entire course of erection and commissioning works, which may involve considerable payment including overtime. Hence, contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including labours, engineers / supervisors, T&Ps etc. Time is the essence of contract. Night shift working is envisaged for works not hazardous in nature with due permission of BHEL like- Erection works at low heights, Material shifting, Preassembly works, welding works etc.
2.9.5.	The terminal points can be inferred from the relevant drawings and any further clarifications can be obtained/decided by BHEL and that is final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also, 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.

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	Also, kindly note if any pump is supplied with gland packing, then same shall be replaced with mechanical seal after commissioning of respective systems. Replacement of gland packing with mechanical seal has to be carried out by contractor within the quoted rate.
2.9.6.	Considering the area constrain in the subject project, Contractor has to work in close co-ordination with another Erection/Civil agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less/more at a particular given time. Activities and erection program have to be planned in such a way that the project milestone events like Boiler light up, Synchronization, Trial/Initial operation etc., are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.
2.9.7.	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.
2.9.8.	The storage yards are located within the 5 KMs from main site and spread in multiple locations (2-3 locations). All the materials have to be transported from storage yard to construction area by the contractor at his own cost, using own Pick & Carry Crane (Farrana) , crane and trailer. Bidders are advised to visit site to ascertained all these aspects before quoting.
2.9.9.	Painting: Touch up painting- All structures/components 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 or painting on damaged area (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.
2.9.10.	The scope of work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management including high standard safety management (as per relevant clause of tender document) and green belt management (Project Management, HSE & Quality etc.). The contractor should ensure successful and timely completion of the work. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his payroll adequately trained, qualified and experienced supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works. <u>(Refer HSE Plan)</u>

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	Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The erection manuals which are available with BHEL site office are to be referred for compliance and guidance before taking up the work. Any failure to comply with the above might lead to rework and the cost for the same shall be borne by the contractor only. BHEL engineer, depending upon the availability of materials, fronts etc., will decide the sequence of erection and methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs or for any reason whatsoever.
2.9.11.	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.
2.9.12.	Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.
2.9.13.	Giving all notices, paying all fees, taxes, statutory clearances, license (like T&P load test, etc), etc., those are required for successful execution of scope of work and in accordance with the general conditions of contract, that is required for all works including temporary works.
2.9.14.	Void
2.9.15.	The contractor shall provide the owner/BHEL such an assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used.
2.9.16.	Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.
2.9.17.	Arranging for joint checking (with BHEL / BHEL's Customer / Consultant) of all site construction activities Preparation of joint protocols for each & every activity and maintaining quality records for audit/inspection as per approved FQP by BHEL.
2.9.18.	Contractor shall set up suitable guarded storage facilities. Contractor shall ensure the Storage of only those material at site which will be erected/Pre-assembled within 10 days OR as directed by BHEL Engineer. Any wastage due to lapse of storing shall be debited to contractor with 5% overhead.

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2.9.19.	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.
2.9.20.	The detail scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual requirements.
2.9.21.	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.
2.9.22.	Adequate water-less/Bio urinals (as per HSE plan) at locations identified by BHEL site in-charge , shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas with proper disposal arrangement.
2.9.23.	Vendors have to comply requirements of HSE & Statutory requirement in line with BHEL HSE plan, MSPGCL Safety requirement, State/Central statutory requirement.
2.9.24.	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.
2.9.25.	Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.
2.10.	Consumables
2.10.1.	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.
2.10.2.	The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel if required), all gases (inert, Nitrogen Gas for accumulators and Gases required for 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.

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	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 and cannot be construed as excuse for delay.
2.10.3.	All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.
2.10.4.	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.
2.10.5.	The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.
2.10.6.	The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.
2.10.7.	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.
2.10.8.	Storage of electrodes shall be done in an air conditioned / humidity-controlled room as per requirement, at his own cost by the contractor.
2.10.9.	All low hydrogen electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C - 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven (Baking & holding oven) and portable drying ovens shall be provided by contractor in sufficient quantities at his cost.
2.10.10.	In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's subsequent bills at market value plus 5% overheads.
2.10.11.	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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2.10.12.	Sealing compounds and GI wires for insulation mattress binding and Self drilling screws / Self taping screws for sheeting works shall be provided by the agency within the quoted price/rates.
2.11.	HEIRARCHY: In case of any conflict/deviations amongst various documents of TCC, the order of precedence shall be as follows: 1. Items Description in BOQ Cum Rate Schedule. 2. Technical Conditions of Contract (TCC). 3. Technical Specifications of Customer 4. IS Standard. 5. BHEL's Standard Specification.

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

3.0 Facilities in the scope of Contractor/BHEL:

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
3.1	Establishment:			
3.1.1	For Construction Purpose:			
a	Open space for office (as per availability within project premises)	Yes		Location will be finalized after joint survey with owner. Note-All office and covered store buildings shall be of prefab/ pre-engineered / porta cabin construction. Shabby semi-finished constructions in brickwork/ GI / asbestos roof etc shall not be permitted.
b	Open space for storage (as per availability within project premises)	Yes		Location will be finalized after joint survey with owner.
c	Open space for fabrication/pre-assembly (as per availability within project premises)	Yes		Location will be finalized after joint survey with owner.
d	Construction of bidder's office, fabrication yard, canteen and storage building including supply of materials and other services		Yes	
e	Bidder's all office equipment, office / store / canteen consumables		Yes	

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
f	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
g	Firefighting equipment like buckets, extinguishers etc.		Yes	
h	Cordoning-off of storage area, office, canteen etc. of the bidder		Yes	
3.1.2	For living purpose of the bidder:			
A	Open space for labour colony		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	As per Annexure A – “Standard Guidelines for Worker's Accommodation / Establishments at BHEL-Project Sites” Construction Plan shall be approved by BHEL
3.2	Electricity:			
3.2.1	Electricity for construction purposes (for Site/Project works only) 3 Phase 415/440 V (Free of Cost) within project premises			Free of cost at One point near the site at a distance of approx. 500 meters.
a	Single point source	Yes		
b	Further distribution including all materials, Energy Meters, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances, if applicable		Yes	

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
3.2.2	Electricity for office, stores, canteen etc. of the bidder within project premises			
a	Single point source	Yes		Shall be provided by BHEL on chargeable basis at one point near the site at a distance of approx. 500M. Bidder is advised to visit site to ascertain prevailing tariff, unit charges etc.
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, labour Hutment etc.			Contractor has to make his own arrangements
a	Single point source		Yes	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Payment/Duties and deposits including statutory clearances if applicable		Yes	
3.3	Water Supply:			
3.3.1	For construction purposes:			

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
a	Making the water available at single point (Free of charge)	Yes		BHEL provide water supply (at single point source) for construction purpose on Free of charge basis
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	Water supply for bidder's office, stores, canteen etc.			Contractor has to make his own arrangements
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	Water supply for Living Purpose			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	

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
3.4	Lighting			General area lighting through high mast and other fixtures shall be in the scope of BHEL. However, localized area lighting for bidder's construction site/storage yard/pre-assembly yard/ material handling location, etc. shall be in scope of contractor.
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area 4. At the Fabrication yard		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area 4. At the Fabrication yard		Yes	
c	Providing the necessary consumables like bulbs, switches, etc. during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5	Communication facilities for site operations of the bidder			

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
a	Telephone, fax, internet, intranet, e-mail etc.		Yes	
3.6	Compressed air wherever required for the work			
a	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc.		Yes	
b	Installation of above system and operation & maintenance of the same		Yes	
c	Supply of the all the consumables for the above system during the contract period		Yes	
3.7.1	Demobilization of all the above facilities		Yes	
3.7.2	Transportation			
a	For site personnel of the bidder		Yes	
b	For bidder's equipment and consumables (T&P, Consumables etc.)		Yes	
3.7.3	Erection Facilities			
3.7.3.1	Engineering works for construction:			
a	Providing the erection/constructions drawings for all the equipment covered under this scope.	Yes		Shall be provided progressively.
b	Drawings for construction methods	Yes	Yes	In consultation with BHEL

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
c	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.
d	Shipping lists etc. for reference and planning the activities	Yes		
e	Preparation of erection schedules and other input requirements as per Form-14.		Yes	In consultation with BHEL
f	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
g	Weekly erection schedules based on Sl. No. e		Yes	In consultation with BHEL
h	Daily erection / work plan based on Sl. No. g		Yes	In consultation with BHEL
i	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	

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

Sl. No	Description PART I	Scope		Remarks (for details refer relevant clause of tender document)
		BHEL	Bidder	
j	Preparation of pre-assembly bay		Yes	Materials required for pre-assembly bay shall be in agency scope. However, if available, BHEL may provide such material on free returnable basis, which shall be returned without any damage.

3.8.	Land/Open Space: 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 open space for office, storage shed and laydown area as and where made available by Customer. It is the responsibility of the contractor to construct facilities such as sheds, fabrication/Preassembly yard, provide all utilities and dismantle and clear the site after completion of work or as and when required, as a part of his scope of work.
3.9.	Labour and Staff Colony: Following are in the Bidder's scope of work for labour & staff colony:
3.9.1.	Labour colony is to be developed by bidder for all the labourers required to be deployed for the works. All labour colony set-up is to be developed as per attached layout drawing (Design Shall be in the scope of Contractor)/BHEL's standard guidelines (Annexure-A) for workers accommodation/establishment and in compliance of statutory requirements. Cement & Steel required for the Labor shed/Set shall be in contractor's scope.
3.9.2.	Contractor shall ensure establishment & maintenance of workmen/labour colony in line with BHEL layout drawings & Guidelines (As per Annexure A - Standard Guidelines for Worker's Accommodation / Establishments at BHEL-Project Sites)
3.9.3.	In case labour hutment is not completed as per the drawings, BHEL's guidelines and specification and any penalty is imposed by Customer, same shall be recovered from contracts RA Bill. Rectification and Corrections in labour hutment as pointed out by

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

	BHEL/Customer shall be bidder's responsibility and any cost incurred by BHEL to complete the works, in case of noncompliance of the instructions, same shall be recovered from his RA Bills along with 5% overheads.
3.9.4.	Land for labour colony shall be arranged by Contractor at their own cost as per availability outside project area within 5Km, 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.
3.9.5.	Development of contractor's temporary staff colony and labour colony having adequate no. of rest rooms along with toilets & fencing, medical facility etc. is in the scope of contractor
3.9.6.	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
3.9.7.	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.
3.9.8.	Development and maintenance of above facilities for construction workers deployed by the Contractor shall solely rest with the Contractor.
3.9.9.	Installation of necessary amenities and temporary infrastructure for construction activities at Project site locations. Following are the minimum amenities to be provided by the bidder within the quoted price including removal/disposal of the same in environment friendly manner after its intended use/completion of scope of work: i. Labour rest sheds near work spot. ii. Canteen facility creation. iii. Drinking water facility. iv. Labour Bio toilets near work spot in sufficient nos. with regular cleaning & maintenance arrangement. Exclusive arrangement of Bio toilets to be made at site for ladies v. Labour colony should have all hygienic condition, dining hall, toilets, proper sewerage system, good drinking water arrangements. vi. Regular fogging in the work place and labour colony to avoid mosquitoes. vii. Recreational facilities, etc
3.9.10.	As far as possible unskilled labour shall be engaged from the area in the vicinity of the site.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

3.10.	Construction Power:
3.10.1.	Construction power (three phase, 415 V/ 440 V) shall be provided by BHEL free of cost at One point near the site at a distance of approx. 500M. Further, distribution shall be arranged by the contractor at his own cost and services. Construction power (three phase, 415 V/ 440 V) for office, stores, canteen etc. within the site premises will be provided on chargeable basis near the site at a distance of approx. 500M. Further, distribution shall be arranged by the contractor at his own cost and services.
3.10.2.	Contractor shall deploy and install required energy meter (wherever applicable), cables, fuses, distribution boards, switchboards, bus bars, earthing arrangements, protection devices and any other installation as specified by statutory authority/act. Contractor shall provide at his own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized/ accredited agency for working out the power consumption. In case of recalibration required for any reason the necessary charges including replacement by calibrated meters is to be borne by the contractor. Contractor is advised to maintain the calibrated energy measuring instruments. Contractor shall also obtain approvals of appropriate authority and pay necessary fees, levies etc. towards the clearance of such installations, prior to use.
3.10.3.	Sufficient power factor compensation equipment like capacitor shall be provided by contractor for reactive loads like welding machines etc. In case of any fine/penalty on account of low power factor, same shall be shared by contractor proportionately according to power consumption.
3.10.4.	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.
3.10.5.	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.

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Chapter-III: Facilities in the scope of Contractor/BHEL (Scope Matrix)

3.10.6.	While reasonable efforts will be made to ensure continuous electric power supply, interruptions cannot be ruled out and no claim from the Contractor shall be entertained on this account such as idle labour, extension of time etc. The Contractor shall adjust his working shift accordingly and deploy additional manpower, if necessary, so as to achieve the target.
3.10.7.	Contractor shall be well equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc. to tackle situations arising due to failure of supplied power, so as to ensure continuity and completion of critical processes that are underway at the time of power failure or important activities planned in immediate future.
3.10.8.	BHEL is not responsible for any loss or damage to the Contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply.
3.10.9.	The bidder will have to procure & install general mobile illumination system during construction. This system will include temporary pole lighting, within the quoted price. The illumination should be such that minimum illumination requirement as specified by Indian standards for general illumination is maintained.
3.10.10.	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.
3.11.	Construction water:
3.11.1.	BHEL shall provide water supply free of cost (at single point source) for construction purpose. Contractor has to make arrangement of further distribution of water at his own cost. However, contractor shall make alternate arrangement of construction water till the same is made available by BHEL. No extra payment shall be made under this account.
3.11.2.	The Contractor should make their own arrangements for storage of sufficient quantity of water required for work.
3.11.3.	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.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

- 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 for both Packages A & B with certified operator for execution of work as per Technical Conditions of Contract of this tender within the quoted rate.

For Package A and Package B (Each):

S.N.	DESCRIPTION OF MAJOR T&Ps	CAPACITY	QUANTITY Pkg-A	QUANTITY Pkg-B	REMARKS
1.	Crawler crane with fly jib arrangement	150 MT	01 No.	01 No.	Crane to be made available as per instruction from BHEL Site in-charge. Tentative schedule: 2 nd month from Start of ESP Erection till ATT and FGD Duct erection completion
2.	Crawler/Tyre mounted crane	80 MT	01 No.	-	Crane to be made available as per instruction from BHEL Site in-charge. Tentative schedule: for 32 months from Start of ESP Erection Unit#1 Note- This crane shall be shared/used in package-B works also i.e. common for package-A and Package-B

Note for clause 4.1:

- Contractor shall mobilise 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 mobilised by the contractor without any extra cost.
- Agency shall Mobilize / de-mobilize/ re-mobilise the Major T&Ps as per BHEL instruction without any extra cost to BHEL.

- 4.2. Other T&Ps:** The following **Other Tools & Plants** (T&P) shall be arranged by the Contractor for execution of work under **Package A & B (i.e. in each package)** as per Technical Conditions of Contract of this tender within the quoted rate. Below given Quantities are tentative for planning purposes by the bidder.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

For Package A and Package B (Each):

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	TENTATIVE QUANTITY	REMARKS
1	Tyre mounted mobile crane	18/20/23 MT	As per requirement	Sufficient number for parallel working viz. erection, pre-assembly, material loading unloading etc.
2	Tyre mounted mobile crane	10/12/14 MT	As per requirement	Sufficient number for parallel working viz. erection, pre-assembly, material loading unloading etc.
3	Trailer with prime mover	20 MT	01 no.	As per requirement. Within the quoted rates, adequate number of trailers shall be mobilized by contractor at site so that material feeding for achieving monthly target shall not be impacted
4	Trailer with prime mover	40 MT	As per requirement	
5	Man lifter	min. 40mtr height capacity	As per requirement	
6	Calibrated Power driven HSFG bolt tightening machines	As per requirement	As per requirement	
7	Power Driven Torque tightening machine	As per requirement	As per requirement	
8	Torque calibrator	As per requirement	As per requirement	
9	Bolt Tension Calibrator	As per requirement	As per requirement	
10	Electrical torque wrench	As per requirement	As per requirement	
11	Impact wrench	As per requirement	As per requirement	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	TENTATIVE QUANTITY	REMARKS
12	Torque wrench	As per requirement	As per requirement	
13	Steel tape	As per requirement	As per requirement	
14	Steel ruler	As per requirement	As per requirement	
15	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.)
16	Void			
17	Air compressor/blower (electric/diesel operated)	210 CFM, 7 KG/CM ²	As per requirement	As per requirement
18	Void			
19	TIG welding set	As per requirement	As per requirement	
20	Oxy Acetylene Gas cutting Machine	As per requirement	As per requirement	
21	GTAW Machine: HF Welding Machine & SMAW machine: Inverter based welding machine	As per requirement	As per requirement	
22	DC arc welding machine & Submerged ARC welding M/C	As per requirement	As per requirement	
23	3-phase distribution board with complete set up for drawl of construction power	As per requirement	As per requirement	
24	Power cable for drawl of construction power	As per requirement	As per requirement	
25	Self-drilling cum tapping machine for screws	As per requirement	As per requirement	Prior to start of sheeting works.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	TENTATIVE QUANTITY	REMARKS
26	Radiography arrangement with radioactive isotope source	As per requirement	As per requirement	
27	Theodolite of required accuracy	To ensure verticality of structural columns.	As per requirement	Sufficient number as per instructions of BHEL in-charge and required Since start of work
28	Arrangement for UT of higher thickness joints with recording facility & required calibration blocks.	Type USN 50 or equivalent/ up graded type	As per requirement	If required
29	Welding rectifiers / MIG Welding (electrical)	As per requirement	As per requirement	
30	Welding generator (diesel operated)	As per requirement	As per requirement	
31	Radiography film viewer	As per requirement	As per requirement	
32	Pipe/Tube cutting/ bevelling /chamfering machine	As per requirement	As per requirement	
33	Electro/hydraulic pipe bending machine	Up to 2" nb and 12 mm thick pipes	As per requirement	
34	Baking oven with thermostat and temperature gauge for welding electrodes	As per requirement	As per requirement	Required Since start of work
35	Holding oven with thermostat and temperature gauge for welding electrodes	As per requirement	As per requirement	Required Since start of work
36	Portable oven for welding electrodes	As per requirement	As per requirement	Required Since start of work
37	Pug Cutting machines	As per requirement	As per requirement	
38	Chain pulley blocks	As per requirement	As per requirement	
39	Electric winch	1/2/3/5 MT capacity	As per requirement	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	TENTATIVE QUANTITY	REMARKS
40	Hand winch	0.5 ton/1.0 MT capacity	As per requirement	
41	Battery Driven emergency light	As per requirement	As per requirement	
42	Scaffolding materials with clamps for insulation, painting etc works	As per requirement	As per requirement as decided by BHEL engineer	
43	Profile making m/c	For aluminium sheet cladding work	As per requirement	
44	Nibbling m/c	As per requirement	As per requirement	
45	Shearing m/c	As per requirement	As per requirement	
46	Portable grinding m/c	As per requirement	As per requirement	
47	Portable drilling m/c	As per requirement	As per requirement	
48	Hoisting and pulley devices/pulleys	As per requirement	As per requirement	
49	Spanners / Eye Bolts (of All Sizes)	As per requirement	As per requirement	
50	Magnetic particle testing equipment – DRY &WET Type	As per requirement	As per requirement	
51	Hydraulic Jacks	10/20/50/100 MT	As per requirement	
52	Dewatering pumps	As per requirement	As per requirement	
43	Various sizes of clamps/ fixtures for assembling	As per requirement	As per requirement	
44	Hand Operated Megger 500 / 1000 V	As per requirement	As per requirement	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	TENTATIVE QUANTITY	REMARKS
45	Tong Tester 10, 20 Or 50 Amp + / - 3 % Accuracy	As per requirement	As per requirement	
46	Digital and Analogue Multimetres	As per requirement	As per requirement	
47	U Tube Manometer 0-2000 mm Water Column	As per requirement	As per requirement	
48	Inclined Manometer 0-50 mm Water Column	As per requirement	As per requirement	
49	Concrete Blocks	As per requirement	As per requirement	For making bed of steel structure for checking dimensional accuracy, configuration and minor rectification.
50	Wooden/Concrete sleeper 1.5-2.0 Mtr length	As per requirement	As per requirement	
51	PMI (Positive Material Identification)	As per requirement	As per requirement	
52	Equipment for carrying out NDT test like LPI/MPI etc along with consumables.	As per requirement	As per requirement	
53	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	
54	Digital Elcometer for paint thickness checking	As per requirement	As per requirement	
55	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	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IV: T&Ps and MMEs to be deployed by Contractor

SN	DESCRIPTION OF OTHER T&Ps	CAPACITY (MINIMUM)	TENTATIVE QUANTITY	REMARKS
56	Suspended working platform Size :7mX1mX0.5m, Rated load 800 kg to 1000 Kg,	As per requirement	As per requirement	Prior to start of sheeting works.
57	Spot Welding M/c	As per requirement	As per requirement	
58	Hand operated pressurizing pump	As per requirement	As per requirement	

4.3.	List of suggestive safety Equipments /PPEs to be brought by Contractor for Package A and Package B (Each):		
1.	Safety Net (Conforming IS 11057:1984) Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12mm diameter polypropylene rope (tested as per IS: 5175). Two meters length shall be provided at all four corners.	20-30 Nos (Fire resistant)	
2.	Fall Arrester 'Rope grab fall arrestor' & anchorage line. Anchorage Line: 14mm- 16 mm diameter, three strand twisted Polyamide rope. Rope Grab fall arrestor: Openable & Guided type Fall Arrestor (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope. Material: Nickel Chrome plated Steel. Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN), material: Steel	15-20 Nos. of Rope Grab Fall arrestor' and Karbiner each, 10-15 nos. anchorage line, 30 metre long each, 5 nos. anchorage line, 40 metre long each,	
3.	Horizontal life line Stainless Steel Wire rope of 8mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end).	5-10 nos. of wire rope, each 40-metre-long 15 nos.. of wire rope, each 25 metre long.	
4.	Ladders on column The minimum design live load on metallic ladder shall be a single concentrated load of 100 kilo grams. All rungs shall have a minimum diameter of 1.9 cm and minimum clear length of rungs shall be 40.6 centimetres. The distance between rungs shall not exceed 30.5 centimetres. Each ladder shall have maximum height of 9.0 metre.	Cumulative length of ladders is 200-300 metres	

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Chapter-IV: T&Ps and MMEs to be deployed by Contractor

	The ladder shall have proper fastenings for attaching it to a column using positive means such as bolt, weld or other type of fasteners.	
5.	Full body safety harness double lanyard with shock absorber	As per requirement (tentatively 70 nos.)
6.	Industrial Safety Helmet	As per requirement (tentatively 200 nos.)
7.	Industrial Safety Shoes	As per requirement (tentatively 200 nos.)
Note: - Above items and quantities are indicative and tentative. Any items required in quantity or type, more than mentioned above or in addition, has to be arranged by Contractor at its own cost.		

4.4.	List of suggestive safety Equipments /PPEs to be included in List of minimum T&P for Package A and Package B (Each):	
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 EN 74 for hard barricading	As per requirement
7.	Axial Fan with exhaust hood for confined space working and DC Light Unit	Min 1Nos each
8.	Oxygen Meter	1 No
9.	Fire Blanket	Min 100 Mtr
10.	Fire resistant tarpaulins	20 Nos
11.	Safety Posters as per BHEL Guidelines	As per requirement and instruction of BHEL
12.	Fire Extinguishers: ABC – 6 Kg: 20 Nos, Co2 – 4.5 Kg: 10 Nos, Foam – 9 Kg: 3 Nos Fire Bucket (set of ¾ buckets) with stand – 5 Nos	
13.	Rubber Mat as per IS 15652	Min 100 Sqm
14.	Electrical rubber gloves	As per requirement

Note- Please refer BHEL HSE plan (Annexure-C) in respect of safety equipment/PPEs. Separate annexure issued to all contractor at the time of execution of work by Safety officer of BHEL with approval of construction manager/ GM/ PD. PPEs Quantity annexure issued by site are final and agency must fulfill the same during execution of work.

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Chapter-IV: T&Ps and MMEs to be deployed by Contractor

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 12 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 not permitted 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.
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-asertain/ 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 type or 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 in S.No. 4.2 above (Other than mentioned in S.No. 4.1 Major T&Ps) 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

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	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.
4.21.	In the eventuality of contractor not deploying / abnormal down time of T&P/cranes in his scope during the period specified above, and BHEL arranges for the same [BHEL's own cranes], prevailing BHEL Corporate Crane hire charges (which may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed as part of tender document as file titled "Annexure-B-BHEL T&P Hire Charges". <i>(Please note that these charges are as valid up to Aug'2027 and may get revised further).</i> 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 this scope of work, except the Tools & Plants mentioned in Chapter V of TCC: T&Ps to be provided by BHEL , 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.

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	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.
4.29.	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.
4.30.	Such of those consumables as indicated as consumables provided by BHEL alone will be provided to the contractor by BHEL free of charge for erection activities. Other required consumables like electrodes, all gases, and other materials for this scope of work are to be arranged by the contractor at their cost.
4.31.	Imported electrodes / TIG welding wires released by manufacturing unit, if any, will be given by BHEL. All other electrodes / TIG welding wires including stainless steel electrodes and Filler wires required for shall be arranged by the contractor at his cost. However, BHEL will provide imported electrodes as provided by manufacturing units. In any case, if the requirement of the electrodes is more than the BHEL MU supplied quantities, Bidder has to arrange the same at his cost. In case, BHEL arranges the electrodes on Bidders behalf, the applicable cost along with 5% overheads towards the purchase of the electrodes shall be recovered from the monthly RAB of the bidder. The bidder shall use the Customer approved quality welding electrodes only.
4.32.	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.
4.33.	<u>LIFTING OPERATIONS FOR CRANE</u>

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Chapter-IV: T&Ps and MMEs to be deployed by Contractor

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.

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.

Contractor lifting plans include:

- 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 12 years from the current year shall be only allowed to be used at project Site's. Pre-safety Inspection of the equipment by safety deptt. shall be done before mobilizing the equipment at our project site.

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

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	riggers) and must be checked and issued prior to lifting operation. Clear communication channels must be formally established and maintained between everyone involved in a lift with only authorized person giving instruction to the operator. Special permission needs to be taken from Customer for tandem lifting and for any non-routine lifting operations must strictly adhere to the guidelines described in corresponding Standard / Procedures / Directive. No employee of the contractor shall be positioned under a suspended load or between a suspended load and fixed objects. 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. 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.
4.34.	Penalty due to non-availability of T&Ps: In order to meeting the site requirement and in line with monthly plan and review format (F-14), Contractor has to mobilise their T&Ps and made available at site for required activities. For Major T&Ps, if contractor fails due to, either of the case, 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)'. Case 1: Contractor fails to mobilise the same within the mobilisation period of 30 days from the date of intimation. OR Case 2: After mobilisation of T&P at site, the work is getting hampered due to non-availability of T&P for more than 05 days from the date of such intimation, Penal rate for Major T&Ps is mentioned hereunder: 150 MT Crane – Rs. 20,832/day 80 MT Crane- Rs. 8,765/day

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Chapter-V: T&Ps AND MME TO BE DEPLOYED BY BHEL ON SHARING BASIS

5.0 LIST OF T&P TO BE PROVIDED BY BHEL FREE OF HIRE CHARGES ON SHARING BASIS:

5.1. BHEL shall provide following T&Ps on sharing basis in each package:

SL NO	DESCRIPTION & CAPACITY OF T&P	QUANTITY	REMARKS
1	Cranes	As decided by BHEL	All cranes (except that in Contractor scope as mentioned in 4.1), if required for mentioned work, will be arranged by BHEL as per requirement.
2	Venturi meter along with Air blower	As required	
3	Huck Bolting Machine	As required	BHEL will provide only Huck bolting machine with one set of 12mm and 16mm jaws. Further requirement of jaws to be arranged by the contractor at his cost. Consumables like O-ring, backup ring, springs, hydraulic fluid for top-up etc., required for maintenance of the Huck Bolting machine to be arranged by contractor at his cost

5.2.	All the T&Ps mentioned in clause 5.1 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.
5.3.	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 mentioned in Cl. no 5.1 for his use.
5.4.	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.
5.5.	All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections for the BHEL issued T&Ps shall have to be arranged by the contractor at his cost.
5.6.	The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to agency. Necessary grout materials are to be arranged by the contractor at his cost.

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5.7.	The day-to-day and routine maintenance including replacement of spares for the BHEL T&Ps will be carried out by the contractor at his own cost. However, BHEL shall supply spare parts free of charges for normal wear and tear only.
5.8.	Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor.
5.9.	T&Ps 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.
Note	For BHEL Owned or hired Crane:
	1. The cranes may be BHEL owned or may be obtained on hiring basis including operating and maintenance crew.
	2. Operator and O&M for BHEL Owned/Hired crane will be provided by BHEL (including extended hours), free of charge.
	3. Contractor shall provide the fuel for BHEL provided cranes (Hired/owned) for his use.
	4. Contractor shall make necessary arrangements like laying of special sleeper beds and steel plates (Plates for BHEL owned/ hired cranes shall be provided by the BHEL), assembly and dismantling of heavy attachment, boom, jib etc. for movement and operation of the crane. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work. Levelled & reasonably compacted area will be provided by BHEL/customer for the movement of BHEL cranes. If any, further Consolidation of the ground with hard-crusting of Area required for movement of crane (including civil work with material) for placing crane for operation shall be facilitated by BHEL. Necessary plates required for marching operation shall be provided by the BHEL only for BHEL owned cranes.

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Chapter-VI: Time Schedule

6.0 TIME SCHEDULE & MOBILIZATION

6.1.	Time Schedule and Mobilization:
6.1.1.	Initial Mobilization and Time Schedule: After issue of LOA (though Fax/courier/email) the contractor shall report to the Construction Manager/Site In-Charge of BHEL at site within Two weeks (14 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. The activities for Erection etc. shall be started as per directions of Construction Manager of BHEL. The contractor has to subsequently augment his resources in such a manner that the project milestones are completed on specified schedules and entire work completed within the entire contract period, as specified in the following clause from the date of start of work, in a manner required by BHEL to match with the project schedule.
6.1.2.	COMMENCEMENT OF CONTRACT PERIOD The date of start of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy, the decision of BHEL shall be considered to be final and binding to contractor. The contractor shall have to mobilize his resources before the start of contract period for preparatory work like taking over of Foundations, drawing & materials and chipping of foundations, blue-matching, grouting of packer plates etc. and start of pre-assembly Based on the availability of civil foundations, drawings and material from BHEL, contractor may have to advance the erection activity after getting clearance from Construction Manager, or the erection activity may get delayed due to site conditions. The contractor shall 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.
6.2.	Schedule of Completion: The contract period for completion of entire work under scope shall be as mentioned hereunder, from the “START OF CONTRACT PERIOD” as specified earlier for completion of the entire work in respective Package.

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	S.No.	Package	Contractual Schedule (Months)
	1.	Package-A: Unit # 1 ESP (Electrostatic Precipitator) and its auxiliaries including ducting from ESP outlet to Chimney Inlet and FGD & auxiliaries as per BOQ at 2x660 MW MSPGCL Koradi BTG TPS	32 Months
	2.	Package-B: Unit # 2 ESP (Electrostatic Precipitator) and its auxiliaries including ducting from ESP outlet to Chimney Inlet and FGD & auxiliaries as per BOQ at 2x660 MW MSPGCL Koradi BTG TPS	32 Months

6.3. The schedule of important milestones is as follows:

6.3.1. ESP & FGD including Ducting for Package A (unit-1) and Package B (unit-2)		
SL No.	Milestones	Tentative Schedule w.r.t start of contract period
1.	ESP Erection Start	1 st Month
2.	FGD Erection Start	3 rd Month
3.	Completion of Air Tightness Test of ESP	23 rd Month
4.	Readiness of Flue Gas Ducting	24 th Month
5.	Readiness for Boiler Light Up (BLU)	26 th Month
6.	Completion of FGD ducting	27 th Month
7.	Readiness for Synchronization on Coal	29 th Month
8.	Readiness for Full Load Operation	30 th Month
9.	Completion of Trial Run /Initial Operation	31 st Month
10.	Completion of Facilities	32 nd Month

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Chapter-VI: Time Schedule

6.3.2.	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.	
6.3.3.	In order to meet the above schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, Contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL Engineer w.r.t. monthly plan and review format (F-14).	
6.4.	Intermediate milestones:	
6.4.1.	Two Major Intermediate Milestones are identified as M1 and M2 above.	
	Milestones for Package A	Tentative Schedule from start of work
M1	Completion of Air Tightness Test of ESP	23 rd Month
M2	Readiness for Full Load Operation of Unit#1 (First Unit)	30 th Month
	Milestones for Package B	Tentative Schedule
M1	Completion of Air Tightness Test of ESP	23 rd Month
M2	Readiness for Full Load Operation of Unit#2 (Second Unit)	30 th Month
6.4.2.	Provision of Penalty in case of slippage of Intermediate Milestones: In case of slippage of Two Major Intermediate Milestones, mentioned as M1 & M2 above, delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to F-14.	
6.4.3.	In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld.	
6.4.4.	In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value, will be withheld.	
6.4.5.	Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone.	
6.4.6.	Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (corresponding RA Bill) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.	

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6.4.7.	Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion/ closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.
6.4.8.	In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery.
6.4.9.	Contractor shall make all possible efforts to expedite the activities, in case of delay of any intermediate milestone, to maintain overall project completion schedule.
6.4.10.	* Executable Contract Value - Value Of work for which inputs/ fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.
6.5.	COMPLETION OF WORK AND COMMENCEMENT OF GUARANTEE PERIOD
6.5.1.	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.
6.5.2.	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.
6.5.3.	The BHEL Engineer shall certify to the contractor the date on which the work is completed and the date thereof for commencement of Guarantee Period. Guarantee Period shall be as given in GCC (clause 2.24). The work shall be deemed to be completed upon substantial completion of work leaving aside minor pending works/punch point liquidation/defects which are not likely to affect overall performance of the system. The decision of EIC shall be final and binding on the vendor.
6.6.	The contractor shall submit and a detailed area/structure wise L3 schedule within 25 days from date of LOA, in consultation with BHEL, based on the tentative schedule provided as above. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Bidder shall submit L3 schedule in MS Projects and excel to meet the agreed project schedule covering various mile stone activities and their split-up details such as mobilization, procurement of materials & erection activities. This schedule shall also clearly indicate the interface facilities / inputs applicable in each package. Bidders shall submit Resource

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	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.
6.7.	The under mentioned Records/ Log-books/ Registers applicable to be maintained.
	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.
6.8.	Control and monitoring of progress of work
6.8.1.	Refer forms F -14 to F-15 of volume I D (Forms & Procedure). Plan and review will be done as per the formats.
6.8.2.	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.
6.8.3.	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.
6.8.4.	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.
6.8.5.	Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.
6.8.6.	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.
6.8.7.	The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.

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6.8.8.	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.
6.8.9.	The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.
6.9.	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.
d	Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, 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.
6.10.	Site Data Digitalisation: Daily Activity Log, M-Book and Subcontracting Billing Module: -
a	<u>Refer Vendor Portal System with links: for ref. https://pshq.bhel.in/sddvp/</u>
b	Login ID and Password shall be provided by respective package manager.
c	Contractor by clicking 'Daily Work Photos', shall upload area wise photos on daily basis.
d	Contractor by clicking 'Daily Activity Log', shall update site activities on daily basis.
e	Contractor by clicking 'Measurement Book', shall enter Measurement Book in Format and BOQ.
f	Contractor shall raise their RA Bills along with supporting documents (such as Quality and HR Document – Vetted by Customer Etc.) and checklist through SDD portal only.
g	Contractor shall comply the system requirement.
h	Refer Vendor Manual for further details.
	Note: The contractor shall be required to provide all facilities including manpower for the aforementioned activities, without any cost implications to the BHEL.

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6.11.	Agency shall extend all support towards inputs for IPMS system for project monitoring and control.
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Chapter-VII: TERMS OF PAYMENT

7.0 Terms of payment

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 under each Package: Payment shall be regulated progressively as mentioned in Table 7.1 & 7.2 below.

7.1 Progressive Payment against monthly running bills will be made upto **85 %** of the value of the erected Pro-rata as per SL no 7.1.1 to 7.1.12 of the following table:

Sl No.	Sub Packages ----->	ESP	Structure	Non-Pressure Parts (NPP)	Rotating Machines	Piping (CS, GI, SS)	Insulation (Wool mattress, Iron com, Sheeting)
	Rate schedule Identifier --->	1A	1B	1C	1D	2A	3A, 3B, 3C
	Pro rata payments (85%)						
7.1.1	On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position)	15%	20%	25%	15%	15%	--
7.1.2	Readiness of scaffolding arrangement in position (if not applicable, this portion shall be clubbed with placement in position)	--	--	--	--	--	25%
7.1.3	Placement in position	25%	20%	10%	20%	20%	35%
7.1.4	Alignment (with grouting etc wherever applicable)	15%	20%	15%	21%	20%	5%
7.1.5	Welding/bolting/fixing/Torque check/tightness check of bolts	20%	20%	23%	20%	20%	20%

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SI No.	Sub Packages ----->	ESP	Structure	Non-Pressure Parts (NPP)	Rotating Machines	Piping (CS, GI, SS)	Insulation (Wool mattress, Iron com, Sheeting)
	Rate schedule Identifier --->	1A	1B	1C	1D	2A	3A, 3B, 3C
7.1.6	Inspection of Bolt Tightening/Torque checking for bolted structure/ Welding inspection & NDE (DP test etc.)	5%	5%	--	--	--	--
7.1.7	Completion of non-destructive examination – as per approved FQP/EWS (if not applicable, then this portion to be paid along with S.No. 7.1.4)	--	--	2%	--	5%	--
7.1.8	Completion of Stress relieving/ heat treatment as per approved FQP / EWS (if not applicable, then this portion to be paid along S.No. 7.1.4)	--	--	--	--	2%	--
7.1.9	Erection of emitting and collecting rapping system with drivers	5%	--	--	--	--	--
7.1.10	Hangers & supports etc wherever necessary as per drg	--	--	10%	--	3%	--
7.1.11	Equipment trial operation	--	--	--	8%	--	--
7.1.12	Completion of PGMA				1%		
	TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)	85%	85%	85%	85%	85%	85%

7.2 Further **15%** payment will be made on pro-rata basis shall be released on achievement of the following stage / milestones events (as per Cl no 7.2.1 to 7.2.11 of the following table) for the tonnage erected:

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SI No.	Sub Packages ----->	ESP	Structure	Non-Pressure Parts (NPP)	Rotating Machines	Piping (CS, GI, SS)	Insulation (Wool mattress, Iron com, Sheeting)
	Rate schedule Identifier -->	1A	1B	1C	1D	2A	3A, 3B, 3C
	STAGE/MILESTONE PAYMENTS (15%)						
7.2.1	Completion of air & gas tightness test for ESP, Ducts, Absorber	4%	5%	7%	--	--	--
7.2.2	Charging of ESP fields	2%	--	--	--	--	--
7.2.3	Hydraulic Test	--	--	--	--	6%	--
7.2.4	Boiler light up	2%	3%	1%	--	--	5%
7.2.5	Full load	1%	1%	--	4%	--	3%
7.2.6	Trial/Initial operation of unit	1%	1%	3%	5%	3%	3%
7.2.7	Completion of Painting works	1%	1%	--	1%	1%	--
7.2.8	Area cleaning, temporary structures cutting/removal and return of scrap	1%	1%	1%	1%	1%	1%
7.2.9	Punch List points/pending points liquidation	1%	1%	1%	2%	2%	1%
7.2.10	Material Reconciliation	1%	1%	1%	1%	1%	1%
7.2.11	Completion of Contractual Obligation	1%	1%	1%	1%	1%	1%
	TOTAL FOR STAGE/MILESTONE PAYMENTS (15%)	15%	15%	15%	15%	15%	15%
	TOTAL 7.1 + 7.2	100%	100%	100%	100%	100%	100%

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7.3	Progressive Payment/ Final Payment: The payments for works under the scope of this contract for both the packages shall be as per clause no 2.6; 2.22; 2.23 of General Conditions of Contract and Volume-IB, Chapter-X of SCC.
7.3.1	<u>Documents required for RA Bill:</u>
	GST Complied Invoice of the work done as per approved BBU.
	WAM -6 for RA Bill.
	Jointly signed Measurement sheet.
	Power of Attorney before submission of Bill.
	Validity of Bank Guarantees as applicable under the contract.
	Monthly HSE Compliance Certificate certified by BHEL- Safety including compliance for worker's accommodation
	Material reconciliation statement alongwith RA Bill (Monthly basis).
	Jointly signed quality check protocols as per FQP
	<u>HR/IR compliance documents:</u>
	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.
7.3.2	<u>Documents required for Final Bill:</u>
	The final bill is drawn as soon as the entire work is completed. From the final amount due, all amounts already claimed up to the previous running account bill will be deducted. It should be ensured that in the final bill the following additional particulars have been provided: - 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 etc.

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	• 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.
7.3.3	The payment for running bills will be released after submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc. and other dues in the meanwhile. No interest shall be payable for the delayed payment (if any).
	Few points of consideration are as below:
	i. The measurements sheets of work done in a month shall be submitted in triplicate duly agreed/signed by BHEL Engineer. The contractor shall extend all necessary assistance for verification of measurements of works without any extra cost.
	ii. Material reconciliation shall be complied on monthly basis.
	iii. The RA bill payments are interim payments and bills shall be submitted in prescribed formats.
	iv. Recoveries on account of electricity , water, statutory deductions etc. shall be made as per terms of contract.
	v. BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS.
7.4	vi. Final bill shall be submitted after completion of works and upon material reconciliation along with all prescribed formats.
	Quoted Rates are inclusive of all labour, contractor's equipment, temporary works, consumables and all matters and things of whatsoever nature, charges for Safety Aspects/Compliance to Safety Rules including operations and maintenance services (if applicable) etc., and other services, as identified in the tender Documents, as necessary for the proper execution of the subject work.
7.4	SECURED RECOVERABLE ADVANCES:
	Interest Free Secured Mobilization Advance as per GCC Clause No. 2.13.1 will be payable under exceptional circumstances on certification of BHEL Construction Manager at Site. Interest Free Mobilization Advance shall be disbursed in specifically mentioned stages of major respective resource mobilization as specified hereunder:

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For Package-A/B

1. For Mobilization of **01 no. of 150 MT Mobile crane - 2.0%** of Contract value of each package (A/B).
2. For Mobilization of balance **required T&Ps and resources at site to start the work in Package A/B as finalised with BHEL Engineer In-Charge - 2%** of Contract value of each package (A/B).
3. For Installation and Erection of **Site Infrastructure by contractor i.e. site office stores, etc. - 01%** of Contract value of each package (A/B).

Note:

1. BHEL Site-CM shall be the deciding authority for assessing the admissibility of advance payment to contractor.
2. In case contractor do not fulfil the agreed conditions of payment of earlier mobilization advance, BHEL Construction Manager will have the authority to not allow the subsequent mobilization advance to contractor.

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Chapter-VIII: Taxes and Duties

8.0	TAXES & DUTIES
8.1	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. However, provisions regarding GST on output supply (goods/service) and TDS/TCS as per Income Tax Act shall be as per following clauses.
8.2	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.

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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	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: - 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.

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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.
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	<u>Variation in Taxes & Duties:</u> 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. 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.

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	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.
8.3	<u>Income Tax:</u> TDS/TCS as applicable under Income Tax Act, 1961 or rules made thereunder shall be deducted/collected from contractor's bill.

8.4 BOCW Act & Cess Act

8.4.1 BOCW Cess is not to be borne by contractor. Refer Annexure-1 for BOCW Act & Cess Act.

Annexure-1:	
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

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	Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.
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 sub-contractor 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: 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 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.

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BILL OF QUANTITY/WEIGHT SHCEDULE

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

SI No	Rate Schedule	Description	Package-A (Unit#1) Tentative Weight (MT)	Package-B (Unit#2) Tentative Weight (MT)	Total Qty (unit # 1 & 2) (MT)
1	1A	ESP	11,083.14	11,083.14	22,166
2	1B	Structure (Absorber structure, Duct structure etc.)	3,293.85	2,690.05	5,984
3	1C	NPP (Ducting, Gates & Dampers)	1,842.37	1,889.37	3,732
4	1D	Rotating Machines	1,308.02	211.50	1,520
5	2A	Piping-CS, GI & SS	383.70	227.50	611
6	3A	Insulation-Wool Mattress	577.00	577.00	1,154
7	3B	Insulation-Iron Parts	209.00	209.00	418
8	3C	Insulation- Aluminium Cladding Sheets	163.00	163.00	326
		Total	18,860	17,051	35,911

Note to weight schedule:

1	The PGMA/Weights/Quantities/dimensions mentioned above are approximate and liable to vary as per design consideration. There will be change in weight, description etc. However, payments will be made for the tonnage actually erected at the quoted rate. Quantity Variation will be dealt as per clause 2.14 of General Conditions of Contract (Volume I BCD).
2	A material breakup is indicated in the relevant chapter of this tender specification, but the contractor is required to erect actual tonnage which may be necessary to complete the work in all respects as detailed in the tender specifications, for which payments shall be released based on agreed rates. The weights and dimensions of material shown are approximate and are liable to vary.
3	Besides PG / PGMA 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 PGMA's, 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.

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4	Rate Schedule Identified are based on envisaged material specification. Payment shall be made on the basis of material specification of actual material received and erected at site irrespective of PGMA allocation in the weight schedule. BHEL's decision in this regard shall be final.
5	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 shall be carried out as a part of work. 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. Dismantling of temporary piping, edge preparation and return to BHEL stores, area cleaning is in the scope of contractor. Required pipes, valves, blanks, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by agency and returned to BHEL. All thermo well points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded. No Extra Payment shall be made for the same.
6	Fixing components for insulation: The scope of works covers welding of all attachment on the ESP and auxiliaries, Ducting, FGD area etc for fixing insulation & accessories.
7	The Erection of MOTORS/HVR are covered in this scope of contract. However, dry out, testing and commissioning is not in the scope of this contract.

9.1 Detailed (PGMA wise) weight of BOQ for ESP and its auxiliaries and ducting from ESP outlet to Chimney Inlet, FGD & auxiliaries: -

Package A: Unit # 1

Area	PGMA	PGMA Description	Estimated Design Wt. (in MT)	BHEL Unit	Item	Rate Schedule
ESP	79981	SUPPOTING STRUCTURES FOR ESP	809.93	Ranipet	ESP	1A
ESP	79901	ROLL/SLIDE SUPPORTS	15.62	Ranipet	ESP	1A
ESP	79943	HOPPER RIDGES	113.96	Ranipet	ESP	1A
ESP	79948	CASING STRUCTURE	871.85	Ranipet	ESP	1A
ESP	79949	CASING SHELL/PANEL	899.08	Ranipet	ESP	1A
ESP	79928	ESP ROOF BEAM	310.77	Ranipet	ESP	1A
ESP	89610	EP GALLERIES&STAIRS	125.73	Ranipet	ESP	1A
ESP	89612	FLOOR GRILL AND STEP TREAD	86.93	Ranipet	ESP	1A
ESP	79814	SUPPORT INSULATORS	24.62	Ranipet	ESP	1A

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ESP	79911	GAS SCREEN-EP	8.00	Ranipet	ESP	1A
ESP	79913	EMIT SYST SUSPENSION	29.55	Ranipet	ESP	1A
ESP	79919	COL ELEC SUSPENSION	191.00	Ranipet	ESP	1A
ESP	79920	COLLECTING ELECTRODE	2,176.75	Ranipet	ESP	1A
ESP	79921	EMIT SYS FRAME-TOP	172.80	Ranipet	ESP	1A
ESP	79922	EMIT SYS FRAME BOTOM	235.00	Ranipet	ESP	1A
ESP	79924	SHOCK BARS	145.10	Ranipet	ESP	1A
ESP	79932	EMIT SYS FRAME-MIDLE	420.00	Ranipet	ESP	1A
ESP	79946	INSULATOR SUPP PANEL	151.12	Ranipet	ESP	1A
ESP	79955	PENT HOUSE FOR E P	250.00	Ranipet	ESP	1A
ESP	89614	PENT HOUSE ROOFING SHEETS	43.00	Ranipet	ESP	1A
ESP	79908	GAS DIST. ASSY	112.00	Ranipet	ESP	1A
ESP	79915	EMITTING ELECTRODES	46.05	Ranipet	ESP	1A
ESP	79942	OUTER ROOF-EP	372.00	Ranipet	ESP	1A
ESP	79944	HOPPER UPPER PART	406.00	Ranipet	ESP	1A
ESP	79945	HOP MLD&LOWER PART	1,035.00	Ranipet	ESP	1A
ESP	79947	ROOF PANEL ASSY	239.40	Ranipet	ESP	1A
ESP	79950	INLET-OUTLET FUNNEL	250.00	Ranipet	ESP	1A
ESP	79957	SPLITTER&GUIDE VANES	43.00	Ranipet	ESP	1A
ESP	79925	COLL ELECT RAPP MECH	115.50	Ranipet	ESP	1A
ESP	79841	ELECTRICAL MISCELLANEOUS ITEMS	19.80	Ranipet	ESP	1A
ESP	79906	INSULATOR HOUSING AS	80.00	Ranipet	ESP	1A
ESP	79916	EMIT ELECT RAPP MECH	85.90	Ranipet	ESP	1A
ESP	79917	DRIVE ARGT. FOR EMIT. SYS	63.00	Ranipet	ESP	1A
ESP	79965	APP PLATFORM-HOPPER	160.00	Ranipet	ESP	1A
ESP	89611	ESP ROOF HANDRAILS	16.00	Ranipet	ESP	1A
ESP	89613	FLOOR GRILL AND MOBILE LADDER	103.74	Ranipet	ESP	1A
ESP	79831	GEARED MOTORS FOR RAPPING MECH	37.00	Ranipet	ESP	1A
ESP	79859	SUPPORTS FOR ELECTRICAL ITEMS	30.00	Ranipet	ESP	1A
ESP	79863	ASH LEVEL INDICATOR	3.86	Ranipet	ESP	1A
ESP	79872	INTERLOCKS-EP	3.56	Ranipet	ESP	1A
ESP	79873	ELECTRICALLY OPERTD HOIST&ACCE	10.11	Ranipet	ESP	1A
ESP	79890	HEATING ELEMENTS	1.58	Ranipet	ESP	1A

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ESP	79905	ESP-SUB-DELIVERY COMPONENTS	1.10	Ranipet	ESP	1A
ESP	79909	GD-RAPPING MECHANISM	19.74	Ranipet	ESP	1A
ESP	79910	GD_DRIVE ARRANGEMENT	1.38	Ranipet	ESP	1A
ESP	79923	INSPECTION DOORS	17.00	Ranipet	ESP	1A
ESP	79926	COLL ELEC RAPP DRIVE	12.36	Ranipet	ESP	1A
ESP	79961	EP PERF TEST EQUIPT	30.70	Ranipet	ESP	1A
ESP	79830	ELECTRICAL SD COMPTS	33.05	Ranipet	ESP	1A
ESP	79860	CABLE-CABLE RACKS	390.60	Ranipet	ESP	1A
ESP	79891	PANEL TYPE HOPPER HEATERS & AC	30.00	Ranipet	ESP	1A
ESP	79966	WATER WASHING SYSTEM	8.30	Ranipet	ESP	1A
ESP	79989	GUIDE PLATE/VANE EP INLET DUCT	14.00	Ranipet	ESP	1A
ESP		HVR	210.60	Jhansi	ESP	1A
		Total (ESP)	11,083.14			
FGD	FY779	SUPPORTS FOR CABLE TRAYS/CONTR	48.00	Ranipet	Structure	1B
FGD	FW386	INTER-CONNECTING PLTF TO ABS	8.00	Ranipet	Structure	1B
FGD	FW385	ELEVATOR M/C ROOM & GUIDE ,	15.00	Ranipet	Structure	1B
FGD	FW384	ELEVATOR FLOOR GRILL	26.00	Ranipet	Structure	1B
FGD	FW383	ELEVATOR STAIR AND HAND RAIL	11.00	Ranipet	Structure	1B
FGD	FW382	ELEVATOR FLOORS	19.00	Ranipet	Structure	1B
FGD	FW381	ELEVATOR BEAM AND BRACING	66.00	Ranipet	Structure	1B
FGD	FW380	ELEVATOR COLUMN	40.00	Ranipet	Structure	1B
FGD	FW372	HSFG BOLT-ELEV STRUC	2.00	Ranipet	Structure	1B
FGD	FW322	ABSORBER SYSTEM-CASING INTERM	127.00	Ranipet	Structure	1B
FGD	FW318	ROOF SHEETING	11.00	Ranipet	Structure	1B
FGD	FW317	NOZZLES & MANHOLE DOORS EQWT	1.00	Ranipet	Structure	1B
FGD	FW309	MONORAIL BEAM ABSORBER AREA	21.00	Ranipet	Structure	1B
FGD	FW307	ABSORBER MISCELLANEOUS	2.00	Ranipet	Structure	1B
FGD	FW306	ABSORBER HSFG FASTNERS	7.00	Ranipet	Structure	1B

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FGD	FW305	ABSORBER STAIRS & HANDRAILS	24.00	Ranipet	Structure	1B
FGD	FW304	ABSORBER FLOOR GRILLS	50.00	Ranipet	Structure	1B
FGD	FW303	ABSORBER UPPER FLOORS	3.00	Ranipet	Structure	1B
FGD	FW302	ABSORBER LOWER FLOORS	18.00	Ranipet	Structure	1B
FGD	FW301	ABSORBER BEAMS AND BRACINGS	156.00	Ranipet	Structure	1B
FGD	FW300	ABSORBER COLUMNS	79.00	Ranipet	Structure	1B
FGD	FW285	SUPRTING STR FOR EMERGENCY QWT	6.00	Ranipet	Structure	1B
FGD	FW231	ABSORBER SHEAR PLATE	12.00	Ranipet	Structure	1B
FGD	FW226	EMERGENCY QUENCH WATER TANK	19.00	Ranipet	Structure	1B
FGD	FW224	ABSORBER SYSTEM-LINING-C276	20.00	Ranipet	Structure	1B
FGD	FW222	ABSORBER SYSTEM-CASING TOP	86.00	Ranipet	Structure	1B
FGD	FW221	ABSORBER SYSTEM-CASING BOTTOM	94.00	Ranipet	Structure	1B
FGD	FW219	ABSORBER SYSTEM-BASE	23.85	Ranipet	Structure	1B
FGD	FW218	ABS SPRAY PIPE SUPP	26.00	Ranipet	Structure	1B
FGD	FW217	ABS ME SUPPORT	49.00	Ranipet	Structure	1B
FGD	FW216	ABS BAFFLE GRATING SUPP	14.00	Ranipet	Structure	1B
FGD	FW209	MAN HOLE DOOR FOR ABSORBER	4.00	Ranipet	Structure	1B
FGD	FW208	RC PUMP OB SUPPORT	13.00	Ranipet	Structure	1B
FGD	FW203	NOZZLE NB25 TO NB250	1.50	Ranipet	Structure	1B
FGD	FU615	GALLERIES AND RAILINGS-INS&SAM	20.00	Ranipet	Structure	1B
FGD	FU613	GALLARIES AND RAILINGS FOR DUC	10.00	Ranipet	Structure	1B
FGD	FU612	GALLARIES AND RAILINGS FOR DAM	30.00	Ranipet	Structure	1B
FGD	FU399	DUCT EREC MATERIALS	10.00	Ranipet	Structure	1B
FGD	FU373	HSFG BOLT-DUCT STRU	2.00	Ranipet	Structure	1B
FGD	FU330	C276-Ti CLAD PLATE	0.50	Ranipet	Structure	1B
FGD	FU328	W/D INTERFACE (CARBON STEEL)	25.00	Ranipet	Structure	1B
FGD	FU324	HOOD OVER ABSORBER	93.00	Ranipet	Structure	1B

TECHNICAL CONDITIONS OF CONTRACT (TCC)

CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

FGD	FU312	PLATFORM FOR-DUCT INSTR&SAMPLG	15.00	Ranipet	Structure	1B
FGD	FU298	PLATFORM FOR G&D	20.00	Ranipet	Structure	1B
FGD	FU297	PLATFORM FOR DUCT	15.00	Ranipet	Structure	1B
FGD	FU262	DUCT STR ABS & BYP/STACK	85.00	Ranipet	Structure	1B
FGD	FU260	DUCT STR BYP & BUR/GGH/ABS	110.00	Ranipet	Structure	1B
FGD	FU234	DUCT SUP ABS & STACK/BYP	10.00	Ranipet	Structure	1B
FGD	FU232	DUCT SUP BYP & BUF/GGH	25.00	Ranipet	Structure	1B
FGD	FU228	ABSORBER-W/D INTERFACE	42.00	Ranipet	Structure	1B
FGD	FP471	PIPING SUPPORT STR.	50.00	Ranipet	Structure	1B
FGD	FP468	U-BOLTS	12.00	Ranipet	Structure	1B
FGD	FB714	HOISTS	35.00	Ranipet	Structure	1B
FGD	FB713	CHAIN PULLEYS	0.40	Ranipet	Structure	1B
FGD	FB708	SUMP-DRAIN SCREENS	0.20	Ranipet	Structure	1B
FGD	FB323	ABSORBER JAS	1.00	Ranipet	Structure	1B
FGD	FB313	ABSORBER SPRAY NOZZLES	6.00	Ranipet	Structure	1B
FGD	FB293	ELEVATOR AND ACCESSORIES	16.00	Ranipet	Structure	1B
FGD	FB249	HANDLING EQUIP - RC PUMP	5.00	Ranipet	Structure	1B
FGD	FB239	VIEWING PORTS	0.20	Ranipet	Structure	1B
FGD	FB223	ABSORBER SYSTEM ACCESSORIES	4.00	Ranipet	Structure	1B
FGD	FB215	MIST ELIMINATOR & ACCESSORIES	20.00	Ranipet	Structure	1B
FGD	FB214	ABS BAFFLE GRATING	1.00	Ranipet	Structure	1B
FGD	FB213	ABSORBER SYSTEM INTERNALS	30.00	Ranipet	Structure	1B
FGD	FW715	HANDLING EQUIPMENT IN FGD	1.00	Ranipet	Structure	1B
Ducting	39-141	COLS FRAMES NEAR ID	250.00	Trichy	Structure	1B
Ducting	39-142	COLS FRAMES NEAR ID	250.00	Trichy	Structure	1B
Ducting	39-150	COL FRAMES BETN I.D.	171.00	Trichy	Structure	1B
Ducting	39-300	PLATFORMS - AFTER ESP	245.00	Trichy	Structure	1B
Ducting	39-306	FAN HANDLING STRUCTU	50.00	Trichy	Structure	1B
Ducting	39-810	FLOOR GRILL	5.00	Trichy	Structure	1B
Ducting	39-820	STAIRS	5.00	Trichy	Structure	1B
Ducting	39-850	HAND RAIL AND HAND R	5.00	Trichy	Structure	1B
FGD	57566	PLATFORMS AND LADDERS-FGD GD	28.00	Ranipet	Structure	1B
FGD		LS Day Silo (02 nos.)	420.00	HYD	Structure	1B
FGD		Bag Filter for Silo	3.00	HYD	Structure	1B
FGD		Air Blaster for Silo	2.20	HYD	Structure	1B

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

FGD		Elevator for LS Day Silo & WBM Building	3.00	HYD	Structure	1B
FGD		ELECTRIC HOISTS	10.00	PEM	Structure	1B
FGD		Platforms for VBF & Hydrocyclones	25.00	PEM	Structure	1B
FGD		Miscellaneous	25.00	PEM	Structure	1B
		Total (Structure)	3,293.85			
FGD	FU257	DUCT ABS & BYP/STACK	60.00	Ranipet	NPP	1C
FGD	FU255	DUCT BYP & BUF/GGH/ABS	120.00	Ranipet	NPP	1C
FGD	FU252	EXPNSN JNT NON METALLIC	1.00	Ranipet	NPP	1C
FGD	FU251	EXPNSN JNT METALLIC	15.00	Ranipet	NPP	1C
FGD	FU206	MAN HOLE DOOR FOR DUCT	3.00	Ranipet	NPP	1C
FGD	FU200	INSTRUMENT TAPPING FOR DUCT	1.00	Ranipet	NPP	1C
FGD	FW725	NOZZLES & FLANGES	1.00	Ranipet	NPP	1C
FGD	FW331	LEAK DETECTION PIPES	0.50	Ranipet	NPP	1C
FGD	FW229	W/D WASH SYSTEM	0.73	Ranipet	NPP	1C
FGD	FW227	EMERGENCY QUENCH SYSTEM	2.37	Ranipet	NPP	1C
FGD	FW202	ABS NOZL NB 300 & ABOVE	1.00	Ranipet	NPP	1C
FGD	FW201	ABSORB. RC PUMP NOZZLE	6.00	Ranipet	NPP	1C
FGD	FU375	DUCT- EREC BOLTS&NUTS	2.00	Ranipet	NPP	1C
FGD	FU329	ALLOY LINING-DUCT	1.00	Ranipet	NPP	1C
FGD	FU325	SAMPLING NOZZLES FOR DUCT	1.00	Ranipet	NPP	1C
FGD	FU315	CONDENSATE COLLECTION SYSTEM	5.00	Ranipet	NPP	1C
FGD	FP467	RUBBER GASKET, SHEET	1.00	Ranipet	NPP	1C
FGD	FB241	ABSORBER AGITATOR	10.00	Ranipet	NPP	1C
G&D	57470	GATE-ESP OUTLET	70.00	Ranipet	NPP	1C
G&D	57480	GATE-ID FAN INLET	65.00	Ranipet	NPP	1C
G&D	57490	GATE-ID FAN OUTLET	61.50	Ranipet	NPP	1C
G&D	57C73	DMPR-FGD OUTLET	28.23	Ranipet	NPP	1C
G&D	57N63	DMPR-FGD INLET	29.56	Ranipet	NPP	1C
G&D	57C83	DMPR-FGD BYPASS	34.85	Ranipet	NPP	1C
G&D	57F09	MOUNTING BRACKET-FGD	3.00	Ranipet	NPP	1C
G&D	57F41	SEAL AIR PIPING-FGD	10.50	Ranipet	NPP	1C
G&D	57F91	BLOWER WITH MOTR-FGD	6.50	Ranipet	NPP	1C
G&D	57F97	KGV & CHECK VALV-FGD	4.25	Ranipet	NPP	1C
G&D	57491	BLOWER WITH MOTOR	3.20	Ranipet	NPP	1C

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

G&D	57497	KGV & CHECK VALVE	1.95	Ranipet	NPP	1C
G&D	57577	ELECT ACTUATOR FOR GATE,DAMPER	13.00	Ranipet	NPP	1C
Ducting	48-482	DUCT - ESP TO ID FAN	385.00	Trichy	NPP	1C
Ducting	48-484	EXPNJT - ESP TO ID FAN	27.50	Trichy	NPP	1C
Ducting	48-485	SUPPORT - ESP TO ID FAN	33.00	Trichy	NPP	1C
Ducting	48-492	DUCT - IDFAN-CHIMNY	370.00	Trichy	NPP	1C
Ducting	48-494	EXPNJT - IDFAN-CHIMNY	13.00	Trichy	NPP	1C
Ducting	48-495	SUPORT IDFAN-CHIMNEY	27.00	Trichy	NPP	1C
Ducting	48-496	SQ DUCTID FAN-CHIMNEYRIGHT	180.43	Trichy	NPP	1C
Ducting	48-498	DUCT - ID FAN-CHIM	240.58	Trichy	NPP	1C
Ducting	48-912	SLIDE BRG PL-ID SYS	2.72	Trichy	NPP	1C
		Total (NPP)	1,842.37			
FGD		Grith Gear -HALF	48.00	HYD	RM	1D
FGD		Main pinion Shaft	10.00	HYD	RM	1D
FGD		Main reducer	40.00	HYD	RM	1D
FGD		Inching reducer	10.00	HYD	RM	1D
FGD		Agitator assembly	10.00	HYD	RM	1D
FGD		Mill Shell	80.00	HYD	RM	1D
FGD		Losse items	40.00	HYD	RM	1D
FGD		Mill Slurry pump	20.00	HYD	RM	1D
FGD		Dischrage trunion assembly	6.00	HYD	RM	1D
FGD		Grinding Balls	300.00	HYD	RM	1D
FGD		Mill Liners	60.00	HYD	RM	1D
FGD		Slurry tank	10.00	HYD	RM	1D
FGD		Bearing housing	24.00	HYD	RM	1D
FGD		Foundation items	30.00	HYD	RM	1D
FGD		Hydroc-cyclone	20.00	HYD	RM	1D
FGD		Belt Feeder	20.00	HYD	RM	1D
FGD		Piping	40.00	HYD	RM	1D
FGD		Misc.	80.00	HYD	RM	1D
FGD		Slurry Recirculation pumps	121.00	HYD	RM	1D
FGD		Oxidation Blowers	30.00	HYD	RM	1D
FGD		RC Pump HT Motor	44.10	Bhopal	RM	1D
FGD		Oxidation Blower HT Motor	16.40	Bhopal	RM	1D
FGD		Wet Ball Mill HT Motor	30.52	Bhopal	RM	1D
FGD	FP702	WATER PUMPS & ACCESSORIES	7.00	Ranipet	RM	1D
FGD	FP701	SLURRY PUMPS & ACCESSORIES	40.00	Ranipet	RM	1D

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

GDWE		Motor of Vacuum Pump	12.00	PEM	RM	1D
GDWE		Cake Wash Pump with Motor	2.00	PEM	RM	1D
GDWE		Belt/Cloth Wash Pump with Motor	2.00	PEM	RM	1D
GDWE		Secondary Hydrocyclone & Accessories	13.50	PEM	RM	1D
GDWE		Vacuum Belt Filter & Accessories	80.00	PEM	RM	1D
GDWE		Vacuum Pump	31.50	PEM	RM	1D
GDWE		Vacuum Receiver	10.00	PEM	RM	1D
GDWE		Primary Hydrocyclone & Accessories	20.00	PEM	RM	1D
		Total (RM)	1,308.02			
FGD	FP851	DIAPHRAGM VALV-SLURRY	1.50	Ranipet	Piping-CS, GI & SS	2A
FGD	FP848	CHECK VALVES- WATER	0.15	Ranipet	Piping-CS, GI & SS	2A
FGD	FP846	BALL VALVES-SLURRY	0.10	Ranipet	Piping-CS, GI & SS	2A
FGD	FP845	BALL VALVES- WATER	0.60	Ranipet	Piping-CS, GI & SS	2A
FGD	FP842	MAN PINCH VALV-GYP SLRY	0.10	Ranipet	Piping-CS, GI & SS	2A
FGD	FP841	CONTROL VALVES	0.70	Ranipet	Piping-CS, GI & SS	2A
FGD	FP840	CERAMIV VALVES	0.40	Ranipet	Piping-CS, GI & SS	2A
FGD	FP834	MAIN GLOBE VALV-UTLTY	4.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP830	PNEUM GATE VALVE-UTLTY	3.50	Ranipet	Piping-CS, GI & SS	2A
FGD	FP829	MOTOR GATE VALV-UTLTY	4.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP828	MAN GATE VALV-UTLTY	3.50	Ranipet	Piping-CS, GI & SS	2A
FGD	FP824	PNEUM BTRFLY VALV-GYP SLRY	7.00	Ranipet	Piping-CS, GI & SS	2A

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

FGD	FP823	MOTOR BTRFLY VALV -GYP SLRY	0.40	Ranipet	Piping-CS, GI & SS	2A
FGD	FP822	MAN BTRFLY VALV-GYP SLRY	0.60	Ranipet	Piping-CS, GI & SS	2A
FGD	FP821	PNEUM BTRFLY VALV-LS SLRY	0.60	Ranipet	Piping-CS, GI & SS	2A
FGD	FP820	MOTOR BTRFLY VALV-LS SLRY	0.35	Ranipet	Piping-CS, GI & SS	2A
FGD	FP819	MAN BTRFLY VALV-LS SLRY	0.10	Ranipet	Piping-CS, GI & SS	2A
FGD	FP818	PNEM BTRFLY VALV-UTLTY	0.30	Ranipet	Piping-CS, GI & SS	2A
FGD	FP817	MOTOR BTRFL VALV-UTLTY	0.20	Ranipet	Piping-CS, GI & SS	2A
FGD	FP816	MANL BTRFLY VALV - UTLTY	0.10	Ranipet	Piping-CS, GI & SS	2A
FGD	FP477	CS PIPING (LOT-2)	15.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP475	FRP PIPING (LOT-2)	10.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP470	PIPING ACC.	0.50	Ranipet	Piping-CS, GI & SS	2A
FGD	FP466	FASTENERS CS & SS	20.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP463	CS PIPING (PW,CW,SW)	75.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP462	CSRL PIPE-2 (GS,LS)	105.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP460	FRP PIPING (LS,GS)	55.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP412	RC PUMP OUTLET VALVE	25.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP411	RC PUMP INLE VALVE	25.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP479	GI PIPING (LOT-2)	3.00	Ranipet	Piping-CS, GI & SS	2A
FGD	FP465	GI PIPING (IA, DW)	20.00	Ranipet	Piping-CS, GI & SS	2A

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FGD	FP464	SS PIPING (W/D)	2.00	Ranipet	Piping-CS, GI & SS	2A
		Total (Piping-CS, GI & SS)	383.70			
ESP	79967	MIN WOOL FOR ESP INSULATION	489.00	Ranipet	Insul-Wool	3A
Ducting	33-221	DUCT MINERAL WOOL	68.00	Trichy	Insul-Wool	3A
FGD	FU267	INSULATION MATERIALS FOR DUCT	20.00	Ranipet	Insul-Wool	3A
		Total (Insl-Wool)	577.00			
ESP	79968	FIXING COMP. FOR ESP INSULATION	137.00	Ranipet	Insul-Fix Comp	3B
Ducting	32-210	FIX COMP-DUCT INSULN	62.00	Trichy	Insul-Fix Comp	3B
FGD	FU268	FIXING COMP FOR DUCT	10.00	Ranipet	Insul-Fix Comp	3B
		Total (Insl- Iron components)	209.00			
ESP	89615	INSULATION CLADDING SH FOR ESP	103.00	Ranipet	Insul-AL	3C
Ducting	37-010	BLR OUTER CSG COMPS	50.00	Trichy	Insul-AL	3C
FGD	FU269	CLADDING SHEET FOR DUCT	10.00	Ranipet	Insul-AL	3C
		Total (Insl-AL cladding sheeting)	163.00			
		Grand Total	18,860.08			

Package B: Unit # 2

Area	PGMA	PGMA Description	Estimated Design Wt. (in MT)	BHEL Unit	Item	Rate Schedule
ESP	79981	SUPPOTING STRUCTURES FOR ESP	809.93	Ranipet	ESP	1A
ESP	79901	ROLL/SLIDE SUPPORTS	15.62	Ranipet	ESP	1A
ESP	79943	HOPPER RIDGES	113.96	Ranipet	ESP	1A
ESP	79948	CASING STRUCTURE	871.85	Ranipet	ESP	1A

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ESP	79949	CASING SHELL/PANEL	899.08	Ranipet	ESP	1A
ESP	79928	ESP ROOF BEAM	310.77	Ranipet	ESP	1A
ESP	89610	EP GALLERIES&STAIRS	125.73	Ranipet	ESP	1A
ESP	89612	FLOOR GRILL AND STEP TREAD	86.93	Ranipet	ESP	1A
ESP	79814	SUPPORT INSULATORS	24.62	Ranipet	ESP	1A
ESP	79911	GAS SCREEN-EP	8	Ranipet	ESP	1A
ESP	79913	EMIT SYST SUSPENSION	29.55	Ranipet	ESP	1A
ESP	79919	COL ELEC SUSPENSION	191	Ranipet	ESP	1A
ESP	79920	COLLECTING ELECTRODE	2176.75	Ranipet	ESP	1A
ESP	79921	EMIT SYS FRAME-TOP	172.8	Ranipet	ESP	1A
ESP	79922	EMIT SYS FRAME BOTOM	235	Ranipet	ESP	1A
ESP	79924	SHOCK BARS	145.1	Ranipet	ESP	1A
ESP	79932	EMIT SYS FRAME-MIDLE	420	Ranipet	ESP	1A
ESP	79946	INSULATOR SUPP PANEL	151.12	Ranipet	ESP	1A
ESP	79955	PENT HOUSE FOR E P	250	Ranipet	ESP	1A
ESP	89614	PENT HOUSE ROOFING SHEETS	43	Ranipet	ESP	1A
ESP	79908	GAS DIST. ASSY	112	Ranipet	ESP	1A
ESP	79915	EMITTING ELECTRODES	46.05	Ranipet	ESP	1A
ESP	79942	OUTER ROOF-EP	372	Ranipet	ESP	1A
ESP	79944	HOPPER UPPER PART	406	Ranipet	ESP	1A
ESP	79945	HOP MLD&LOWER PART	1035	Ranipet	ESP	1A
ESP	79947	ROOF PANEL ASSY	239.4	Ranipet	ESP	1A
ESP	79950	INLET-OUTLET FUNNEL	250	Ranipet	ESP	1A
ESP	79957	SPLITTER&GUIDE VANES	43	Ranipet	ESP	1A
ESP	79925	COLL ELECT RAPP MECH	115.5	Ranipet	ESP	1A
ESP	79841	ELECTRICAL MISCELLANEOUS ITEMS	19.8	Ranipet	ESP	1A
ESP	79906	INSULATOR HOUSING AS	80	Ranipet	ESP	1A
ESP	79916	EMIT ELECT RAPP MECH	85.9	Ranipet	ESP	1A
ESP	79917	DRIVE ARG. FOR EMIT. SYS	63	Ranipet	ESP	1A
ESP	79965	APP PLATFORM-HOPPER	160	Ranipet	ESP	1A
ESP	89611	ESP ROOF HANDRAILS	16	Ranipet	ESP	1A
ESP	89613	FLOOR GRILL AND MOBILE LADDER	103.74	Ranipet	ESP	1A
ESP	79831	GEARED MOTORS FOR RAPPING MECH	37	Ranipet	ESP	1A
ESP	79859	SUPPORTS FOR ELECTRICAL ITEMS	30	Ranipet	ESP	1A
ESP	79863	ASH LEVEL INDICATOR	3.86	Ranipet	ESP	1A
ESP	79872	INTERLOCKS-EP	3.56	Ranipet	ESP	1A

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ESP	79873	ELECTRICALLY OPERTD HOIST&ACCE	10.11	Ranipet	ESP	1A
ESP	79890	HEATING ELEMENTS	1.58	Ranipet	ESP	1A
ESP	79905	ESP-SUB-DELIVERY COMPONENTS	1.1	Ranipet	ESP	1A
ESP	79909	GD-RAPPING MECHANISM	19.74	Ranipet	ESP	1A
ESP	79910	GD_DRIVE ARRANGEMENT	1.38	Ranipet	ESP	1A
ESP	79923	INSPECTION DOORS	17	Ranipet	ESP	1A
ESP	79926	COLL ELEC RAPP DRIVE	12.36	Ranipet	ESP	1A
ESP	79961	EP PERF TEST EQUIPT	30.7	Ranipet	ESP	1A
ESP	79830	ELECTRICAL SD COMPTS	33.05	Ranipet	ESP	1A
ESP	79860	CABLE-CABLE RACKS	390.6	Ranipet	ESP	1A
ESP	79891	PANEL TYPE HOPPER HEATERS & AC	30	Ranipet	ESP	1A
ESP	79966	WATER WASHING SYSTEM	8.3	Ranipet	ESP	1A
ESP	79989	GUIDE PLATE/VANE EP INLET DUCT	14	Ranipet	ESP	1A
ESP		HVR	210.6	Jhansi	ESP	1A
		Total (ESP)	11,083.14			
FGD	FW386	INTER-CONNECTING PLTF TO ABS	8.00	Ranipet	Structure	1B
FGD	FW385	ELEVATOR M/C ROOM & GUIDE ,	15.00	Ranipet	Structure	1B
FGD	FW384	ELEVATOR FLOOR GRILL	26.00	Ranipet	Structure	1B
FGD	FW383	ELEVATOR STAIR AND HAND RAIL	11.00	Ranipet	Structure	1B
FGD	FW382	ELEVATOR FLOORS	19.00	Ranipet	Structure	1B
FGD	FW381	ELEVATOR BEAM AND BRACING	66.00	Ranipet	Structure	1B
FGD	FW380	ELEVATOR COLUMN	40.00	Ranipet	Structure	1B
FGD	FW372	HSFG BOLT-ELEV STRUC	2.00	Ranipet	Structure	1B
FGD	FW322	ABSORBER SYSTEM-CASING INTERM	127.00	Ranipet	Structure	1B
FGD	FW318	ROOF SHEETING	11.00	Ranipet	Structure	1B
FGD	FW317	NOZZLES & MANHOLE DOORS EQWT	1.00	Ranipet	Structure	1B
FGD	FW309	MONORAIL BEAM ABSORBER AREA	21.00	Ranipet	Structure	1B
FGD	FW307	ABSORBER MISCELLANEOUS	2.00	Ranipet	Structure	1B
FGD	FW306	ABSORBER HSFG FASTNERS	7.00	Ranipet	Structure	1B
FGD	FW305	ABSORBER STAIRS & HANDRAILS	24.00	Ranipet	Structure	1B
FGD	FW304	ABSORBER FLOOR GRILLS	50.00	Ranipet	Structure	1B
FGD	FW303	ABSORBER UPPER FLOORS	3.00	Ranipet	Structure	1B
FGD	FW302	ABSORBER LOWER FLOORS	18.00	Ranipet	Structure	1B
FGD	FW301	ABSORBER BEAMS AND BRACINGS	156.00	Ranipet	Structure	1B
FGD	FW300	ABSORBER COLUMNS	79.00	Ranipet	Structure	1B

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

FGD	FW285	SUPRTING STR FOR EMERGENCY QWT	6.00	Ranipet	Structure	1B
FGD	FW231	ABSORBER SHEAR PLATE	12.00	Ranipet	Structure	1B
FGD	FW226	EMERGENCY QUENCH WATER TANK	19.00	Ranipet	Structure	1B
FGD	FW224	ABSORBER SYSTEM-LINING-C276	20.00	Ranipet	Structure	1B
FGD	FW222	ABSORBER SYSTEM-CASING TOP	86.00	Ranipet	Structure	1B
FGD	FW221	ABSORBER SYSTEM-CASING BOTTOM	94.00	Ranipet	Structure	1B
FGD	FW219	ABSORBER SYSTEM-BASE	23.85	Ranipet	Structure	1B
FGD	FW218	ABS SPRAY PIPE SUPP	26.00	Ranipet	Structure	1B
FGD	FW217	ABS ME SUPPORT	49.00	Ranipet	Structure	1B
FGD	FW216	ABS BAFFLE GRATING SUPP	14.00	Ranipet	Structure	1B
FGD	FW209	MAN HOLE DOOR FOR ABSORBER	4.00	Ranipet	Structure	1B
FGD	FW208	RC PUMP OB SUPPORT	13.00	Ranipet	Structure	1B
FGD	FW203	NOZZLE NB25 TO NB250	1.50	Ranipet	Structure	1B
FGD	FU615	GALLERIES AND RAILINGS-INS&SAM	20.00	Ranipet	Structure	1B
FGD	FU613	GALLARIES AND RAILINGS FOR DUC	10.00	Ranipet	Structure	1B
FGD	FU612	GALLARIES AND RAILINGS FOR DAM	30.00	Ranipet	Structure	1B
FGD	FU399	DUCT EREC MATERIALS	10.00	Ranipet	Structure	1B
FGD	FU373	HSFG BOLT-DUCT STRU	2.00	Ranipet	Structure	1B
FGD	FU330	C276-Ti CLAD PLATE	0.50	Ranipet	Structure	1B
FGD	FU328	W/D INTERFACE (CARBON STEEL)	25.00	Ranipet	Structure	1B
FGD	FU324	HOOD OVER ABSORBER	93.00	Ranipet	Structure	1B
FGD	FU312	PLATFORM FOR-DUCT INSTR&SAMPLG	15.00	Ranipet	Structure	1B
FGD	FU298	PLATFORM FOR G&D	20.00	Ranipet	Structure	1B
FGD	FU297	PLATFORM FOR DUCT	15.00	Ranipet	Structure	1B
FGD	FU262	DUCT STR ABS & BYP/STACK	85.00	Ranipet	Structure	1B
FGD	FU260	DUCT STR BYP & BUR/GGH/ABS	110.00	Ranipet	Structure	1B
FGD	FU234	DUCT SUP ABS & STACK/BYP	10.00	Ranipet	Structure	1B
FGD	FU232	DUCT SUP BYP & BUF/GGH	25.00	Ranipet	Structure	1B
FGD	FU228	ABSORBER-W/D INTERFACE	42.00	Ranipet	Structure	1B
FGD	FP471	PIPING SUPPORT STR.	25.00	Ranipet	Structure	1B
FGD	FP468	U-BOLTS	6.00	Ranipet	Structure	1B
FGD	FB323	ABSORBER JAS	1.00	Ranipet	Structure	1B
FGD	FB313	ABSORBER SPRAY NOZZLES	6.00	Ranipet	Structure	1B
FGD	FB293	ELEVATOR AND ACCESSORIES	16.00	Ranipet	Structure	1B

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

FGD	FB249	HANDLING EQUIP - RC PUMP	5.00	Ranipet	Structure	1B
FGD	FB239	VIEWING PORTS	0.20	Ranipet	Structure	1B
FGD	FB223	ABSORBER SYSTEM ACCESSORIES	4.00	Ranipet	Structure	1B
FGD	FB215	MIST ELIMINATOR & ACCESSORIES	20.00	Ranipet	Structure	1B
FGD	FB214	ABS BAFFLE GRATING	1.00	Ranipet	Structure	1B
FGD	FB213	ABSORBER SYSTEM INTERNALS	30.00	Ranipet	Structure	1B
Ducting	39-141	COLS FRAMES NEAR ID	250.00	Trichy	Structure	1B
Ducting	39-142	COLS FRAMES NEAR ID	250.00	Trichy	Structure	1B
Ducting	39-150	COL FRAMES BETN I.D.	171.00	Trichy	Structure	1B
Ducting	39-300	PLATFORMS - AFTER ESP	245.00	Trichy	Structure	1B
Ducting	39-306	FAN HANDLING STRUCTU	50.00	Trichy	Structure	1B
Ducting	39-810	FLOOR GRILL	5.00	Trichy	Structure	1B
Ducting	39-820	STAIRS	5.00	Trichy	Structure	1B
Ducting	39-850	HAND RAIL AND HAND R	5.00	Trichy	Structure	1B
	57566	PLATFORMS AND LADDERS-FGD GD	28	Ranipet	Structure	1B
		Total (Structure)	2690.05			
FGD	FU257	DUCT ABS & BYP/STACK	60.00	Ranipet	NPP	1C
FGD	FU255	DUCT BYP & BUF/GGH/ABS	120.00	Ranipet	NPP	1C
FGD	FU252	EXPNSN JNT NON METALLIC	1.00	Ranipet	NPP	1C
FGD	FU251	EXPNSN JNT METALLIC	15.00	Ranipet	NPP	1C
FGD	FU206	MAN HOLE DOOR FOR DUCT	3.00	Ranipet	NPP	1C
FGD	FU200	INSTRUMENT TAPPING FOR DUCT	1.00	Ranipet	NPP	1C
FGD	FW331	LEAK DETECTION PIPES	0.50	Ranipet	NPP	1C
FGD	FW229	W/D WASH SYSTEM	0.73	Ranipet	NPP	1C
FGD	FW227	EMERGENCY QUENCH SYSTEM	2.37	Ranipet	NPP	1C
FGD	FW202	ABS NOZL NB 300 & ABOVE	1.00	Ranipet	NPP	1C
FGD	FW201	ABSORB. RC PUMP NOZZLE	6.00	Ranipet	NPP	1C
FGD	FU375	DUCT- EREC BOLTS&NUTS	2.00	Ranipet	NPP	1C
FGD	FU329	ALLOY LINING-DUCT	1.00	Ranipet	NPP	1C
FGD	FU325	SAMPLING NOZZLES FOR DUCT	1.00	Ranipet	NPP	1C
FGD	FU315	CONDENSATE COLLECTION SYSTEM	5.00	Ranipet	NPP	1C
FGD	FP467	RUBBER GASKET, SHEET	1.00	Ranipet	NPP	1C
FGD	FB241	ABSORBER AGITATOR	10.00	Ranipet	NPP	1C
G&D	57470	GATE-ESP OUTLET	70	Ranipet	NPP	1C
G&D	57480	GATE-ID FAN INLET	65	Ranipet	NPP	1C
G&D	57490	GATE-ID FAN OUTLET	61.5	Ranipet	NPP	1C
G&D	57C73	DMPR-FGD OUTLET	28.23	Ranipet	NPP	1C

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

G&D	57N63	DMPR-FGD INLET	29.56	Ranipet	NPP	1C
G&D	57C83	DMPR-FGD BYPASS	34.85	Ranipet	NPP	1C
G&D	57F09	MOUNTING BRACKET-FGD	3	Ranipet	NPP	1C
G&D	57F41	SEAL AIR PIPING-FGD	10.5	Ranipet	NPP	1C
G&D	57F91	BLOWER WITH MOTR-FGD	6.5	Ranipet	NPP	1C
G&D	57F97	KGV & CHECK VALV-FGD	4.25	Ranipet	NPP	1C
G&D	57491	BLOWER WITH MOTOR	3.2	Ranipet	NPP	1C
G&D	57497	KGV & CHECK VALVE	1.95	Ranipet	NPP	1C
G&D	57577	ELECT ACTUATOR FOR GATE,DAMPER	13	Ranipet	NPP	1C
Ducting	48-482	DUCT - ESP TO ID FAN	385.00	Trichy	NPP	1C
Ducting	48-484	EXPJNT - ESP TO ID FAN	27.50	Trichy	NPP	1C
Ducting	48-485	SUPPORT - ESP TO ID FAN	33.00	Trichy	NPP	1C
Ducting	48-492	DUCT - IDFAN-CHIMNY	370.00	Trichy	NPP	1C
Ducting	48-494	EXPJNT - IDFAN-CHIMNY	13.00	Trichy	NPP	1C
Ducting	48-495	SUPPORT IDFAN-CHIMNEY	27.00	Trichy	NPP	1C
Ducting	48-496	SQ DUCTID FAN-CHIMNEYRIGHT	180.43	Trichy	NPP	1C
Ducting	48-498	DUCT - ID FAN-CHIM	240.58	Trichy	NPP	1C
Ducting	48-912	SLIDE BRG PL-ID SYS	2.72	Trichy	NPP	1C
DG set		PLACEMENT OF DG SET (1x1750 KVA) ON FOUNDATION	18.00	ISG Bangalore	NPP	1C
DG set		ERECTION OF ACOUSTIC ENCLOSURE AROUND THE DG SETS	5.00	ISG Bangalore	NPP	1C
DG set		ERECTION OF SILENCER, EXHAUST PIPING (MS Class 200 NB pipes, CLASS-B), SUPPORT , AND STACK (MS Class 200 NB pipe- CLASS B) AND 10 METERS EXHAUST SUPPORT STRUCTURE , INSULATION AND ALUMINIUM CLADDING.	4.00	ISG Bangalore	NPP	1C
DG set		ERECTION OF 30 METERS GALVANISED EXHAUST PIPE SUPPORT STRUCTURE	15.00	ISG Bangalore	NPP	1C
DG set		INSTALLATION OF DG AMF PANEL, DISTRIBUTION BOARD, BATTERY CHARGER AND BATTERY, NGR ON DG FOUNDATION , INSIDE THE ACOUSTIC ENCLOSURE.	2.00	ISG Bangalore	NPP	1C
DG set		ERECTION OF FUEL TANK AND FUEL PIPING (MS Class 1 inch Pipes).	1.00	ISG Bangalore	NPP	1C

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

DG set		INSTALLATION OF 5 KL BULK OIL TANK WITH TWO NOS. FUEL UNLOADING PUMP AND 2 NOS FUEL TRANSFER PUMP AND ASSOCIATED PIPING AND INSTRUMENTS.	3.00	ISG Bangalore	NPP	1C
		Total (NPP)	1889.37			
FGD		Slurry Recirculation pumps	121.00	HYD	RM	1D
FGD		Oxidation Blowers	30.00	HYD	RM	1D
FGD		RC Pump HT Motor	44.10	Bhopal	RM	1D
FGD		Oxidation Blower HT Motor	16.40	Bhopal	RM	1D
		Total (RM)	211.50			
FGD	FP411	RC PUMP INLE VALVE	25	Ranipet	Piping-CS, GI & SS	2A
FGD	FP412	RC PUMP OUTLET VALVE	25	Ranipet	Piping-CS, GI & SS	2A
FGD	FP460	FRP PIPING (LS,GS)	15	Ranipet	Piping-CS, GI & SS	2A
FGD	FP462	CSRL PIPE-2 (GS,LS)	105	Ranipet	Piping-CS, GI & SS	2A
FGD	FP463	CS PIPING (PW,CW,SW)	40	Ranipet	Piping-CS, GI & SS	2A
FGD	FP464	SS PIPING (W/D)	2	Ranipet	Piping-CS, GI & SS	2A
FGD	FP465	GI PIPING (IA, DW)	5	Ranipet	Piping-CS, GI & SS	2A
FGD	FP466	FASTENERS CS & SS	10	Ranipet	Piping-CS, GI & SS	2A
FGD	FP470	PIPING ACC.	0.5	Ranipet	Piping-CS, GI & SS	2A
		Total (Piping-CS, GI & SS)	227.50			
ESP	79967	MIN WOOL FOR ESP INSULATION	489	Ranipet	Insul-Wool	3A
Ducting	33-221	DUCT MINERAL WOOL	68.00	Trichy	Insul-Wool	3A
FGD	FU267	INSULATION MATERIALS FOR DUCT	20.00	Ranipet	Insul-Wool	3A
		Total (Insl-Wool)	577			

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CHAPTER-IX: ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)

ESP	79968	FIXING COMP. FOR ESP INSULATION	137	Ranipet	Insul-Fix Comp	3B
Ducting	32-210	FIX COMP-DUCT INSULN	62.00	Trichy	Insul-Fix Comp	3B
FGD	FU268	FIXING COMP FOR DUCT	10.00	Ranipet	Insul-Fix Comp	3B
		Total (Insl- Iron components)	209			
ESP	89615	INSULATION CLADDING SH FOR ESP	103	Ranipet	Insul-AL	3C
Ducting	37-010	BLR OUTER CSG COMPS	50.00	Trichy	Insul-AL	3C
FGD	FU269	CLADDING SHEET FOR DUCT	10.00	Ranipet	Insul-AL	3C
		Total (Insl-AL cladding sheeting)	163			
		Total	17,050.56			

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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.)

10.0 GENERAL

10.1 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.

10.2 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.

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

10.3.1 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.

- 10.4** 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.
- 10.5** Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies / personnel on latest ISO Standards.
- 10.6** 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 equipments 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.
- 10.7** 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.
- 10.8** 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.
- 10.9** 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.
- 10.10** 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

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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.

- 10.11** Contractor shall erect and commission all the equipments 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.
- 10.12** The Contractor shall perform any services, tests etc. which may not be specified but nevertheless, required for the completion of work within quoted rates.
- 10.13** The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.
- 10.14** 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.
- 10.15** All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments / 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.
- 10.16** The Contractor shall take delivery of the components, equipments, 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 equipments after usage shall be submitted to the BHEL and reconciled periodically.
- 10.17** Plant materials should not be used for any temporary supports / scaffolding/ preparing pre-assembly bed etc. The details of equipments 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 equipments 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.

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- 10.18** 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.
- 10.19** Layout of field routed, fine fittings, 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 ESP 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.
- 10.20** If applicable, Fixing and seal welding of thermowells & plugs before Hydro test 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.
- 10.21** In installation of various equipments 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 equipments to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free - returnable basis which shall be returned to BHEL after the use.
- 10.22** 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.
- 10.23** Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.

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- 10.24** 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.
- 10.25** 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.
- 10.26** BHEL is operating web based computerized E-store system that includes, inter-alia, issue of materials, daily progress reporting, Contractor's running monthly billing and material reconciliation through a computerized data management system. Contractor shall install necessary hardware to hook-up with the BHEL's system and use the same for his scope of work.
- 10.27** In the event the computerized E-store/SOMS is inoperative for any reasons, the Contractor shall take delivery of materials from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer. All these records however shall be updated in the E-store/SOMS as and when the E-store/SOMS is reactivated/ normalized.
- 10.28** Gases like argon, oxygen, acetylene etc that are required for erection related activities shall be arranged by the Contractor at his cost. Contractor should arrange to verify the purity of argon at site as required by BHEL/Customer
- 10.29** **All lubricants and chemicals required for testing, preservation, chemical cleaning / acid cleaning, oil flushing, and the lubricants for trial runs of the equipments and trial operation of the unit will be supplied by BHEL free of charges.**
- 10.30** Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.
- 10.31** 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.
- 10.32** Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.

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- 10.33** 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.
- 10.34** 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.
- 10.35** The consumables (welding electrodes, special T&Ps etc), commissioning spares and erection material spares and other similar items are not billable. However, certain spare items when actually erected as a part of permanent equipment shall be paid as per agreed payment terms as applicable. The decision of BHEL Engineer in this regard shall be final and binding on contractor.
- 10.36** 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.
- 10.37** 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 BHEL Engineer in- Charge.
- 10.38** 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.
- 10.39** 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.
- 10.40** 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.

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10.41 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.

10.42 SITE INSPECTION

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

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

10.42.3 Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor 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.

10.43 UTILITY POINTS

10.43.1 Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N₂) 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.

10.43.2 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.

10.44 DOCUMENTATION

10.44.1 Contractor has to maintain documents regarding erection, alignment, welding, joints, NDT if applicable 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.

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10.45 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.

10.46 Statutory approval

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

10.46.2 Void

10.46.3 Necessary approval for drawings, documents (wherever applicable), Load Testing, license of hoists, Misc cranes etc. to be erected by bidders has to be arranged for getting statutory fitness certificates, drawings/documents from Statutory agency/Third party inspectors without any extra commercial implication on BHEL treating as normal scope of work. Contractor has to arrange sufficient manpower (fitters, electricians with supporting helpers) and T&P /other resources with sufficient testing instruments, IMTE/MMD for erection and commissioning of these systems without any extra commercial implication on BHEL treating as normal scope of work.

10.46.4 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 Employer, as may be required for erection, testing and commissioning etc. As called for under the statutes, regulations and the safety codes, all such documentation submission and taking necessary approval shall be the responsibility of contractors. Necessary approval is required from statutory authorities for the entire work.

10.47 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.

10.48 Dewatering

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Dewatering of Low Lying areas ESP-Duct, FGD 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.

10.49 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 **10%** 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/insulation debris 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.

10.50 Approach platforms, fixtures

10.50.1 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 similar item in BOQ/Rate schedule.**

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

10.51 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. These types of activity are treated as vendor's

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normal scope of work without any extra commercial implication on BHEL. 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.

10.52 Fin /attachment/scallop plates & associated items Cutting, restoration of panels, panels of ESP and FGD

During course of erection in ESP and FGD fin/attachment & associated items cutting to align difference, panels will be required 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.

10.53 Inspection, cleaning of ESP, ducts/and subsequent restoration, rectification, normalization

During erection, pre-commissioning, commissioning, operation, Stabilisation period trial Run - Inspection, cleaning of ESP, hoppers, Absorber, FGD equipments 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, coal rejects /clinkers and other foreign materials, associated items from ESP, FGD & surrounding areas. For this installation of equipments, 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. Generally, such works would not be repeated more than 3-4 times.

10.54 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

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

Erection/Final Welding Schedule of subject Project shall be made available during Erection.

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Chapter-XII: 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.)

12.0 PREPARATION OF FOUNDATIONS AND GROUTING

- 12.1** Building foundations and other necessary civil works for supporting structures, equipments 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.
- 12.2** Minor adjustment of foundation level, dressing and chipping of foundation surfaces and blue-matching (wherever required) for of all equipments 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 up-to **+/- 50 mm**, 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.
- 12.3** 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.
- 12.4** Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nut's movement. If required cleaning of the threads to be done with proper dies.
- 12.5** While on the job, care is essential to avoid too much chipping and resultant lowering of level of foundation.
- 12.6** 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 as per drawings/instructions of BHEL engineer.

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Chapter-XII: FOUNDATIONS & GROUTING

- 12.7** 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.
- 12.8** The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments / equipments based on the foundations including shear lug provisions / openings.
- 12.9** Contractor shall carry out scrapping and blue matching of embedded plates/ packers of rotating equipments. 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.
- 12.10** Complete grouting of structures, equipments, 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.
- 12.11** After the grouting has finally set and cured, alignment of structure, equipment, alignment of shafts of rotating machines, the slopes of all bearing pedestals, centring 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 equipments 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.

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Chapter-XII: FOUNDATIONS & GROUTING

- 12.12** The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment. Packer plates should not only be blue matched with foundation but also inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineer's instructions.
- 12.13** 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. as per the instructions of BHEL engineer. This special non-shrink cement shall be arranged by the contractor at his cost. The quoted rate shall be inclusive of the same.
- 12.14** All equipment bases and structural steel bases and foundations pockets shall be grouted and finished as per these specifications after surface preparation unless otherwise recommended by the equipment manufacturers. The surface preparation includes soda washing of the foundations to remove oil, grease etc. to ensure proper grouting.
- 12.15** The certificates of the grout are to be submitted to BHEL. If necessary, test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.
- 12.16** All the materials required for grouting including special cements as approved by BHEL and other materials like Portland cement, sand chips, gravel etc., are to be arranged by the contractor at his cost and within the quoted rates. 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.
- 12.17** **PROCEDURE FOR GROUTING:** Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per the supplier's recommendation / IS standard. Copy of those recommendations is to be submitted to BHEL for records.

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Chapter-XIII: MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

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

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

13.0 Material Handling, Transportation and Site Storage

- 13.1** Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation / location, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks/ slings/ tools and tackles / labour including operators, fuel, lubricants etc. for loading & unloading of materials will be in the scope of contractor.
- 13.2** The storage yard is located within the 5KM from main site and spread at two-three location. Bidders are requested to visit site and acquire full knowledge and information regarding the same.
- 13.3** Transportation of all items including ODC items from BHEL Store/Yard to Erection site shall be in the contractor's scope. However, in some cases, consignments including ODC may be unloaded near erection site as per space availability and site requirements.
- 13.4** Loading at storage yard and transporting to site, unloading at site / pre-assembly area or at working area, is in the scope of work. Required cranes for loading & unloading of materials, trailer shall be in the scope of contractor. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, sandbags which are required for temporary supporting of the components at site.
- 13.5** The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
- 13.6** 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.

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- 13.7** Sometimes it may become necessary for the contractor to handle certain unrequired 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.
- 13.8** Contractor shall plan and transport equipments, components from storage yard to erection site in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. However, in specific cases **“as a special case to expedite the job”** the consignment received at BHEL stores can directly be diverted to the work site, as decided by BHEL, following issuance procedure of BHEL. Such direct issues shall be as per the Challan/dispatch document/LR received with the consignment. In such cases, contractor shall do unloading of materials from trucks/lorry/trailers at their own cost.
- 13.9** 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 re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost. Contractor shall maintain register/diary for location and quantity of materials transported from BHEL/Customer Store/Yard and unloaded at site/ pre-assembly area.
- 13.10** All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.
- 13.11** 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.
- 13.12** The contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its sub-contractors with respect to the transport of Goods, Materials and Labour to the site do not interfere with local traffic in the vicinity of the site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.
- 13.13** 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

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XIII: MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

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.

- 13.14** Open land for storage purposes shall be provided by BHEL on free of cost/as available basis for storage of materials issued to contractor (within the site premises or area approved by BHEL engineer). Temporary barbed wire fencing (if required), as required, of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc wherever required off the land provided to agency and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel to safeguard all such materials in his custody. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. In case, loss of any materials for whatsoever reasons attributable to the contractor, then cost of such materials shall be recovered from the running bill payment with 5% overhead.
- 13.15** All surplus materials shall be returned to BHEL store. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be returned to the stores on weighment basis in consultation with BHEL Engineer and a receipt obtained for material accounting purposes. Scrap materials shall be sorted section-wise and returned separately at a place directed by BHEL Engineer within the project area/BHEL yard. Return of such materials will not be entitled for any handling and incidental charges.
- 13.16** 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-XIV: ERECTION

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

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

14.0 Erection

14.1 Brief list of System / sub-system to be erected by the contractor & approximate weight of individual structure, equipment, PGMA's 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. Erection and commissioning shall be done as per the drawings and documents provided by BHEL site engineer at site during course of work.

14.2 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 and rigging operations,
- b) Machine/ flame/ electric cutting, grinding, welding, radiography and stress relieving (if applicable) & 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 as mentioned in scope

14.3 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.

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- 14.4** 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.
- 14.5** 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.
- 14.6** Approach road in the vicinity of ESP and FGD area only are to be maintained by Contractor.
- 14.7** 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.
- 14.8** 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
- 14.9** 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.
- 14.10** 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.
- 14.11** Welding of all thermo wells, draft, pressure and temperature instrumentation points and all other instrumentation points, adapters for PG test, as applicable, on ESP, Ducts, Piping System and auxiliaries and welding of thermocouple pads for permanent system as well as for performance guarantee test is in the scope of work.
- 14.12** 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.
- 14.13** 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

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Chapter-XIV: ERECTION

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.

- 14.14** 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.
- 14.15** All the equipments /material to be taken inside the plant building shall be cleaned thoroughly before taking them inside. The contractor shall clean, wherever necessary -inside and outside and other components as per instruction of BHEL Engineer during erection within the quoted rate.
- 14.16** 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.
- 14.17** Any fixtures, scaffolding materials, approach ladders, concrete block supports, steel structures required for temporary supporting, pre-assembly, checking, welding, lifting & handling during pre-assembly and erection and during application of insulations shall be arranged by the contractor at his cost.
- 14.18** **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.
- 14.19** **ERECTION OF ESP & ITS AUXILIARIES**
- 14.19.1** 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 upto the time of completion of commissioning activities and supply and application of touch-up 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 /

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completion schedules. Complete pre-assembling of components is in the scope of the contractor.

- 14.19.2** All the dampers, valves, lifting equipment's, 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 at no extra cost. Even after commissioning the equipment's, if there are problems in the operation they have to be attended by contractor.
- 14.19.3** Any other systems / Components which are integral to ESP & auxiliaries and ducting from ESP outlet to chimney inlet, supplied by BHEL manufacturing units are also to be erected and commissioned by the contractor within the quoted / accepted tonnage rate / lump sum value.
- 14.19.4** The Erection & Alignment of HV rectifier transformer is in the scope of contractor. However, dry out, testing and commissioning is not in the scope of this contract. HVR Transformer to be erected and handed over for commissioning in good condition. However, if any major defect found in the transformer due to reasons not attributable to the vendor, cost of rectification shall be paid extra to the vendor as per conditions of contract. Refilling of oil, if required for HVR transformer, is included in the scope of the bidder till completion of HVR Transformer commissioning.
- 14.19.5** Installation, erection and commissioning of Monorails with electrically operated hoists including monorail beams on the roof for handling transformer rectifiers is in the scope of contractor.
- 14.19.6** Installation, erection and commissioning of Electric Hoist including receipt at site, installation of Supporting and Main Structure of the Hoist, Erection and Commissioning of the Hoists at the locations identified in the drawing.
- 14.19.7** Erection & dismantling of air blowers, venturimeter and connecting pipes & ducts, providing blanks/ dummies at the required locations and conducting gas-tightness test is in the scope of contract and shall be carried out within the quoted rate. The material for the fabrication of Dummies/blanks shall be provide by BHEL free of cost. Temporary piping, plates for blinds/ dummys, blanks shall be issued to bidder on returnable basis.
- 14.19.8** Void
- 14.19.9** Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be removed / attended as per BHEL engineer.

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- 14.19.10** Wherever equipment's are supplied in pre-fabricated assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor 's scope.
- 14.19.11** All the bearings, Gearboxes etc., of the equipment and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing/gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing/lubricating them with recommended lubricants and assembling back.
- 14.19.12** All the motors/pumps shall be stripped opened, thoroughly serviced with proper care and re-assembled properly before erection by the contractor. During servicing, pre-commissioning & commissioning, if any deficiency is observed the same should be taken up with BHEL Engineer at site
- 14.19.13** All site-fabricated pipes will be issued in running metres as straight. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. All the attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing. Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor. Fittings like bends, tees, elbow, MITRE bends, reducers, flanges etc., will be supplied as loose items.
- 14.19.14** ESP Collecting Electrodes may require straightening and repair for minor transport damages before erection as per erection manual by the contractor within the quoted price.
- 14.19.15** Additional platforms of permanent nature for approaching different equipment's, as per site requirement which may not be indicated in drawings shall be fabricated and installed by the contractor. However, the contractor will be paid for this work on accepted tonnage rate as per similar item in BOQ/Rate schedule. The material required for platform will be supplied by BHEL at free of cost.
- 14.19.16** It shall be the responsibility of the contractor to provide ladders on column for initial works till such time stairways are completed. For this the ladder should not be welded on the column and should be prefabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL.
- 14.19.17** Any fixtures, concrete block supports, steel structures required for temporary supporting for pre-assembly or checking and welding for lifting and handling during pre-assembly and

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erection shall be arranged by 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.

- 14.19.18** All the works such as cleaning, checking, levelling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipment's for checking and cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general engineering practices at site, cutting, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, shaping, fitting up etc. as may be applicable in such erection works are to be treated as incidental to erection and necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work and at his quoted rates.
- 14.19.19** Fixing, welding of necessary instrumentation tapping points for regular measurements as well as performance testing, to be provided on auxiliaries covered within the scope of this specification will also be the responsibility of the contractor and will be done as per the instructions of BHEL Engineer. The fixing / welding of all the above items will be contractor 's responsibility even if the
- i). Product groups under which these items are supplied are not specifically indicated in the Tender Specification.
 - ii). Items are supplied by an agency other than BHEL.
- 14.19.20** Suspension for pipes 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 as outside (or as per the drawings as instructed by BHEL Engineer). Also, it may sometime become necessary to remove any of the erected members to facilitate erection of bigger / pre-assembled equipment. In such case the removal and re-erection of such members, which are essential will have to be carried out by the contractor without any extra payment (for the works as per the issued RFC Drawings).
- 14.19.21** 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/prepared the edges to suit the matching profile weld/bolt connect the joints at no extra cost.
- 14.19.22** Normally, the matching profile will be cut out for the structural members but the contractor will have to carry out suitable alterations / adjustments at site, without any extra payment, in case it becomes necessary.

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- 14.19.23** 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.
- 14.19.24** Contractor shall carryout necessary touch up painting periodic application of preservation on all components and other equipment during erection / after erection until completion of work. Contractor shall provide necessary crew with all items like wire brushes, paint brushes, emery paper, cotton waste, scaffolding materials etc.
- 14.19.25** Contractor has to arrange required fire proof tarpaulins to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.
- 14.19.26** 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 completed only when jointly certified so, by the BHEL Engineer & Customer. Also, the contractor should ensure that the alignment is not disturbed afterwards.
- 14.19.27** Works 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.
- 14.19.28** 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 various locations as indicated by BHEL Engineer. The housekeeping must be a routine and continuous activity in the various work fronts. If the contractor does not do this job satisfactorily, BHEL will arrange for the same at the cost of the contractor.
- 14.19.29** All the valves, lifting equipment's, etc. shall be serviced and lubricated to the satisfaction of BHEL Engineer before erecting the same and also during pre-commissioning. The bearings shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning the equipment's, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract (for the limited 3 nos of incidents on same equipment/defect and reasons not attributable to the Vendor after commissioning of the equipments/system). Welding or joining of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rate.
- 14.19.30** 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).

- 14.19.31** 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.
- 14.19.32** 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.
- 14.19.33** Ducts /expansion pieces are dispatched to site in loose walls / plates and these are to be assembled at site before erection.
- 14.19.34** No members of the structure / platform should be cut without specific approval of BHEL.
- 14.19.35** 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.
- 14.19.36** 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.
- 14.19.37** 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
- 14.19.38** Attachment welding of necessary instrumentation tapping points, both for regular measurements and performance testing to be provided on E.S.P / its auxiliaries or pipelines covered within the scope of this tender will also be the responsibility of the contractor and the same will be done as per the instruction of BHEL Engineer.

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- 14.19.39** Spring suspensions / constant load hangers have to be pre-assembled and adjusted for the required loading and erected as per the instructions of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers etc. have to be carried out as and when required.
- 14.19.40 Roof Insulation** One layer of insulation mattress on roof top of E.S.P roof (inner) shall be applied before outer roof is placed (layers shall be done as per the drawings & instructions of BHEL Engineer)
- 14.19.41 Welding in ESP and auxiliaries shall be done as per BHEL/customer drawings and documents approved for this site and based on instructions of BHEL Engineer. Decision regarding Type of welding, method, Electrodes, consumables etc of BHEL engineer shall be final.**
- 14.20 MAIN SUPPORTING STRUCTURES, EXTERNAL STRUCTURES, ELEVATOR STRUCTURES, STAIRWAYS, GALLERIES & PLATFORMS & HANDLING ARRANGEMENT**
- 14.20.1** 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.
- 14.20.2** 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.
- 14.20.3** 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.
- 14.20.4** 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.

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- 14.20.5** 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 for fixing clips are in contractor scope**. Contractor shall deploy the **drilling cum fixing machine** required for this purpose as a regular scope of work.
- 14.20.6** 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 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 Structure. No payment is envisaged for fabrication of such structures.
- 14.21 FLUE GAS DESULPHURIZATION**
- 14.21.1** Erection, alignment, welding, bolting, grouting and painting as applicable for the BHEL Supplied materials of Absorber, Wet Ball Mill, Limestone Handling System, Gypsum Dewatering System and other associated auxiliaries as per BOQ/PGMA item list.
- 14.21.2** 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.
- 14.21.3** Brief list of System / sub-system to be erected by the contractor & approximate weight of individual PGMA's & items are given in this tender elsewhere and are meant for giving general idea to the tender only about magnitude of the work involved. This 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 is requested to get the correct details from the engineer to avoid mistakes and rework
- 14.21.4** All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include
- a) Scaffolding and rigging operations
 - b) Machine / flame / electric cutting, grinding, welding, radiography and stress relieving.

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c) Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, cleaning, checking, leveling, 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

- 14.21.5** Preparation of preassembly bed is arranged wherever required for preassembly of FGD components on consolidated ground. The preassembled component should be supported to avoid sagging. No separate payment will be made
- 14.21.6** Duct/ 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).
- 14.21.7** All the dampers, valves, lifting equipments, 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 at no extra cost.
- 14.21.8** 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
- 14.21.9** Spring suspensions / constant load hangers have to be preassembled and adjusted for the required loading and erected as per instructions, of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers, etc., have to be carried out as and when required at no extra cost to BHEL Contractors has to adjust the cold and hot values of CLH/VLH as per the drawings and document in cold condition as well as in unit operation condition observing all necessary safety measures/ safety permit/ etc.
- 14.21.10** The contractor shall carry out necessary preservative painting, periodic application of preservations on Rotating parts and other equipments during erection / after erection until completion of work. Necessary preservatives / paints, other consumables are to be arranged by the contractor at his cost
- 14.21.11** Contractor shall provide necessary crew with all items like wire brushes, paint brushes, emery paper, cotton waste, scaffolding materials etc., at his cost

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- 14.21.12** 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 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)
- 14.21.13** Fabricated 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. Bends up to NB 65 mm will have to be fabricated at site adopting specified heat treatment procedures, wherever required at no extra cost
- 14.21.14** 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, connect the joints at no extra cost. Normally, the machine profile will be cut out for the structural members but the contractor will have to carry out suitable alteration / adjustments at site, without any extra payment in case it becomes necessary.
- 14.21.15** Erection & 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 are 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 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. Payment will be regulated as per the settled terms and conditions
- 14.21.16** 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
- 14.21.17** All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. 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.

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- 14.21.18** 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
- 14.21.19** Fine fittings, 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. Necessary sketch for routing these lines should be 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
- 14.21.20** Additional platforms for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be fabricated, assembled and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for erection of structure. 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. Works of major nature not covered under this clause.
- 14.21.21** 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
- 14.21.22** 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
- 14.21.23** Assistance for “calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting of actuators” shall be provided by contractor within the quoted rates
- 14.21.24** All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection. If in the opinion of BHEL 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
- 14.21.25** The HT Electric motor bearings shall be blue matched at site and checked for bearing clearance. Scrapping of bearing housing, if required to any extent shall be carried out by the contractor. No extra claim for blue matching of any two surfaces will be entertained. The HT Electric motors

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will also be checked for air gap and adjustment of stator / rotor to magnetic center shall be carried out as part of erection

- 14.21.26** 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 hydraulic test of oil coolers. etc.,if applicable
- 14.21.27** 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
- 14.21.28** 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. If the contractor does not do this job satisfactorily, BHEL will arrange for the same at the cost of the contractor. Periodical payments to the contractor for the work done will be considered only if the housekeeping is certified as satisfactory by the customer.

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

- 14.22.1** 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.
- 14.22.2** 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.
- 14.22.3** Void
- 14.22.4** 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

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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.**

- 14.22.5** 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.
- 14.22.6** BHEL issued materials, shall not be under any circumstances whatsoever, and shall be taken out of the project site unless otherwise permitted by BHEL for outside job.

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

The equipments 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.

15.2 All welders including tack welders, structural, NPP 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.

15.3 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.

15.4 Void

15.5 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.

15.6 **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 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

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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.

- 15.7** All butt / fillet welds shall be subject to Non-Destructive testing as per the Drawing/Procedures/Welding Schedules/FQP at no additional cost.
- 15.8** **Non-Destructive Testing such as RT, hardness test, SR etc. ,if applicable and wherever applicable shall be in Contractor scope.**
- 15.9** 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.
- 15.10** All welded joints shall be subjected to acceptance by BHEL Engineer.
- 15.11** 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.
- 15.12** 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.
- 15.13** 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.
- 15.14** 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.
- 15.15** 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

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qualification tests do not relieve the contractor of a contractual obligation to check the welder's performance.

15.16 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.

15.17 List of Penalties on Violations on Quality Provisions

Sr no	Violation	Penalty in Rs
1	Mother oven not working	500 per day & ban on its use
2	Slackness in control over baking of welding electrodes (Doc.)	200 per incident
3	Holding oven not working/plugged in	500 per incident/day & ban its use
4	Portable oven not working/Plugged in	100 per incident & welder to be 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
12	Lack of safe approach Scaffolds/Platform for inspection & non-availability of calibrated MMDs –	1000 per incident.

15.17.1 RECEIPT INSPECTION OF WELDING ELECTRODES / FILLER WIRES

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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.
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.

15.17.2 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 .

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

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

2.4 Colour coding for filler wires:

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

Table - 1

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

(* or other approved equivalents)

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

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

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

15.17.3 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.

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Chapter-XV: Welding, Heat Treatment & Radiography and Non-destructive Testing

C. GTAW Filler Wires:

1. These wires do not require any baking.

D. Covered Electrodes:

- I. Baking and holding
- II. Identify baking oven and holding oven.
- III. They shall have a temperature control facility upto 350 °C for baking oven and 200 Deg. C for holding oven.
- IV. A calibrated thermometer shall be provided for monitoring temperature.
- V. On opening a packet of electrodes, segregate and place them in the baking oven. Avoid mix up.
- VI. After loading, raise the baking oven temperature to the desired range as per Table below.
- VII. Note the time when the temperature reaches the desired range. Maintain this temperature for the duration required as per Table below.
- VIII. On completion of baking, transfer the electrodes to holding oven, maintain a minimum temperature of 100°C till issue.
- IX. The electrode shall not be subjected to more than two cycles of baking. Maintain a register containing following details:
 - a. Brand name (e.g. Supratherme)
 - b. Size (e.g Dia 4.0 mm)
 - c. Quantity (e.g. 110 pieces)
 - d. Time at required temperature ie. Above 250⁰C
 - e. Time of Transfer to holding oven. Activities a, b, c to be recorded before loading into the oven.

15.18 All Welding, NDE/SR to be carried out at site as per prevailing manual/FQP procedure issued by BHEL during execution of contract within quoted price.

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Chapter-XVI: 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)

- 16.1 The pressure testing for system, as applicable, shall be carried out as per IBR / Customer / customers' consultant specification / BHEL specifications.

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Chapter-XVII: 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.)

17.0 TESTING, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

- 17.1 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 but not limited to **Air leak test, hydraulic test, flow test, Gas Distribution Test, Sync, Coal Firing, FGD commissioning test, blowers, pumps, full load operation, Trial/Initial Operation, etc.** as instructed by BHEL using contractors own consumables, labour and scaffoldings etc. Air leak test 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.
- 17.2 All required tests (Mechanical and electrical) 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.
- 17.3 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.
- 17.4 After completion of erection of ESP, ducts, Absorber, Mills, blowers, pumps etc. a test shall be performed on the Equipment by the contractor to establish the tightness of the erected equipment
- 17.5 The scope of pre-commissioning, commissioning and post commissioning activities cover installation of all necessary temporary piping, supports, valves, blanking, pumps, tanks etc. and other accessories with access platforms valves, pressure gauges, electric cables, switches, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test, chemical cleaning, steam blowing or any other tests as the case may be and as per applicability of test for scope of work 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.
- 17.6 Raw materials for all temporary piping necessary for conducting Hydraulic test, Chemical cleaning, oil Flushing, effluent disposal, etc. will be provided by BHEL free of cost. However, fabrication, servicing, erection and dismantling the same and return of the temporary piping, flanges, valves etc. to BHEL stores is the responsibility of the contractor without any extra charges.

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Chapter-XVII: Testing, Pre-Commissioning & Commissioning and Post Commissioning

- 17.7 All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests/ activities may not have been listed in these specifications.
- 17.8 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.
- 17.9 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. 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.
- 17.10 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.
- 17.11 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.
- 17.12 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.
- 17.13 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 equipments as first fill and subsequent topping up's will be furnished by BHEL.
- 17.14 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.

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- 17.15 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.
- 17.16 The hydraulic testing of the equipment and piping, covered under this scope of work has to be carried out by the contractor as per instructions of BHEL Engineer. The contractor shall provide all facilities required for hydraulic testing. Before hydraulic test, all the hangers are to be locked by locking pin / plate or temporary support. After completion of Hydraulic test, these are to be removed and all hangers are to be readjusted if required, to the desired value within quoted value.
- 17.17 All the tests shall be repeated till equipments satisfy the requirements / obligation of BHEL to their customer.
- 17.18 Transportation of oil drums from customer/ BHEL's stores, filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly transport of chemicals for various pre-commissioning activities / processes mentioned in the above clauses and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.
- 17.19 Replacing / cleaning of filters of the erected equipments, piping system etc. during pre-commissioning / commissioning stage are within the scope of work.
- 17.20 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 / oil flushing / carboard bursting etc. of piping and other equipments are in the scope of work. Necessary, materials for this will be provided by BHEL.. All the chemicals will be supplied by BHEL free of cost.
- 17.21 The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces.
- 17.22 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.
- 17.23 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain 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

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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.

- 17.24 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.
- 17.25 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.
- 17.26 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.
- 17.27 For conducting gas tightness, Air leak 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.
- 17.28 Contractor has to remove the all temporary supports, structures from inside of duct, absorber, ESP and it's parts and grind the all points after cutting and proper clean and make it free from dust, weldments and burrs.
- 17.29 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.
- 17.30 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 till handing over of sets to customer, whichever is earlier.
- 17.31 Commissioning of the FGD, ESP & Auxiliaries, Gate and dampers, actuators, ducting will involve trial runs of all the equipments erected, blowing of the lines, cleaning, flushing, servicing of equipments 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.

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17.32 After synchronization, the commissioning activities and trial/initial operations will continue till handing over of the unit. Contractor shall provide the manpower 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) ESP Fitters
- c) Structural welders
- d) Riggers
- e) Unskilled workers
- f) Supervisors
- g) Electricians
- h) Ladders
- i) Sheet metal fabricator/fitter
- j) Any other category of workers as may be required.

Further in addition to the above, contractor has to arrange the following minimum manpower **in each package** 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
- 4. Six helpers per shift for three shifts

17.33 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.

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- 17.34 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.
- 17.35 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.
- 17.36 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.
- 17.37 D.S.L / equivalent system for 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.
- 17.38 Operation of related Hoists are in the scope of contractor till trial operation and handing over of Unit.
- 17.39 No payment will be made for temporary installations made for testing of systems & similarly no payment will be made for electrical installations made for any temporary system.

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

In accounting of temporary materials following wastage allowances are provided:

1. Structural items : 4%

- a. Contractor shall cut / open / dismantle work, if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.
- b. Similarly, during the course of erection, if certain portion of equipments erected by the Contractor has to be undone for enabling other Contractors / agencies of BHEL / Customer to carry out their work, Contractor shall carry out such jobs expeditiously and promptly and

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make good the job after completion of work by other Contractors / agencies of BHEL / Customer as per BHEL engineer's / agencies of BHEL / Customer s instructions. Claims, if any, in this regard shall be governed as relevant clauses of 'General Conditions of Contract'.

- c. All surplus steel and all wastage materials will be taken back on weighment 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. Scrap for reinforcement steel and structural steel shall be returned separately.

- 17.40 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.
- 17.41 The contractor shall carry out all required tests, pre-commissioning and commissioning activities required for the successful and reliable operation of Unit.
- 17.42 On completion of all pre-commissioning activities/ tests and as a part of commissioning the complete facilities shall be put on 'Initial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests.
- 17.43 After satisfactory initial operation, the plant shall be put on Trial operation. **The period of trial operation shall be Twenty Eight (28) days of which minimum continuous seventy two (72) hours shall be at full load on designated fuel** in fully automatic mode i.e. with Coordinated Master Control (CMC) on fully automatic mode. During the period of trial operation, all the necessary adjustments in the plant/equipment shall be made by the contractor as per instructions of BHEL engineer to establish that the complete system as per scope as a whole with all sub-systems and with all standby equipment is ready for continuous operation.
- 17.44 Specialized test equipment, if any, shall be provided by BHEL / its client free of hire charges. However, contractor has to take proper care of the equipment issued to him.

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- 17.45 Contractor shall conduct the air/gas tightness test/Leak test of ESP and auxiliaries and ducting 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).
- 17.46 Void
- 17.47 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.
- 17.48 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.
- 17.49 The instruction of the motor manufacturer regarding storage of the motors and re conservation must be strictly followed without any deviation.
- 17.50 The contractor shall endeavour to complete the work undertaken in all designated areas/system/sub-system in all respect without any punch points including area cleaning alongwith 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-XVIII: PAINTING

18 PAINTING

18.1 Touch up Painting:

All structures/components 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 or painting on damaged areas (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.

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

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

- IS:5 – Colour for ready mixed paints and enamels
- IS : 101 Part 1 to 9 – Methods of sampling and test for paints, varnishes and related products
- IS : 1477 Part I&II – Code of practice for painting of ferrous metals in building
- IS : 2932 – Specifications for enamel, synthetic and exterior,
 - Under Coating
 - Finishing
- IS: 9407 – Colour code for identification of pipelines used in thermal power plants.
- Contractor shall satisfy himself, availability of all information in the specifications for proper selection of the paints and ensure their applications as per Codes.

18.3 Primer Painting: (wherever applicable incidental to touch-up & preventive painting)

a) After surface preparation, two coats of **epoxy resin-based zinc primer** shall be applied. Primer shall be applied by either spraying or bushing ensuring a continuous film without “holidays”. Primer coat shall be immediately applied without any time lag after the surface preparation.

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b) Any equipment shall be carefully examined and where ever the primer coat is damaged shall be recoated with primer. However, over the field welds, bolts and nuts etc. two primer coats as per a) shall be applied.

18.4 Finish Painting (wherever applicable incidental to touchup 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.

18.5 Touch-up/ re-painting/finish 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/re-painting/finish 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/finish primer.

18.6 Final painting of piping shall be in the scope of this work. Supply of paint shall also be in the scope of contractor.

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Chapter-XVIII: PAINTING

- 18.7 Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.
- 18.8 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.
- 18.9 Painting procedure to be followed for touch-up painting on damaged areas.
- 18.10 The scope of work includes touch-up/re-painting/finish painting and colour bands, lettering, stencilling, 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.
- 18.11 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.
- 18.12 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.
- 18.13 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.
- 18.14 Specified drying time shall be permitted from one to another coat.
- 18.15 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.
- 18.16 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.

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- 18.17 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.
- 18.18 In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush painting. However, areas/equipments inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the Contractor. Laying of air hose pipe and any other line required shall be done by Contractor at his cost
- 18.19 Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.
- 18.20 Acceptance of Final Painting for required thickness shall be as per the thickness measured by Elcometer by customer/BHEL Engineer. Contractor shall have to carry out painting till the required thickness is achieved.
- 18.21 **Painting Schedule: Attached**

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Chapter-XIX: Lining and Insulation

19.0 APPLICATION OF INSULATION AND REFRACTORY

- 19.1 Handling at site stores / storage yard, Transportation to site of work, Application of refractory & Insulation materials and connected works for ESP and auxiliaries, Ducting, FGD etc. binding and cladding with sheets etc., using their own tools plants, tackles, all consumables, supervisor and men as enumerated in the scope of contract.
- 19.2 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: -
- ESP & its Auxiliaries, Absorber, Non-Pressure parts, Ducts, Ducting from ESP outlet to Chimney Inlet, Rotating equipments etc. It also includes temporary cleaning and air leakage/tightness test, all drain lines, traps, flanges, fine fittings, sampling lines etc.**
- 19.3 All insulations and refractory materials including iron components and other sheets casing materials, etc., required as per drawing will be supplied by BHEL free of cost and the same have to be erected / applied as per the drawings and specifications of BHEL by the contractor.
- 19.4 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
- 19.5 Painting of inner side of sheet metal covering over the insulation walls with two coats of anti-corrosive 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. Retainer type 'A' must be coated with Aluminium paint. 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.
- 19.6 Supply of Bituminous sealing compound shall be in the scope of Contractor.
- 19.7 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 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.

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- 19.8 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.
- 19.9 Wherever iron components are to be welded on non-pressure parts, the contractor shall employ only approved structural welders. All consumables tools and plants etc., required for the work shall be arranged by the contractor at their cost.
- 19.10 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.
- 19.11 Void
- 19.12 Dressing of insulation bricks to suit site conditions curing the refractory concrete applied, sheet cladding over insulations, form the part of this work.
- 19.13 Removal type of insulation to be provided for valves fittings, expansion joints etc., as per the drawings or as directed by BHEL Engineer.
- 19.14 All piping insulations shall be carried out in such a manner as to facilitate removal of bolts nuts and washers from the flanges.
- 19.15 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.
- 19.16 Fabrication, fixing or welding of hooks / supports to equipment to support wool insulation, applying of primer paint to welded portion parts as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.
- 19.17 The contractor shall leave certain gap and opening while doing the work as per the instructions of BHEL Engineer to facilitate inspection 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.
- 19.18 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.

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- 19.19 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.
- 19.20 A logbook shall be maintained by the contractor for the clearance of the area for application of insulation. If the contractor does the work on his own accord without prior permission the area should be redone at his cost.
- 19.21 The contractor shall draw only one week's requirement of material for their work from BHEL stores and keep them in their safe custody (including weather safety) 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/safe custody 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.
- 19.22 Wastages allowance for the materials issued are envisaged as follows:
- a) Wool/LRB mattresses - 2%
 - b) Cladding sheets - 5%
- 19.23 Making structural supporting works for pourable insulation (if applicable as per released drawings during course of erection), laying pourable insulation, adhering to all specifications and instructions shall be the responsibility of the contractor.
- 19.24 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.
- 19.25 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.
- 19.26 Applying different layers of mineral wool as directed and as per drawings and specifications for ESP/FGD-and its auxiliaries, as applicable, 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.

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- 19.27 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.
- 19.28 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
- 19.29 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 arranged by the contractor at his cost.
- 19.30 Contractor has to arrange required fire retardant covering material at their cost to protect the insulation materials drawn from BHEL before and after erection.
- 19.31 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.
- 19.32 Application of insulation and removal of the same for temporary piping under scope of erection of this contract is also included in the scope of the work. However, BHEL will supply the insulation materials free of cost.
- 19.33 All rectification including painting of Employer's structure which are damaged by contractor during his work.
- 19.34 The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, pipes, 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.
- 19.35 The Contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.
- 19.36 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

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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.

- 19.37 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.
- 19.38 The contractor should ensure, proper finishing of surface of the insulation, sheeting and cementing.
- 19.39 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.
- 19.40 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.
- 19.41 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. **Contractor may note that he will supply anti-corrosive black bituminous paint & bituminous sealing compound required for above works at his cost.**
- 19.42 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.
- 19.43 All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc required will be supplied by BHEL free of cost and the same have to be erected/ applied as per the drawings and specifications of BHEL by the Contractor.
- 19.44 Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipments. Multiple layers of wool have to be applied as directed

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and as per drawings and specifications for all equipments/ systems covered under the scope of work.

- 19.45 The cladding and outer casing are aluminium sheets. All relevant specifications and procedures with regards to beading, sealing etc for aluminum sheets have to be adhered to.
- 19.46 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.
- 19.47 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.
- 19.48 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.
- 19.49 Removable type of insulation shall be provided for valves, fittings, expansion joints etc. as per the drawings or as directed by BHEL Engineer.
- 19.50 All temporary pipelines required during testing, pre-commissioning and commissioning should be insulated as directed by BHEL. Required insulation material shall be issued by BHEL free of cost.
- 19.51 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.
 - b) Cutting of the wool mattresses in the required shape and application of finishing cement of required thickness wherever required.
- 19.52 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

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Chapter-XIX: Lining and Insulation

arranged / removed by BHEL Engineer and the expenses incurred with 5% overhead will be recovered from the contractors.

- 19.53 **Cleaning:** Collection of Insulation debris and other debris, transport, burying and filling of the same at a designated placed identified by BHEL/Customer is in the scope of contractor within the quoted rates.

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Chapter-XX: Coating and Wrapping

VOID

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XXI: PRESERVATION & PROTECTION OF COMPONENTS

21.0 PRESERVATION & PROTECTION OF COMPONENTS

- 21.1 At all stages of work, equipments/materials in the custody of Contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents including the primer & paint, for the above work shall be provided by the Contractor.
- 21.2 The Contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.
- 21.3 The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc shall be returned to BHEL stores by the Contractor.
- 21.4 The Contractor shall not waste any materials issued to agency. In case it is observed at any stage that the wastage/excess utilisation of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be affected with departmental charges from the Contractor. Decision of BHEL on this will be final and binding on the Contractor.
- 21.5 For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.

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Chapter-XXII: SPECIAL FEATURE

VOID

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Chapter-XXIII: Specific Exclusion

23.0 Specific Exclusion:

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

- i. All electrical and control & instrumentation items except those specified elsewhere in these specifications.
- ii. Regular Fabrication of Structure except to the extent specifically indicated elsewhere in this tender.
- iii. E&C work of cable trays, cables and earthing etc
- iv. Control panels, EPMS, MCC etc.
- v. Electrical & C&I items of handling system.
- vi. Civil works except to the extent specifically indicated elsewhere in this tender.
- vii. Pneumatic copper tubing and fittings thereof.
- viii. Testing and commissioning of heating elements, thermostats, HV rectifier transformers.
- ix. Electrical and C&I items of Variable Frequency Drives as provided elsewhere in these specifications.
- x. Hume pipes for pipe crossing

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Chapter-XXIV : Bill of Quantities and % Weightage of Individual Items

24.0 Package Description: Erection, Testing, Commissioning, Trial Operation & Handing Over including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, preparation of foundation, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stenciling & Labelling of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist, Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, DG set including installation of items as per BOQ of Unit-1 & 2 at 2x660 MW MSPGCL Koradi BTG TPS, District Nagpur, Maharashtra:

- 1. Package-A: Unit # 1** Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet and FGD & auxiliaries as per BOQ of unit-1 at 2x660 MW MSPGCL Koradi TPS, District Nagpur, Maharashtra
- 2. Package-B: Unit # 2** Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet and FGD & auxiliaries as per BOQ of unit-2 at 2x660 MW MSPGCL Koradi TPS, District Nagpur, Maharashtra

Job:	Erection, Testing, Commissioning, Trial Operation & Handing Over including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, preparation of foundation, NDT, fixing of hangers & supports, application of lining, Insulation, supply & touch-up painting, Stenciling & Labelling of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories from ESP outlet to Chimney Inlet as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist, Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, DG set including installation of items as per BOQ of Unit-1 & 2 at 2x660 MW MSPGCL Koradi BTG TPS, District Nagpur, Maharashtra:						
E&C of ESP & FGD unit-1 & 2 (Package-A +Package-B):							
SN	Rate schedule Identifier	Contract (Main Package)	UOM	QTY (A)	Weightage/ Factor "X" (B)	Total Amount (C)	Unit Rate (D=C/A)
1	1A	ESP	MT	22,166.28	0.50839242		
2	1B	Structure (Absober structure, Duct structure etc.)	MT	5,983.90	0.18867954		
3	1C	NPP (Ducting, Gates & Dampers)	MT	3,731.74	0.13774765		
4	1D	Rotating Machines	MT	1,519.52	0.03785532		

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5	2A	Piping-CS, GI & SS	MT	611.20	0.05590820		
6	3A	Insulation-Wool Mattress	MT	1,154.00	0.04459655		
7	3B	Insulation-Iron Parts	MT	418.00	0.01494645		
8	3C	Insulation- Aluminium Cladding Sheets	MT	326.00	0.01187388		
Sub-total unit-1 & 2			MT	35,911	1.00		
Total Bidder Quote for the entire bill of quantities excluding GST							

Package-A (Unit-1 BOQ)

SN	Rate schedule Identifier	Contract (Main Package)	UOM	QTY (A)	Unit rate (Rs.) (B)	Total Amount (Rs.) (C=AxB)
1	1A	ESP	MT	11,083.14	As derived from Price bid	
2	1B	Structure (Absorber structure, Duct structure etc.)	MT	3,293.85		
3	1C	NPP (Ducting, Gates & Dampers)	MT	1,842.37		
4	1D	Rotating Machines	MT	1,308.02		
5	2A	Piping-CS, GI & SS	MT	383.70		
6	3A	Insulation-Wool Mattress	MT	577.00		
7	3B	Insulation-Iron Parts	MT	209.00		
8	3C	Insulation- Aluminium Cladding Sheets	MT	163.00		
Total Package-A				18,860		

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XXIV : Bill of Quantities and % Weightage of Individual Items

Package-B (Unit-2 BOQ)

SN	Rate Schedule	DESCRIPTION OF WORK	UOM	QUANTITY (A)	Unit rate (Rs.) (B)	Total Amount (Rs.) (C=AxB)
1	1A	ESP	MT	11,083.14	As derived from Price bid	
2	1B	Structure (Absorber structure, Duct structure etc.)	MT	2,690.05		
3	1C	NPP (Ducting, Gates & Dampers)	MT	1,889.37		
4	1D	Rotating Machines	MT	211.50		
5	2A	Piping-CS, GI & SS	MT	227.50		
6	3A	Insulation-Wool Mattress	MT	577.00		
7	3B	Insulation-Iron Parts	MT	209.00		
8	3C	Insulation-Aluminium Cladding Sheets	MT	163.00		
Total Package-B				17,051		

Note: The quantity indicated in the BOQ is approximate only and is liable for variation. Payment will be as per actual quantity executed as certified by BHEL Engineer above Unit rate of individual items of BOQ.

24.1 Modality of Award:

24.1.1 Both the packages i.e. Package-A and Package-B shall be awarded to L-1 Bidder (single agency), with acceptable L-1 rates to BHEL

24.1.2 Bidder has to quote for combined quantity of Package-A and Package-B.

24.1.3 LOA for each Package-A and Package-B shall be issued separately and each Package shall be considered as separate contract with separate contract period (as specified in Chapter-VI "Time Schedule" of TCC), separate start dates and separate contract value etc.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XXIV : Bill of Quantities and % Weightage of Individual Items

24.1.4 Package-A and Package-B: For each item, item rate shall be derived. Payment shall be made on actual execution of work on item rate basis

24.2 Instructions to the bidders

1. Bidders shall quote Total Lump-sum Price for the entire scope of work (total tendered quantities i.e. package-A + package-B quantities) in Rupees at BHEL E-procurement Portal. Any other entry elsewhere in the offer of the bidder shall be treated as Null and Void.
2. BHEL has fixed the % weightages for the amount of individual items of Schedule of Quantity (total tendered quantity) w.r.t. the total price of Price Bid
3. Based on the quantities of individual item in total tendered quantity and the amount arrived in SI No 2 above, item rate of individual items shall be derived by BHEL.
4. The item rates calculated/derived at sl no (3) shall be used for releasing LOAs for package-A and package-B based on the quantities in respective package.
5. Bidders to note that this is an '**Item rate contract**'. Payment shall be made for the actual quantities of work executed at the Unit rate arrived at as per serial no (3)/(4) above.

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Chapter-XXV : Technical Annexure

THIS TENDER SPECIFICATION CONSISTS OF FOLLWING ANNEXURE:

S.N.	DESCRIPTION
Annexure-A	Standard Guidelines for Worker's Accommodation/Establishments at BHEL-Project sites
Annexure-B	T&P Hire Charges
Annexure-C	HSE Plan
Annexure-D	HSFG Bolt Tightening procedure
Annexure-E	GA drawings of ESP, ID system & FGD Ducting
Annexure-F	Painting Schedule

NOTE- ALL THE ABOVE-MENTIONED ANNEXURE ARE UPLOADED ON E-PROCUREMENT PORTAL.