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This volume shall be construed as part of tender document and shall be read along-with others volumes of tender. Unless otherwise specified, in case of any conflict or inconsistency between the general and technical conditions, the same shall be brought out by the bidder in writing to BHEL for clarification during pre-bid discussions, if applicable; failing which most stringent interpretation/ clause in favour of BHEL shall be adopted and the same shall be binding to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each package of the tender.

	5. Process water & cooling water storage & pumping system. 6. Sump & sump pumps 7. Elevator 8. Booster fans 9. Structural steel (for absorbers, tanks & ducting)
4.2	The scope of work under these specifications for Supply of raw materials & fabrication of auxiliary support, small beam & inserts, share keys etc , Erection, testing, commissioning, trial operation & handing over of FGD system(Mechanical),fire protection system broadly consists of but not limited to following:
4.2.1	Taking delivery of the materials from the project storage yard /stores /sheds to erection site.
4.2.2	Their preservation, safe keeping, watch and ward.
4.2.3	Checking, dressing, chipping and levelling of foundations.
4.2.4	Pre-assembly, erection, alignment of various equipment's, machining and grouting.
4.2.5	Welding, heat treatment, radiography, UT and other non-destructive tests wherever required as per approved quality plan/drawings/ documents.
4.2.6	Hydraulic testing, air/gas leak test, air tightness test, other pre commissioning tests as per approved quality plan/drawings/ documents
4.2.7	Insulation and finish painting including supply of paints etc.
4.2.8	Erection and dismantling of all temporary system etc. required for above operations and other commissioning activities including post commissioning operations and stabilisation of the unit,
4.2.9	FGD system trial run, resolving any deficiencies observed and handing over the FGD system to customer M/s NTPC.
4.3	BRIEF DESCRIPTION OF THE FGD SYSTEM
4.3.1	The FGD system shall be based on Wet Limestone Forced Oxidation process. Each unit shall be provided with an independent absorber.
4.3.2	Gas from terminal point on ID fan discharge duct shall be taken directly to the absorber through Booster Fans. In the absorber, SO ₂ in flue gas shall be removed by a spray of recirculating slurry, pumped by slurry recirculation pumps.
4.3.3	Compressed oxidation air shall be blown through the slurry in the oxidation tank, to oxidize the Calcium sulphite to gypsum.
4.3.4	Clean gas from the absorber shall be taken to the Wet Chimney through three stage mist eliminators.
4.3.5	Limestone to the absorbers of the units shall be supplied by a wet limestone grinding system, common for the units. Limestone shall be fed to the Limestone day silos which in turn will feed the Limestone to wet ball mill through a gravimetric feeder.
4.3.6	The gypsum from the absorber(s) shall be pumped by dedicated gypsum bleed pumps to a common Gypsum Dewatering system consisting of two streams (2x100%) of primary and secondary hydrocyclone and vaccum belt filters for gypsum dewatering. The water removed from the absorber shall be recycled to the absorbers. The waste water from the system shall be collected and neutralized using lime and neutralized effluent shall be pumped at required pressure to waste water terminal point.
4.4	The brief list of the major equipment to be erected under the FGD system but not limited to following:
4.4.1	Absorber System along with supporting structures
4.4.2	Booster Fans & isolation gates
4.4.3	Tanks of various sizes
4.4.4	Lime stone grinding and slurry preparation system consist of lime stone silos, bunker, gravimetric feeder, wet ball mills, hydrocyclones
4.4.5	Slurry pumps (Absorber Slurry recirculation pumps, Gypsum Bleed pumps , limestone Slurry feed pumps)
4.4.6	Gypsum Dewatering system consists of Vacuum belt filter, hydrocyclones
4.4.7	Process water and cooling water storage system
4.4.8	Thermal Insulation and cladding sheets
4.4.9	Sump Pumps
4.4.10	Piping system
4.4.11	Equipment Cooling water System (PHEs, DMCW pumps)
4.4.12	Misc platforms, galleries, handrails
4.4.13	Fire Protection System including hydrant , MVWS,HVWS
4.4.14	Equipment Handling System

4.4.15	All required structures for equipments & ducting	
4.4.16	All shop fabricated structural steel including materials handling of the same.	
4.5	Tentative weight to be erected for the FGD System shall be 36081MT (excluding supply of raw materials & fabrication of auxiliary support, small beam & inserts, share keys etc.), and detailed break up indicated in Annexure-II .	
4.5.1	<p>The contractor is required to erect actual tonnage (irrespective of any variation plus or minus) which may be necessary to complete their work and commission above system and complete the work in all respects as detailed in tender specifications, for which payments shall be released on finally accepted tonnage rates. The contractor undertakes to erect / commission actual quantities as per instruction of the BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments shall also be regulated for the same.</p>	
4.5.2	<p>The customer M/s. NTPC and / or their Consultant 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, without any cost implications to the 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.</p>	
5.0	<p>DEVIATIONS</p> <p>The bidder is required to submit with his offer in the relevant schedule / format without any ambiguity. Any assumptions, presumptions, deviations etc. indicated or implied anywhere by the bidder except those indicated in the deviation schedule / format will not be recognized and will not form a part of consideration / offer. In the absence of such filled-up schedule / format it will be understood and agreed that the bidder's offer is based on strict conformance to the specification and no negotiation would be allowed in this regard. BHEL reserve the right not to recognize any / all deviations submitted after opening of the bid.</p>	
6.0	<p>DEWATERING</p> <p>Contractor shall ensure at all times that his work area & adjacent approach / access roads are free from accumulation of water, so that the materials and erection equipment are safe and the erection / progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.</p>	
7.0	<p>GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)</p>	
7.1	<p>Except where otherwise specified, the plant / equipment shall comply with appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in tender, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the bidder shall give all particulars and details as necessary; to enable BHEL to identify all of the plant/ equipment in the same detail as would be possible had there been a standard specification.</p>	
7.2	<p>Where the bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each standard specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.</p>	
7.3	<p>In the event of any conflict between the codes & standards referred above and requirements of this specification, the requirements which are more stringent shall govern.</p>	
7.4	<p>Tools used during erection and commissioning shall not be accepted except with the specific approval of the engineer.</p>	
7.5	<p>Wherever specified or required the plant / equipment shall conform to various statutory regulations such as Indian Boiler Regulation, Indian Electricity Rules, Indian Explosive Act, Factories Act etc, wherever required, obtaining approval for plant / equipment supplied under the specification from statutory authorities shall be the responsibility of the contractor.</p>	
8.0	<p>GENERAL SERVICES TO BE RENDERED BY THE BIDDER</p>	
8.1	<p>Deployment of all tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the construction work to be handled under scope of this specification except otherwise specified.</p>	
8.2	<p>Providing support services for the contractor's erection staff e.g. construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch</p>	

	and ward for security and safety of the materials under the Contractor's custody etc. as required.	
8.3	Maintaining proper documentation of all site activities undertaken by the contractor as per the proforma mutually agreed with BHEL, submitting monthly progress reports as also any such document as and when desired by BHEL / owner, taking approval of all statutory authorities e.g., Factory Inspector, Provident Fund authority etc. for respective portions of work under the jurisdiction of such statutes of laws.	
8.4	As part of overall project management activity, the contractor shall be responsible for proper co-ordination of construction activities during various phases of execution of the contract. The contractor shall identify a person designated as construction manager, with whom BHEL shall interact on matters related to execution of the contract. The construction manager shall be the single point contact person on behalf of the contractor. BHEL shall interact with the construction manager only on all matters on co-ordination between BHEL and the contractor. For timely completion of work, the contractor may have to work in one or more shifts. He will not be eligible for any extra charge on this account.	
8.5	The contractor shall confine all his field operations to those works which can be reformed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms etc and during other unfavourable construction conditions. No field activities shall be performed by the contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the contractor in proper and satisfactory manner in the performance of such works and with the concurrence of the engineer. Such unfavourable construction conditions in no way relieve the contractor of his responsibility to perform the works as per the schedule.	
8.6	The contractor shall supply all skilled, semi-skilled and unskilled workmen required for all works of handling and transportation from site store to erection site, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserve the right to decide on the suitability of the workers and the other personnel who will be employed by the contractor. BHEL reserves the right to insist on removal of any employee of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him.	
8.7	The supervisory staff employed by the contractor shall be technically qualified and experienced in the area of work. They shall ensure proper out turn of work and discipline on the part of labour put on the job by the contractor and in general see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL and BHEL's client.	
8.8	The contractor shall also furnish daily manpower report showing by classification the number of employees engaged in various categories of work a progress report of work as required by BHEL engineer.	
8.9	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall co-operate with other personnel, and other contractors, co-ordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.	
8.10	The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerance given in the drawing / instruction given by BHEL Engineer from time to time.	
8.11	It is the responsibility of the contractor to engage his workman in shifts or on overtime basis for achieving the target set by BHEL during erection, commissioning and testing period. Contractor's quoted rate shall include all these contingencies.	
8.12	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.	
9.0	PROTECTION	
9.1	Equipment having anti-friction or sleeve bearings shall be protected by weather tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces which are damaged shall be repainted.	
9.2	Electrical equipments, controls and instrumentations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound and	

	protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors
9.3	All piping, tubing and conduit connections on equipment and equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or plugs or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.
9.4	All other consumables to be supplied by the contractor within the quoted rate.
10.0	GENERAL GUIDELINES FOR FIELD ACTIVITIES
10.1	The contractor shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.
10.2	The contractor shall co-operate with owner/ BHEL and other contractors working in site and arrange to perform his work in a manner so as to minimise interference with other contractor's works. BHEL's engineer shall be notified promptly of any defect in other contractors' works that could affect the contractor's work. If rescheduling of contractor's work is requested by the owner's / BHEL's engineer in the interest of overall site activities, the same shall be compiled with by the contractor. In all cases of controversy, the decision of BHEL shall be final and binding on the contractor without any commercial implication.
10.3	The BHEL engineer shall hold weekly meeting of all the contractors working at site at a time and a place to be designated by the engineer to discuss interface issues. The contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the engineer and shall strictly adhere to those decisions in performing this work. In addition to the above weekly meeting, engineer may call for other meetings either with individual contractors or with selected number of contractors and in such a case the contractor, if called will also attend such meetings.
10.4	Time is the essence of the contract and the contractor shall be responsible for performance of his work in accordance with the specified construction schedule. If at any time the contractor is falling behind the schedule, he shall take necessary action to make good of such delays by increasing his work to comply with the schedule and shall communicate such action in writing to the engineer, satisfying that his action will compensate for the delay. The contractor shall not be allowed any extra compensation for such action.
10.5	The engineer shall however not be responsible for provision of additional labour and or materials or supply of any other services to the contractor except for the co-ordination work between various contractors as set out earlier.
10.6	The works under execution shall be open to inspection & supervision by BHEL's / Owner's engineer at all times. The contractor shall give reasonable notice to BHEL before covering up or otherwise placing beyond the reach of inspection any work, in order that same may be verified, if so desired by owner/ BHEL.
10.7	Every effort shall be made to maintain the highest quality of workmanship by stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents the same shall be brought to the notice of BHEL's engineer. Manufacturer's interpretation in such cases shall be binding on the contractor.
10.8	The contractor shall comply with all the rules and regulations of the local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by the contractor shall be to his account.
10.9	Equipment and material, in case wrongly installed, shall be removed and reinstalled to comply with the design requirement at the contractor expense, to the satisfaction of BHEL / owner.
11.0	QUALITY CONTROL & QUALITY ASSURANCE
11.1	INSPECTION & FIELD QUALITY ASSURANCE
11.1.1	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) & technical instructions as revised from time to time. 'Total Quality' shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.
11.1.2	Preparation of quality assurance log sheets and protocols with customer / consultants / statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work / specification. These records shall be submitted to BHEL / customer for approval from time to time.

11.1.3	The protocols between contractor and customer / BHEL shall be made for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer / BHEL. This is necessary to ensure elimination of errors and to avoid accumulation and multiplication of errors.
11.1.4	<p>A daily log book (with proper indexing) should be maintained by every supervisor / engineer of contractor, for respective area of work, on the job for detailing and incorporating alignment/ clearance / centering / levelling readings and inspection details of various equipment, etc. This log book shall be always accessible to BHEL engineers.</p> <p>High pressure welding (as applicable under the scope of this contract) details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions.</p> <p>Record of radiography (as applicable under the scope of this contract) containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions.</p> <p>Record of heat treatments (as applicable under the scope of this contract) performed shall be maintained as prescribed by BHEL.</p>
11.1.5	The performance of welders (as applicable under the scope of this contract) will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately.
11.1.6	Only welders duly authorized by BHEL / customer / consultant after welder qualification test as per ASME Sec-Ix / AWS D1.1 (as applicable) shall be engaged on the work. All the welders shall carry identity cards as per the proforma prescribed by BHEL / Customer / Consultant.
11.1.7	Any re-laying or re-termination of cables / re-erection of instruments / recalibration of instruments etc. required due to contractor's mistake and found at any stage inspection shall be carried out by the contractor at no extra cost. Repair / rectification procedure to be adopted to make any job acceptable shall be subject to the approval of BHEL.
11.1.8	Weekly Quality Review Meeting at site shall be organised by BHEL to discuss quality issues and next weeks inspection plans. Site in-charge of the contractor along with QAEs of the contractor must be present in the meeting with closure report of the issues raised by BHEL in the previous meetings.
11.2	REQUIREMENT OF ISO 9001
11.2.1	BHEL: PSER is accredited with ISO 9001 certification and as such this work is subject to various audits to meet ISO 9001 requirements.
11.2.2	The basic philosophy of the Quality Management System under ISO 9001 is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product / procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non-conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers / vendors of various products / services contributing in the work are also considered as part of the quality management system. As such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.
11.2.3	BHEL reserves the right to carry out quarterly quality audits and quality surveillance of the systems and procedures of contractor's quality management. Contractor shall provide all necessary assistance to enable BHEL to carry out such audit & surveillance.
11.2.4	Quality audits / approval of the results of test & inspection will not prejudice the right of BHEL to reject an equipment service not giving desired performance and shall not in no way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of equipment / service as per specification.
11.3	MMEs / MMRs
11.3.1	Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipment). The MMEs shall have test / calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment / instrument is sent for calibration.

	Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall i.e. repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.			
11.3.2	Contractor shall provide all the Measuring Monitoring Equipment (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments / gauges / tools for the work under this specification, is final and binding on the contractor. BHEL shall give an indicative list of MMEs required for this work else where in this contract and to be made available by the contractor. The list will be reviewed by BHEL site as per the requirement of approved FQPs and the contractor shall meet any augmentation needed wherever required.			
11.3.3	It is the responsibility of the contractor to prove the accuracy of the testing / measuring / calibrating equipment brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.			
11.3.4	Re-work necessitated on account of use of invalid MMEs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.			
11.3.5	In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter / finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter / final measurements.			
11.4	INSPECTION BY TS / FES / QA ENGINEERS OF BHEL UNITS / ENGINEERING CENTRES			
11.4.1	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipment under erection and commissioning at various stages may also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc along with proper access for such stage inspections free of cost.			
11.4.2	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per applicable clause of the contract, and provided such modifications have not arisen for reasons attributable to the contractor.			
11.5	PENALTIES ON VENDORS / SUB-CONTRACTORS AGAINST NON-COMPLIANCE OF QUALITY NORMS			
SI. No.	Nature of Non-compliance	Penalty for Domestic Project	Penalty for Export Project	Remarks
GENERAL				
11.5.1	Unavailability of QAE deployment schedule (duly approved by BHEL Site) matching with manpower requirement of approved L2 schedule	0.10%	0.10%	Against each RA bill
11.5.2	Unavailability of required number of QAE with proper experience & NDT certification as per the requirement of the Contract	Rs. 1,000.00	\$16.00	Per person per day
11.5.3	Not attending quality meeting of BHEL by nominated member of vendor / sub-contractor	Rs. 2,000.00	\$32.00	Per meeting
CALIBRATION				
11.5.4	Use of MMEs without valid calibration certificate	Rs. 1,000.00	\$16.00	Per equipment per instance
11.5.5	Use of NDT equipment, welding equipment without having valid calibration certificate / condition not as per requirement	Rs. 1,000.00	\$16.00	Per equipment per instance

WELDING & NDT				
11.5.6	Unqualified welders carrying out welding / tack welding	Rs. 1,000.00	\$16.00	Per welder per instance. (Gatepass of the person shall be withheld)
11.5.7	Not using portable oven for welding consumables	Rs. 500.00	\$8.00	Per welder per instance. (The consumables in the oven shall be confiscated)
11.5.8	Not using electrodes pre-baked in baking oven	Rs. 500.00	\$8.00	Per instance. (The subject consumables shall be confiscated)
11.5.9	Not using welding consumables of approved make & not using correct type of electrode as per approved EWS / Drawing / WPS	Rs. 1,000.00	\$16.00	Per instance. (The subject consumables shall be confiscated)
11.5.10	Non-removal of welding slag and spatters after welding	Rs. 500.00	\$8.00	Per joint
11.5.11	Not using NDT equipment as prescribed in the manual / FQP / guidelines / Contract	Rs. 1,000.00	\$16.00	Per equipment per instance
11.5.12	Welder doing welding without valid job card	Rs. 500.00	\$8.00	Per instance
11.5.13	Discrepancy observed in the weld joints identified by BHEL / Customer for RT vs RT film offered	Rs. 2,000.00	\$32.00	per joint
MATERIAL MANAGEMENT				
11.5.14	Non-maintenance of grid pillar marking	Rs. 200.00	\$3.00	Per location week
11.5.15	Mismatch of location of material in store area w.r.t. location mentioned in stock register	Rs. 500.00	\$8.00	Per instance
11.5.16	Non-compliance of Preservation of material as per storage & preservation manuals	Rs. 1,000.00	\$16.00	Per equipment
11.5.17	Not offering received material for verification within stipulated time as per contract	Rs. 500.00	\$8.00	Per instance
PAINTING & ALLIED WORKS				
11.5.18	Not using primer / paints of approved make and as per Specifications	Rs. 1,000.00	\$16.00	Per instance
11.5.19	Painting without proper surface preparation as per approved schedule / drawing / FQP	Rs. 500.00	\$8.00	Per instance
PROTOCOLS & LOG SHEETS				
11.5.20	Delay in preparation of Protocols / Logsheets as per approved FQP within 3 days of completion of checks	Rs. 200.00	\$3.00	Per protocol per day delay
INSPECTION OF BOUGHT-OUT ITEMS / CONSUMABLES				
11.5.21	Delay in offering inspection of Bought-out Items / Consumables / Aggregates (for items which need site inspection as per approved QP) within 3 days of receipt of material at site	1% of the item value of the LOT	1% of the item value of the LOT	per item per day delay after receipt of material

11.5.22	Delay in submission of required documents (viz. Invoice, Inspection Release Note, COC, MDCC, MTC as the case may be) of Bought-out Items (shop inspection items / consumables) within 3 days of receipt of material at site.	1% of the item value of the LOT	1% of the item value of the LOT	per item per day delay after receipt of material
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NOTE:

Any non-conformity requiring dismantling / rework, attributable to vendor / sub-contractor, shall be penalised at a rate mentioned above or cost to BHEL, which ever is higher.

12.0	HEALTH, SAFETY & ENVIRONMENT
12.1	General
12.1.1	The contractor shall comply with all the requirements of "The Building and Other Construction Workers (Regulation of Employment, Conditions of Service) Act," 1996 and its Central Rule 1998 / State Rules and any other statutory requirements as applicable.
12.1.2	The Contractor shall follow NTPC Safety Rules as issued from time to time with respect to safety in construction & erection.
12.1.3	The contractor shall have the approved Safety, Health and Environment (SHE) Policy in respect of Safety and health of Building Workers and it shall be circulated widely and displayed at conspicuous place in Hindi and local language understood by the majority of the workers. A copy of the safety policy should be submitted to Engineer in charge.
12.1.4	The contractor shall submit the safety plan comprising of methods to implement the Safety Policy/ Rules, Risk assessment and ensuring Safety at work areas, Safety audits, inspections and its compliance, Supervision and Responsibility to ensure Safety at various levels, Safety training to employees, review of Safety and accident analysis, ensure Health and Safety Procedures to prevent accidents to Engineer I/c for approval as per the format of Safety plan as annexed at Annexure - I .
12.1.5	The Contractors shall ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to the Employer or to others, working at the Site.
12.1.6	All equipments used in construction and erection by the contractor shall meet BIS I International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the contractor in accordance with manufacturer's operation manual. The contractor should also follow Guidelines/Rules of the Employer in this regard.
12.1.7	The Contractors shall provide suitable latest Personal Protective Equipments of prescribed standard to all their employees and workmen according to the need. The Engineer I/c shall have the right to examine these safety equipments to determine their suitability, reliability, acceptability and adaptability. The contractor should also ensure these before their use at worksite.
12.1.8	The Contractor shall provide safe working conditions to all workmen and employees at his workplace including safe means of access, railings, stairs, and ladders, scaffolding, work platforms, toe boards etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection of scaffolds, access, work platforms etc. shall be good and the contractor shall use standard quality of material.
12.1.9	The Contractor shall follow and comply with all the Safety Rules, standards, code of practices of NTPC and relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any protest or contest or reservation. In case of any non-conformity between statutory requirement and the Safety Rules of the Employer referred above, the latter shall be binding on the Contractor unless the statutory provisions are more stringent. As and when required he can refer / obtain copy of NTPC safety documents as stated above.
12.1.10	The contractor shall have his own arrangements with nearby hospitals for shifting and treatment of sick and injured. The medical examination of the workers employed in hazardous areas shall be conducted as per Rule 223 Of The Building and Other Construction Worker (Regulation of Employment and Condition of Service) Central Rule 1998. Their health records shall be maintained accordingly and to be submitted to Engineer I/c when asked for. If any worker found suffering from occupational health hazard, the worker should be shifted to suitable place of working and properly treated under intimation to Engineer I/c. The medical fitness certificate to be submitted to Engineer (I/c).
12.1.11	First Aid boxes equipped with requisite articles as specified in the Rule 231 of The Building and Other Construction Worker (Regulation of Employment and Condition of Service) Central Rule 1998 shall be provided at construction sites for the use of workers. Training has to be provided on first aid to workmen & office bearers working at site.
12.2	Emergency Action Plan

	The contractor shall prepare an emergency action plan approved by his competent authority to handle any emergency occurred during construction work. Regular mock drills shall be organized to practice this emergency plan. The Emergency Action Plan should be widely circulated to all the employees and suitable infrastructure shall be provided to handle the emergencies.
12.3	<p>Scaffolding</p> <p>The contractor shall take all precautions to prevent any accidental collapse of scaffolding or fall of persons from scaffolding. The contractor should ensure that scaffolding are designed by a competent person and its erection and repairs should be done under the expert supervision. The scaffolding shall meet the required strength and other requirements for the purpose for which the scaffold is erected. The material used for scaffold should conform to the BIS / International standards.</p>
12.4	<p>Opening</p> <p>The contractor shall ensure that there is no opening in any working platform/any floor of the building, which may cause fall of workers or material. When ever an opening on a platform/any floor of the building is unavoidable, the opening should be suitably fenced and necessary measures for protection against falling objects or building workers from such platform are taken by providing suitable safety nets, safety belts or other similar means.</p>
12.5	<p>Explosives</p> <p>The contractor shall take all precautions while handling, using, storing or transporting of all explosives. Before usage of any explosive necessary warning / danger signals be erected at conspicuous places to warn the workers and general public. The contractor should strictly ensure that all measures and precautions required to be complied for use, handling, storing or transportation of explosives under the rules framed under the Explosives Act, 1884.</p>
12.6	<p>Fencing of Machinery</p> <p>The contractor shall provide suitable fencing or guard to all dangerous and moving parts of machinery</p> <p>The contractor shall not allow any of the employees to clean, lubricate, repair, adjust or examine during machinery in motion, which may cause injury to the person.</p>
12.7	<p>Carrying of Excessive Weight by a Worker</p> <p>The worker shall not be allowed to lift by hand or carry over his head, back or shoulder more than the maximum limit set by the prescribed rules for the construction Workers.</p>
12.8	<p>Dangerous and Harmful Gases / Equipment</p> <p>The contractor shall ensure that the workers are not exposed to any harmful gases during any construction activity including excavation, tunneling, confined spaces etc. The contractor should not allow any worker to go into the confined space unless it is certified by Engineer (I/c) to be safe and fit for the entry to such work place. Proper record and work permits should be followed to carry out such works.</p>
12.9	<p>Dangerous and Harmful Gases / Equipment</p> <p>The contractor shall ensure that the workers are not exposed to any harmful gases during any construction activity including excavation, tunneling, confined spaces etc. The contractor should not allow any worker to go into the confined space unless it is certified by Engineer (I/c) to be safe and fit for the entry to such work place. Proper record and work permits should be followed to carry out such works.</p>
12.10	<p>Overhead Protection</p> <p>The contractor shall ensure that any area exposed to risk of falling materials, articles or objects is roped off or cordoned off or otherwise suitably guarded from inadvertent entry of any person.</p> <p>Wherever there is a possibility of falling of any material, equipment or construction workers while working at heights, a suitable and adequate safety net should be provided. The safety net should be in accordance with BIS Standards.</p>
12.11	<p>Working at Heights</p> <p>All working platforms, ways and other places of construction work shall be free from accumulations of debris or any other material causing obstructions and tripping. Wherever workers are exposed to the hazard of falling into water, the contractor shall provide adequate equipment for saving the employees from drowning and rescuing from such hazards. The contractor shall provide boat or launch equipped with sufficient number of life buoys, life jackets etc. manned with trained personnel at the site of such work.</p> <p>Every opening at elevation from ground level through which a building worker, vehicle, material equipment etc. may fall at a construction work shall be covered and/or guarded suitably by the contractor to prevent such falls.</p> <p>Wherever the workers are exposed to the hazards of falling from height, the contractor shall provide full harness safety belts fitted with fall arresting systems to all the employees working at higher elevations and life line of 8 mm diameter wire rope with turn buckles for anchoring the safety belts while working or moving at higher elevations. Safety nets shall also be provided for saving them from fall from heights and such equipment should be in accordance with BIS standards.</p> <p>Wherever there is a possibility of falling of any material, equipment or construction workers while</p>

	<p>working at heights, a suitable and adequate safety net should be provided. The safety net should be in accordance with BIS Standards.</p> <p>The contractor shall provide standard prefabricated ladders on the columns where the workers are required to use them as an access for higher elevations till permanent staircase is provided. The workers shall be provided with safety belts permanent staircase is provided. The workers shall be provided with safety belts fitted with suitable fall arresting system (Fall arrestors) for climbing/getting down through ladders to prevent fall from height.</p>
12.12	<p>Handling of Hazardous Chemicals</p> <p>The Contractor will notify well in advance to the Engineer I/c of his intention to bring to the Site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. NTPC shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the Contract shall strictly adhere to and comply with such instructions. The Engineer I/c shall have the right at his sole discretion to inspect any such container or such construction plant / equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. No claim due to such prohibition shall be entertained by NTPC and NTPC shall not entertain any claim of the Contractor towards additional safety provisions / conditions to be provided for / constructed.</p> <p>Further, any such decision of the Engineer I/c shall not, in any way, absolve the Contractor of his responsibilities and in case, use of such a container or entry thereof into the Site area is forbidden by NTPC, the Contractor shall use alternative methods with the approval of the NTPC without any cost implication to the NTPC or extension of work schedule.</p> <p>Where it is necessary to provide and / or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and / or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the Engineer I/c. In case any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.</p> <p>The Contractor shall be fully responsible for the safe storage of his and his Sub- contractor's radioactive sources in accordance with BARC/DAE (Bhabha Atomic Research Centre/ Department of Atomic Energy, Govt. of India) Rules and other applicable provisions. All precautionary measures stipulated by BARC/DAE in connection with use, the contractor would take storage and handling of such material.</p> <p>The contractor shall provide suitable personal protective equipments to the workers who are handling the hazardous and corrosive substances including alkalis and acids.</p> <p>As a precautionary measure the contractor should keep the bottles filled with distilled' water in cupboard / Boxes near work place for emergency eye wash by worker exposed to such hazardous chemicals.</p>
12.13	<p>Eye Protection</p> <p>The contractor shall provide suitable personal protective equipment to his workmen depending upon the nature of hazards and ensure their usage by the workers engaged in operations like welding, cutting, chipping, grinding or similar operations which may cause injuries to his eyes.</p>
12.14	<p>Excavation</p> <p>The contractor shall take all necessary measures during excavation to prevent the hazards of falling or sliding material or article from any bank or side of such excavation which is more than one and a half meter above his footing by providing adequate piling, shoring, bracing etc. against such bank or sides.</p> <p>Adequate and suitable warning signs shall be put up at conspicuous places at the excavation work to prevent any persons or vehicles falling into the excavation trench. No worker should be allowed to work where he may be stuck or endangered by excavation machinery or collapse of excavations or trenches.</p>
12.15	<p>Electrical Hazards</p> <p>The contractor should ensure that all electrical installations at the construction work comply with the requirements of latest electricity acts / rules.</p> <p>The contractor shall take all adequate measures to prevent any worker from coming into physical contact with any electrical equipment or apparatus, machines or live electrical circuits which may cause electrical hazards during the construction work. The contractor shall provide the sufficient ELCBs / RCCBs for all the portable equipments, electrical switchboards, distribution panels etc. to prevent electrical shocks.</p> <p>The contractor should ensure use of single I double insulated hand tools or low voltage i.e., 110 volts</p>

	hand tools. The contractor should also ensure that all temporary electrical installations at the construction works are provided with earth leakage circuit breakers.
12.16	Vehicular Traffic The contractor should employ vehicle drivers who hold a valid driving license under the Motor Vehicles Act, 1988.
12.17	Lifting Appliances, Tools & Tackles, Lifting Gear And Pressure Plant & Equipment etc. The contractor shall ensure all the lifting appliances, tools & tackles including cranes etc., lifting gear including fixed or movable and any plant or gear, hoists, Pressure Plant and equipment etc. are in good condition and shall be examined by competent person and only certified shall be used at sites. Periodical Examination and the tests for all lifting / hoisting equipment & tackles shall be carried out. A register of such examinations and tests shall be properly maintained by the Contractor and will be promptly produced as and when desired by the Engineer I/c or by the person authorized by him.
12.18	Excessive Noise, Vibration The contractor shall take adequate measures to protect the workers against the harmful effect of excessive noise or vibration. The noise should not exceed the limits prescribed under the concerned rules, Noise Pollution (Regulation and Control) Rules, 2000.
12.19	Electrical Installations The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the Employer or other contractors under any circumstances, whatsoever, unless expressly permitted in writing by the Engineer I/c to handle such fuses, wiring or electrical equipment. Before the Contractor connects any electrical appliances to any plug or socket belonging to the other contractor or the NTPC, he shall <ul style="list-style-type: none"> i) Satisfy the Engineer I/C that the appliance is in good working condition; ii) Inform the Engineer I/C of the maximum current rating, voltage and phases of the appliances; iii) Obtain permission of the Engineer I/C detailing the sockets to which the appliances may be connected. The Engineer I/C will not grant permission to connect until he is satisfied that: <ul style="list-style-type: none"> The appliance is in good condition and is fitted with suitable plug; having earth connection with the body. Wherever armored / metallic sheathed multi core cable is used, the same armored / sheathed should be connected to earth. <ul style="list-style-type: none"> iv) No repair work shall be carried out on any live equipment. The Engineer I/c must declare the equipment safe and a permit to work shall be issued by the NTPC / contractor as the case may be to carry out any repair / maintenance work. While working on electric lines / equipments whether live or dead, suitable type and sufficient quantity of tools will have to be provided by the contractor to electricians / workmen / Officers. v) The contractor shall employ necessary number of qualified, full time Electricians / Electrical Supervisors to maintain his temporary electrical installation. The installations are provided with suitable ELCBs and RCCBs wherever required
12.20	Safety Organisation
12.20.1	The contractor employing more than 250 workmen whether temporary, casual, probationary, regular or permanent shall employ at least one full time safety officer exclusively to supervise safety aspects of the equipments and workmen, who will coordinate with the NTPC Safety Officer. Further requirement of safety officers, if any, shall be guided by Rule 209 of The Building and Other Construction Worker (Regulation of Employment and Conditions of Service) Central Rule 1998. In case the work is being carried out through subcontractor, the employees / workmen of the sub contractor shall also be considered as the contractor's employees/workmen for

	<p>the above purpose.</p> <p>In case of contractor deploying less than 250 workmen he should designate one of his Engr / supervisor or the contractor himself (if he is directly supervising the work) as safety officer in addition to his existing responsibilities. The Engr./ supervisor should get atleast 2 days safety training from any reputed organization or from NTPC before resuming the work. If already trained in past the declaration along with trg. certificate to be furnished to NTPC safety officer.</p>
12.20.2	The name and address of such Safety Officer of the Contractor will be promptly informed in writing to the EIC with a copy to the Project Safety Officer before he starts work or immediately after any change of the incumbent is made during currency of the Contract.
12.21	<p>Reporting of Accident and Investigation</p> <p>In case any accident occurs during the construction / erection or other associated activities undertaken by the Contractor thereby causing any near miss, minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the Engineer I/C, NTPC Safety Officer with a copy to NTPC Head of Project in the prescribed form and also to all the authorities envisaged under the applicable laws.</p>
12.22	Right to stop Work
12.22.1	The Engineer VC shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipments. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury / accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can, if felt necessary appeal against the order of stoppage of work to the Project Manager within 3 days of such stoppage of work and decision of the Project Manager in this respect shall be conclusive and binding on the Contractor.
12.22.2	The Contractor shall not be entitled for any damages / compensation for stoppage of work, due to safety reasons and the period of such stoppage of work shall not be taken as an extension of time for Completion of the Facilities and will not be the ground for waiver of levy of liquidated damages.
12.23	<p>Fire Protection</p> <p>The contractor shall provide sufficient fire extinguishers at place /s of work. The fire extinguishers shall be properly maintained as per relevant BIS Standards. The employees shall be trained to operate the fire extinguishers / equipment.</p>
12.24	<p>Penalties</p> <p>I. If the Contractor fails in providing safe working environment as per the Safety Rules of NTPC or continues the work even after being instructed to stop the work by the Engineer I/C as provided in, the Contractor shall be penalized at the rate of Rs. 25,000/- per day or part thereof till the instructions are complied with and so certified by the Engineer I/C. However, in case of accident, the provisions contained in relevant sub clause shall also apply in addition to the penalties mentioned in this sub-clause.</p> <p>II. If the Contractor does not take all safety precautions and / or fails to comply with the Safety Rules as prescribed by the Employer or under the applicable law for the safety of the plant and equipment and for the safety of personnel and the contractor does not prevent hazardous conditions which cause injury to this own employees or employees of other contractors, or NTPC's employees or any other person who are at the Site or adjacent thereto, the Contractor shall be responsible for payment of penalty to NTPC as per the following schedule:-</p> <p>a) Fatal injury or accident causing death: Penalty @10% of contract value or Rs. 5,00,000/- per person, which ever is less.</p> <p>b) Major injuries or accident causing 25% or more permanent disablement to workmen or employees: Penalty @2.5% of contract value or Rs. 1,00,000/- per person which ever is less</p> <p>Permanent disablement shall have the same meaning as indicated in The Workmen's Compensation Act' 1923. The penalty mentioned above shall be in addition to the compensation payable to the workmen / employees under the relevant provisions of the Workmen's Compensation Act' 1923 and rules framed there under or any other applicable laws as applicable from time to time.</p> <p>III. If any contractor worker found working without using the safety equipment like safety helmet,</p>

	<p>safety shoes, safety belts, etc. or without anchoring the safety belts while working at height the Engineer I/c / Safety Officer of NTPC shall have the right to penalize the contractor for Rs. 200/- per person per day and such worker shall be sent out of the workplace immediately and shall not be allowed to work on that day. Engineer I/c / Safety Officer of NTPC will also issue a notice in this regard to the contractor.</p> <p>IV. If two or more fatal accidents occur at same NTPC site under the control of contractor during the period of contract and he has</p> <ol style="list-style-type: none"> (1) not complied with keeping adequate PPEs in stock or (2) defaulted in providing PPEs to his workmen (3) not followed statutory requirements / NTPC safety rules (4) been issued warning notice/s by NTPC head of the project on non observance of safety norms (5) not provided safety training to all his workmen, the contractor can be debarred from getting tender documents in NTPC for two years from the date of last accident. <p>The safety performance will also be one of the overriding criteria for evaluation of overall performance of the contractors by NTPC. The contractor shall submit the accident data including fatal / non-fatal accidents for the last 3 years where he has undertaken the construction activities Projects-wise along with the tender documents. This will also be considered for evolution of tender documents. If the information given by the contractor found incorrect, his contract will be liable to be terminated.</p>
12.25	The Contractor will make available minimum quantity of all safety equipments and safety personal protection equipments (PPEs) of required specifications as per suggestive list included bidding documents as a part of "List of minimum T & P". Further Contractor will ensure availability of additional requirement for individual worker and safety equipment as per site requirement during execution of the contract till its completion.
12.26	<p>Award</p> <p>If the Contractor's performance on safety front is found satisfactory i.e. without any fatal/reportable accident in the year of consideration; he may be considered for suitable award "ACCIDENT FREE SAFETY MERITORIOUS AWARD" as per scheme of the employer.</p>
12.27	<p>The Contractor shall abide by the following during Construction and Erection activities</p> <p>I. Chain pulley block shall not be used for loads more than 2 (Two) tonne.</p> <p>II. Hydra shall not be used for material transport.</p> <p>III. Cage shall necessarily be provided to Monkey ladders of height more than 4 m.</p> <p>IV. Fencing shall be provided to all Electrical Distribution boards and transformers etc.</p>
12.28	Further details of applicable HSE norms shall be as per HSE clause of Tender SCC.
13.0	LAND
13.1	Availability of land within plant boundary is very limited and the contractor has to plan & use the existing land considering the use of land by other contractors and the storage of plant machineries and materials. The existing land shall be shared by all erection agencies. The same will be reviewed by BHEL and allotted to the extent available/ considered necessary free of cost. Contractor shall develop these areas for their site office, their own stores etc. Bidder must visit site to assess site condition, prior to quoting.
13.2	Levelled area for storage area for BHEL's material shall be provided as per availability free of cost.
13.3	Land for labour colony shall be arranged by successful bidder at their own. The contractor shall construct labour colony / hutment as per his requirements after obtaining approval of formalities from statutory body. Further, contractor must ensure minimum HSE norms and hygienic sanitary conditions in his labour colony.
13.4	The contractor will be responsible for handing back all lands, as handed over to him by BHEL/NTPC.
14.0	WATER
14.1	BHEL will provide single point supply for construction & drinking water inside the project premises for office free of cost.
14.2	Further necessary network for construction & drinking water system shall be done by the bidder at

	his own cost.
14.3	Contractor should arrange for water for labour colony of their own.
14.4	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water at their own cost.
14.5	Contractor will have to arrange for storage of water to meet the day-to-day requirement.
14.6	The availability of water (construction as well as drinking) may be limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
15.0	ELECTRICITY
15.1	BHEL shall provide construction power free of charge at 415V level at one point. Contractor has to make their own distribution arrangement to draw electricity. Overall area illumination will be provided by BHEL. However, for night working contractor should arrange illumination as and when required by them.
15.2	The bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives/ T&Ps are deployed.
15.3	The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply/ variation in voltage level and no compensation for delay in work can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.
15.4	Bidder will have to arrange sufficient illumination at their own work areas.
15.5	The contractor should ensure that the work in critical areas is not held up in the event of power breakdown. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the contractor to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
15.6	The contractor shall have to make arrangement at their own cost for illumination that will be required in the working area for execution of the work & safety of workmen.
15.7	Contractor shall make arrangement of electricity of their own for labour colony.
16.0	CONSUMABLE
16.1	All consumables, like gas, electrodes, chemicals, lubricants etc. required for the scope of work, shall be arranged by the contractor at his cost unless otherwise specifically mentioned in the contract.
16.2	All consumables to be used for the job shall have to be approved by NTPC / BHEL prior to use.
16.3	In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.
17.0	TEST CERTIFICATES
	Necessary test certificates of all materials supplied by contractor are to be produced to BHEL prior to use of those materials.
18.0	PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT
	To meet the need of construction management at site, contractor shall provide the following services within quoted/ accepted rates.
18.1	PLANNING & MONITORING
18.1.1	The bidder shall prepare detail construction schedule (L-3) as per completion dates given in this document. This schedule must include all milestone and key activities for each sub-systems / components in the areas of engineering (wherever applicable), procurement, manufacture (wherever applicable), ecogniz, excavation/ construction/ erection. This network must conform to the overall project schedule. The bidder should also ensure monitoring of these activities at least weekly basis to start with and on daily basis whenever required by BHEL.
18.1.2	The bidder shall also prepare progress report indicating progress on key activities, management summary for critical activities, list of actions requiring attention of BHEL. This schedule is to be preferably made in PRIMAVERA/ MS PROJECTS, so that the same is compatible with BHEL's project management software.
18.1.3	The bidder will have to Supply & install of 1 No. PC (multimedia PC work station Pentium- Core-i5- 650, 3.2 GHZ or above, 1 TB HDD, 8 GB RAM, 100 /1000 MBPS LAN card) of HP / HCL / COMPAQ / LENEVO or equivalent make with window 10 or higher, 64 bit (with roll back to 32 bit O/S and required software like MS Office 2016 or higher, AutoCAD 2014 or higher, ADOBE PDF CREATOR with 1 no. Multifunction (scanner / copy / print) & 1 No. A4 Colour laser printer as per instruction of

	<p>BHEL for exclusive use of BHEL. These computers / printer / Multifunction shall remain Vendors property and they will be allowed to take out the same after closing of contract. The contractor shall provide data / information etc. in prescribed formats for periodical updating of the progress reports, material management reports, updating of network pertaining to the contractor's scope of work etc. The contractor shall also provide 1 (One) Number computer operators and 1 (One) number service staff for miscellaneous service for BHEL's use at site / Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation etc.</p> <p>These facilities are to be provided within 30 days from LOI date till completion of scheduled contract period.</p> <p>If BHEL do not availed the service of computer / printer / personnel as per requirement, BHEL shall have the right to deduct the amount as per following rates on prorate basis, from contractor's RA bill or any other dues.</p>
18.1.3.1	@ Rs 20,000 (Twenty thousand) / month for each computer operator or at actual (rate +30%) if BHEL arranges this facility, whichever is lower.
18.1.3.2	@ Rs 12,000 (Twelve thousand) / month for each computer with printer or at actual (rate +30%) if BHEL arranges this facility, whichever is lower.
18.1.3.3	@ Rs 16,000 (Sixteen thousand) / month for each service staff or at actual (rate +30%) if BHEL arranges this facility, whichever is lower.
18.1.3.4	In the event of the contract period getting extended beyond the stipulated time for reasons not attributable to the bidder. The bidder will be reimbursed at the above mentioned rate or actual +15%, whichever is lower, if the services of operator / service staff are being used by BHEL.
18.1.3.5	The contractor's site office must have facilities of communications like E-mail, and telephone / mobile phones within a month from LOI.
18.2	PROGRESS REPORTING
18.2.1	The bidder shall submit daily, weekly and monthly progress reports for work force, materials reports, consumables (gases/electrodes) report and other reports as per pro-forma considered necessary by the BHEL. In case of any failure on contractor's part to comply with this, BHEL may at its discretion, consider to withhold part payment against their RA bills.
18.2.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which the contractor intends to take to make good the slippage or lost time, so that further works again proceed as per the original program and the slippages do not accumulate and effect the overall program.
18.2.3	The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.
18.2.4	Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed or actions to be taken for achieving targets. For discussions, the contractor shall present program of subsequent week. The contractor shall constantly update/revise his work program to meet the overall requirement.
18.2.5	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at Kolkata / Site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
18.2.6	During construction, contractor shall take an average forty colour digital photograph / slides (indicating date) each month (not less than five per week) of the works during progress. In case of failure in providing such photograph in each month, an amount of Rs. 20,000/- per month shall be deducted from contractor's RA bill.
18.2.7	Successful bidder has to provide for electronic/ computerized storing and re-production/ printing/ plotting of various data, log sheets, protocols, measurements etc. These may be stored in CD (as per requirement) and handed over to BHEL as per requirement.
18.3	SITE ORGANIZATION
18.3.1	The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all time for smooth execution of the contract headed by a competent construction manager for site operations with sufficient level of authority to take site decisions. The vendor will submit organization chart (showing the name of Site-in-charge) with individual bio-data indicating various levels of experts to be posted for supervision in the fields of supervision and execution, quality, material management, planning, safety, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from the schedule

	without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from the date of LOI.	
18.3.2	Following (minimum) engineering manpower with power plant construction background to be deployed at site by the successful vendor for their day to day supervision etc.	
18.3.2.1	Qualified safety officers with assistants (exclusive for safety supervision for project jobs).	Officer – One no. Assistant - One no.
18.3.2.2	Site supervising engineer and supervisors for piling work etc.	Two Engineers (day & night working). Four Supervisors (day & night working).
18.3.2.3	Engineer & Supervisors for quality inspection.	One Engineer & One supervisor (Assistant).
18.3.3	Deputation of above man-power shall be jointly decided at site in line with construction schedule.	
18.3.4	Engineer/ supervisor for other functions like store & purchase, material management, planning, finance, administration etc are to be provided as per site requirement and not considered above.	
18.3.5	In the event of non deputation of engineer/ supervisor by the bidder as per above agreed schedule, BHEL shall reserve the right to deduct Rs 70,000 per man-month for engineer, Rs 50,000 per man-month for the supervisor/ safety officer and Rs. 35000 per man-month for safety supervisor from RA bills. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement without any financial implication.	
18.3.6	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.	
18.3.7	In addition to above, a well experienced qualified engineer to be designated, as 'Project Manager', shall be deployed by the contractor. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc to contractor's own team during the complete execution period of contract.	
18.3.8	The contractor should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed from site without written permission of BHEL.	
18.3.9	The contractor should also submit network programs for the erection of various items. These networks shall show the customer / BHEL hold points (CHP), which have to be cleared by customer/ BHEL, or their authorized representatives before further erection can take place. These programs for the erection would clearly identify responsibilities of the contractor and customer/ BHEL. It is the responsibility of the contractor to get the networks approved by BHEL within four weeks of the date of finalization of award of work/ placement of LOI.	
18.4	CONSTRUCTION MANAGEMENT	
18.4.1	Based on the approved program, the contractor shall submit a program of construction/ erection/ commissioning for the implementation. These programs would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detail monitoring. The three monthly rolling program with the first month's program being tentative based on the site condition would be prepared based on these programs. The contractor shall also be involved along with NTPC / BHEL to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.	
18.4.2	The program would be jointly finalized by the site in-charge of the contractor with BHEL/ NTPC's project coordinator as well as the site-planning representative. The erection program will also identify sequential events matching financial turnover.	
18.4.3	The contractor is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.	
18.5	ERCTION SCHEDULE	
18.5.1	Contractor shall submit within 07 days of LOI date, detailed program (L2 schedule) of construction / erection / commissioning along with matching resources T&P deployment and manpower deployment schedule for approval to Site In-Charge/Project Manager-Kolkata. L2 schedule shall be the working level documentdemonstrating contractor's ability and methods of completing the work within the key milestones identified in the tender specification These program would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring. The three monthly rolling program with the first month's program being tentative based on the site conditions would be prepared based on these program. The Contractor shall also be involved along with the Customer/BHEL to tie up detailed resource mobilisation plan over the	

	period of time of the contract matching with the performance targets.
18.5.2	The program would be jointly finalised by the site in-charge of the contractor with BHEL /Customer's project coordinator as well as the site planning representative. The erection program will also identify the sequential erectorable tonnages
18.5.3	Contractor shall submit daily work program based on above schedule. Deferment of above schedule is not acceptable. Contractor will adhere to schedule & augment resources to ensure completion as per schedule.
18.6	<p>Detailed description of major equipment (per unit & common) to be Installed, tested and commissioned under this specification is given below:</p> <p>Below mentioned details are to give only general idea of FGD system/ equipment's to the bidder. Any equipment's/system's not mentioned in this specification but which are required for the completion and smooth running of the FGD system contractor shall do the erection and commissioning of that system within the finally accepted rates / prices.</p>
18.6.1	Absorber System:
18.6.1.1	An independent Limestone Forced Oxidation (LSFO) type absorber system shall be provided for each unit. Each absorber system shall be complete with:
18.6.1.2	Absorber tower complete with re-circulating slurry spray header(s) and nozzles, three stage mist eliminators, wash water nozzles, oxidation tank integral to tower, oxidation headers and nozzles, and agitators and all internal systems integral to the working of the absorber.
18.6.1.3	3x100% re-circulating slurry pump for each level of spray.
18.6.1.4	Complete Ducting System from ID fan common outlet duct to absorber tower & from absorber outlet to wet stack chimney.
18.6.1.5	3x100% Centrifugal/ positive displacement type oxidation blowers / compressors
18.6.1.6	1 No. Emergency water tank for spraying water at inlet of Absorber for upset condition.
18.6.1.7	3x100% gypsum bleed pumps.
18.6.1.8	Auxiliary Absorbent tank
18.6.1.9	Passenger cum Goods elevator for each Absorber of minimum capacity of 1000kgs.
18.6.2	LIMESTONE GRINDING AND SLURRY PREPARATION SYSTEM(Common)
18.6.2.1	Limestone grinding system for all the units and shall comprise of:
18.6.2.2	Three number Limestone storage silos shall be complete with supporting steel structure, platforms, staircase, air canons, power operated gates, gravimetric feeders etc.
18.6.2.3	Three numbers of wet horizontal ball mills
18.6.2.4	Three limestone slurry tanks, complete with all accessories and Agitator(s).
18.6.2.5	Limestone slurry pumps for each absorber connected to each of the limestone slurry tank. Each pump catering to slurry requirement of each unit's absorber.
18.6.2.6	Each mill shall be fed from an independent Limestone bunker. Each mill shall be complete with the following items, as a minimum requirement:
a	Bunker outlet gate
b	Gravimetric limestone feeder along with its drive and all other auxiliaries
c	Separator tank with agitator(s).
d	Mill circuit pumps.
e	One set of hydro-cyclone
f	Peripheral/central drive system with motor, speed reducer gearbox and other auxiliaries.
g	Auxiliary motor for inching operation with speed reducer.
h	Complete lubricating system
i	Lube oil pumps, coolers, duplex oil filters, connecting piping
18.6.3	GYPSUM DEWATERING SYSTEM(COMMON)
	Each set of dewatering equipment (01 working set + 01 standby set) shall comprise of the following items as a minimum requirement:
18.6.3.1	One set of primary hydro-cyclones
18.6.3.2	One vacuum belt filter
18.6.3.3	Vacuum receiver tank
18.6.3.4	Vacuum pump
18.6.3.5	One set of secondary hydro-cyclones

18.6.3.6	Filtrate tank along with filtrate water pump
18.6.3.7	Cake washing Pumps for Vacuum Belt Filter.
18.6.3.8	Cloth washing Pumps for Vacuum Belt Filter.
18.6.3.9	Waste water tank along with agitator and centrifugal pumps
18.6.3.10	Lime neutralization tanks
18.6.4	PROCESS WATER STORAGE TANKS AND PUMPS
18.6.4.1	Three Process water Storage tanks along with three numbers Boosterwater pumps, if required,
18.6.4.2	Process Water Pumps for each unit connected to each of the Process water Storage tanks along with all necessary piping, valves.
18.6.4.3	Mist Eliminator Wash Water Pump for each unit connected to each of theProcess water Storage tanks along with all necessary piping, valves.
18.6.4.4	Three clarified water Storage tanks (each tank catering to the clarified water requirement for one vacuum Belt Filter) along with three numbers of clarified Booster water pumps, if required, from terminal point.
18.6.4.5	Emergency water storage tanks
18.7	Booster Fan & Isolation Gates
18.7.1	For each unit, two (2) nos. Booster Fans of axial type, Constant speed, variable pitch controlled each with drive motor, base plates, foundation bolts and nuts, inletbox, discharge case, coupling, coupling guard and suitable arrangement to prevent rain water entry to fan motor.
18.7.2	Each Booster Fan shall be provided with bearing lubrication and hydraulic blade pitch control unit(s) consisting of;
a	Oil pumps each with motor, coupling and coupling guard.
b	Oil coolers.
c	Filters, differential pressure switches, etc.
d	Oil storage tank
18.7.3	Motorized Guillotine type gates with seal air fans shall also be providedat suction & discharge of each Booster Fan.
18.7.4	Inter connected piping, valves and fittings .Electrical actuator with accessories
18.8	PIPING
18.8.1	Slurry Piping
18.8.1.1	Piping from gypsum bleed pumps to gypsum dewatering system, along withrecirculation lines (if required) necessary isolation and control valves
18.8.1.2	Limestone slurry piping to each absorber, along with recirculation lines, all isolation and control valves.
18.8.1.3	All connecting pipes / chutes along with necessary valves between various systems of the mill and from hydro-cyclone to common slurry storage.
18.8.1.4	All slurry pipes having Material of construction carbon steel and rubber lined. End connections are bolted flanged connections.
18.8.2	Oxidation Air piping
18.8.3	Service Water
18.8.4	Service Air & Instrument Air
18.8.5	Process water piping
18.8.6	Equipment Cooling water system piping
18.8.7	Piping and equipment, as per requirement / drawings are to be thermally. Insulated with bonded / unbounded mineral wool /LRB mineral wool and to be covered withaluminum cladding
18.8.8	All the above systems of piping include the erection of pipes, bends, elbows, valves, fittings, impulse piping and including root valves, sampling lines, drains,hangers and supports & other accessories so as to make the systems completein all respect.
18.9	Fire Protection system (Common)
18.9.1	Hydrant System
18.9.1.1	Hydrant system consists of (pipe, hydrant valves, landing valves, water monitors,hoses, branch pipes and nozzles etc)
18.9.2	HVW & MVW Spray System(High Velocity and Medium Velocity)
18.9.2.1	It shall consist of water mains network, deluge valves, isolation valves, Y type strainers, spray nozzles/ projectors, spray nozzles piping network.
18.9.3	Fire Extinguishers
18.9.3.1	The contractor shall install the following fire extinguishers at various locations of FGD system as per

	TAC requirement.						
18.9.3.2	Pressurized water type (9lit. capacity as per IS 15683)						
18.9.3.3	CO2 type (4.5 kg Cap IS:15683)						
18.9.3.4	Dry chemical type (6 kg Cap IS:15683)						
18.9.4	Necessary civil works for the fire protection system includes (trenches/ pedestals/foundations /sheds/sandfilling) excluded from the scope of this contract and shall be done by the civil agency of the BHEL. Fire detection package and associated C&I/cabling work is excluded from scope of this contract and shall be done by another agency. However the wrapping and protective coating of the buried pipings shall be in the scope of contractor.						
18.9.5	The complete Fire Detection and Protection Systems shall be as per the guidelines/ codes/standards / rules of TAC/ NFPA / IS: 3034 / OISD etc. and all the systems, equipment's and installation shall be got approved from TAC accredited professional(s)-India. Customer M/s NTPC will make arrangement of TAC approved agency for accreditation of work. The contractor has to facilitate TAC for getting approval. As per TAC any modification or any rerouting of the lines, re erection of equipment should be done and same should be carried by contractor with in quoted rates. There is no extra payment will be paid.						
18.10	Equipment Cooling Water System (Common)						
18.10.1	Equipment Cooling water system for all three units with a closed circuit cooling system for cooling of the various auxiliaries of FGD system. The equipment cooling system shall include the following:						
18.10.2	Selfcleaning strainers on the secondary side.						
18.10.3	4 Nos (3 working + 1 standby) plate type heat exchangers.						
18.10.4	4 Nos (2 Working + 2 standby) FGD Auxiliary (Secondary) Cooling water pumps, along with drives.						
18.10.5	4 Nos (3 Working + 1 standby) FGD DM (Primary) cooling water pumps along with drives.						
18.10.6	Overhead DM water tank (ECW O/H tank).						
18.10.7	Alkali (Sodium Hydroxide) preparation tank, agitator and motor, piping, valves etc						
18.11	Tentative Weight schedule /BOQ of the FGD system given under the Annexure-II, III IV, V, VI, VII, VIII & IX.						
18.12	The equipment /piping systems indicated above are only major items and does not cover all the equipment / piping system to be erected / commissioned. Contractors are however, required to erect / commission within the price quoted by them, all connected equipment / system shown in manufacturer's drawings / other documents which may be necessary for erection completion and overall commissioning of FGD system.						
18.13	The contractor undertakes to erect/ commission actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments will also be regulated for the same.						
18.14	Important information for the Erection Work of FGD system under this tender specifications:						
18.14.1	Absorber tower have top elevation of approx. 47 mtr with 7 tier structure and average casing panels have size (6 mx4m x0.5 m).						
18.14.2	Absorber System W/D (wet dry) interface having lining of C276 material. Site welding of liner is in the contractor scope. BHEL supplied the liner with plug welding and special electrode for the welding of liner shall be supplied by BHEL Ranipet. Welding to be done as per approved procedure of BHEL/NTPC.						
18.14.3	Tanks shall be supplied by the units in more than one segment (rolled sections) having height of each segment approx. 2500 mm. Contractor have to complete the assembly at site with necessary welding/NDT/testing as per the approved FQP. Rubber lining of the tanks (along with surface preparation by blasting or another approved method and necessary testing i.e spark test/ pin hole test of the rubber lining) excluded from the scope of work and shall be done by rubber lining vendor of BHEL Ranipet. However necessary assistance to be provided by the contractor. Sizes of the tank mentioned below to give general idea to the bidders regarding the extent of work						
	Description	Diameter in mm	Height in mm	Qty			
1	Primary Hydrocyclone Feed Tank	7000	7500	1			
2	Belt filter/Cake washing tank	3500	4200	2			
3	Filtrate Water Tank	5500	6200	1			

4	Secondary Hydrocyclone Feed Tank	6000	6200	1
5	Waste Water Tank	7000	8000	1
6	Lime stone Slurry Storage Tank	13500	15400	2
7	Auxiliary absorbent tank	12500	13800	1
8	Process Water tank	6000	6700	2
9	Clarified Water Tank (cake washing)	3500	4200	2
10	Emergency quenchtank	5000	5700	3
11	Air receiver	1700	3300	
18.14.4	Lime stone silos shall be supplied by the units in more than one segment and height of each segment shall be 2500 mm. Contractor shall have to complete the assembly, final welding, /NDT/testing as per the approved drawings/documents/ FQP. Sizes of the silos mentioned below to give general idea to the bidders regarding the extent of work.			
18.14.4.1	Description	Diameter in mm	Height in mm	Qty
	Lime stone Storage Silo	9300	16000	2
18.14.5	Erection and commissioning of the below mentioned equipment's/system under FGD system excluded from the scope of work under this contract. Erection and commissioning shall be done by the BHEL Ranipet vendor /system supplier/OEM of the system.			
a	Absorber Elevator			
b	Rubber lining of tanks and absorber			
c	Glass flake lining of ducts (absorber outlet to wet stack chimney portion)			
18.14.6	However, contractor scope limited to extend the necessary assistance along with T&Ps, scaffolding to the vendor during the erection and commissioning of the above system.			
18.15	Quantities and dimensions mentioned above for tanks, silos, absorber are indicative and to give general idea regarding the extent of work for estimation purpose. Quantity and dimension detail based on the engineering /drawings /documents available as on date of NIT and liable for variation.			
19.0	TOOLS & PLANTS (TO BE PROVIDED BY CONTRACTOR)			
19.1	Tentative list of T&P to be deployed by contractor for successful completion of work is mentioned in relevant Annexure-A .			
19.2	The above list is only indicative and these T&Ps may not be required for entire contract period but contractor shall ensure the availability of the T&Ps as per work requirement and T&P Deployment schedule. T&P Deployment schedule shall be finalized at site in consultation with BHEL Engineer based on the work fronts/work requirement. BHEL decision shall be final and binding regarding the T&P deployment schedule. Contractor shall mobilize / maintain the T&P's as per the deployment schedule notified time to time by BHEL Engineer.			
19.3	As per requirement - Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer.			
19.4	If any one of T&P mentioned above is not needed for proper execution of scope of work, provided contractor has not utilized BHEL free issued T&P for completing such work, no recovery from contractor shall be applicable.			
19.5	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.			
19.5.1	i.) In case deployment of T&P w.r.t requirement/schedule, is delayed or deployed for a shorter period or abnormal down time of T&P or ii) in case T&P w.r.t requirement was not deployed by the contractor as per instruction of BHEL and BHEL had to deploy either its own T&P or iii.) BHEL had to deploy the T&P from outside agency, then recovery shall be done from the contractor as under :			
19.5.2	In case the contractor does not deploy or delays deployment or major T&P with reference to schedule specified or T&P deployed is out of service for continuous more than 5 days, BHEL will recover non-refundable penalty per day in the following manner- In respect of each 40MT/50MT crane- @ Rs 5000/- per day In respect of each 10/12/14/18 MT Nextgen pick & carry type tyre mounted mobile crane - @ Rs			

	3000/- per day. In respect of each trailer 12/15/30 MT- @ Rs 2000/- per day For the daily recovery rate for other T&P/IMTEs BHEL Engineer decision shall be final and binding on the contractor.
19.5.3	In case BHEL had to deploy its own T&P, hire charges of T&P applicable for outside agencies as per extant guidelines for "Hire Charges on issue of Capital Tools & Plants" shall be recovered.
19.6	In case BHEL had to deploy the T&P from outside agency, actual hiring cost plus applicable overheads shall be recovered.
19.7	All the tools and tackles/measuring instruments shall be duly tested/calibrated and valid certificate to that effect should be submitted to BHEL site in-charge before the start of work.
19.9	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 for releasing the T&P.
20.0	TOOLS & PLANTS (TO BE PROVIDED BY BHEL ON SHARING BASIS)
20.1	List of T&P to be provided by BHEL on sharing basis for successful completion of work is mentioned in relevant Annexure-B .
20.2	As per the relevant clause of SCC shall read as day-to-day upkeep and running maintenance like filling topping up of lubricants, changing filters, etc. including repair of self-starter, batteries and dynamo of these cranes shall be excluded from the scope of the contractor. In case of breakdown of crane, contractor shall provide the necessary manpower for maintenance of the crane to maintenance agency, failing to do so BHEL will get the job done at the risk and cost of contractor. BHEL may also provide cranes through crane hiring agencies in which case the day-to-day upkeep and running maintenance shall be excluded from scope of contractor.
20.3	As per the relevant clause of SCC, the operator, helper & maintenance personal for BHEL's cranes 100 MT & above capacity being provided by BHEL free of cost. Further fuel for operation of all BHEL cranes shall be provided by contractor without any extra cost.
20.4	The Crane will be provided as per requirement and availability at the sole discretion of the BHEL Engineer
20.5	The contractor shall make necessary arrangement like laying of special sleeper beds, assembly & dismantling of heavy lift attachment, boom, jib etc. for movement and operation of crane.
20.6	For other T&P mentioned in the list, contractor shall transport from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores.
21.0	INSURANCE
21.1	BHEL shall arrange comprehensive MCE (marine cum erection) Insurance Policy for total project supply & services including balance of plant package covering transit risks & loss, destruction or damage during handling at Site, Storage, civil works ,erection, testing and commissioning up to trial operation completion of unit including theft, sabotage, fire, lightning and other natural calamities.
21.2	Contractor shall report to BHEL in writing any damages to equipment/components on receipt, storing, and during withdrawal of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning till trial operation completion including handing over. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.
21.3	The contractor will take necessary precautions/ due care to protect the material at Project site, while in his custody from any damage/ loss till the same is handed over to BHEL/ customer at Project site. For lodging/ processing of insurance claim the contractor will submit necessary documents. BHEL will reserve the right to recover the loss from the contractor as detailed below in case the damage/loss is due to negligence/ carelessness on the part of the contractor. In case of theft of material under contractor's custody, the same shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL/ customer for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the materials in his custody.
21.4	In case the damage/loss/theft of materials are attributable to negligence/failure in discharging the duties and obligations of the contractor, the expenses incurred for repair/replacement of such components in excess of the amount realized from the underwriters, limited to Normal Excess (Deductible Franchise) shall be recovered from the contractor.
21.5	Other conditions of Insurance shall be as per relevant clause of GCC/SCC.
22.0	TIME SCHEDULE

22.1	The contractor is required to commence the work within 15 days from the date of issue of letter of intent (LOI) unless BHEL decides to fix any other later date. However, the actual date of start of work, to fix up the zero date of the contract, will be certified by BHEL Engineer after adequate mobilization of manpower and T&Ps by the contractor.	
22.2	Entire work shall be carried out in accordance with the broad schedule for FGD system as furnished below, within the stipulated completion period. This schedule will undergo review and based on progress vis-à-vis project requirement, contractor shall submit revised schedule for approval of BHEL/Customer M/s NTPC.	
22.3	Schedule for major construction activities covered under the scope of work is as below for FGD Unit #1:	
	Major activity/Milestone description	Schedule Wef SOW
22.3.1	Start of FGD Erection Work	Within 01 month
22.3.2	Air tightness test of complete ducting-(M1)	09 months
22.3.3	Completion of Erection work of FGD system	10 months
22.3.4	Commissioning of FGD#1 -(M2)	12 months
22.3.5	Completion of Facilities FGD#1	13 months
22.4	Unit # 2 & 3 milestones will have an approximate phase lag of 3 (three) months with Unit# 1 respectively.	
22.5	The contractor shall plan his work in such a manner so as to meet the overall project schedule, in consultation with BHEL/ customer engineer.	
22.6	Contractor shall submit daily work program based on above construction schedule.	
23.0	COMPLETION PERIOD	
23.1	The entire work under this scope shall be successfully completed in all respect within 19 (nineteen) months from the date of start of work as certified by Construction Manager, BHEL.	
23.2	Contractor shall mobilise resources to start the work within 15 days from date of intimation of BHEL.	
23.3	However, actual date of start of work shall be reckoned based on certification of Construction manager,	
24.0	LIQUIDATED DAMAGE/ PENALTY	
24.1	Intermediate Milestones (Applicable for each unit separately)	
24.1.1	In case delay in achieving the Milestone as mentioned in Clause 22.3.2 (M1) above in each unit , is solely attributable to the contractor, 0.25% per week of Contract Value, limited to maximum 1% of Contract Value, will be withheld.	
24.1.2	In case delay in achieving the Milestone as mentioned in Clause 22.3.4 (M2) above in each unit , is solely attributable to the contractor, 0.25% per week of Contract Value, limited to maximum 1.25% of Contract Value, will be withheld.	
24.1.3	Amount already withheld, if any against slippage of clause 22.3.2 (M1) & 22.3.4 (M2) above in each unit, shall be released only if there is no delay attributable to contractor in achievement of Milestone as mentioned in clause 22.3.5 of respective unit.	
24.1.4	Amount to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.	
24.1.5	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.	
24.2	Final Completion(Applicable for each unit separately)	
24.2.1	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 of each unit separately. Withheld amount, if any due to slippage of identified intermediate milestone(s) of respective unit shall be adjusted against LD or released as the case may be.	
24.2.2	If the completion of work of the unit is delayed beyond the completion period (Refer clause 22.3.5 & 22.4 above) due to reasons attributable to the contractor, they shall pay to BHEL as penalty a sum @ 0.5% of Contract Value per week of delay or part thereof. For Unit # 1, overall LD including LD against intermediate milestones shall be limited to maximum 4% of contract value. For Unit # 2, overall LD including LD against intermediate milestones shall be limited to maximum 3% of contract value. For Unit # 3, overall LD including LD against intermediate milestones shall be limited to maximum 3% of contract value. Thus maximum LD considering all three units shall be limited to 10% of contract value.	

24.2.3	All other terms shall be as per the provision of GCC in this regard.
24.3	In case of LD recovery, the applicable GST shall also be recovered from the contractor.
25.0	CERTIFICATE TOWARDS COMPLETION The work under the scope of the contractor shall be deemed to have been completed in all respects only when so certified by BHEL/ customer. Decision of BHEL in this regard shall be final and binding on the contractor.
26.0	GUARANTEE
26.1	Even though the work will be carried out under supervision of BHEL, the contractor will be responsible for the quality of workmanship, quality of materials/ items and design for which the contractor is responsible.
26.2	The contractor shall guarantee the work executed under the scope of the contract for a period of 12 (twelve) months from the date of start of guarantee period as certified by the engineer (ie on completion of total work under scope and taking over by BHEL) and shall rectify free of cost all defects due to faulty supply or work done. In case the contractor fails to repair/ replace the defective works within the time specified by the engineer, BHEL may proceed to undertake the repairs/ replace such defective works at contractor's risk and cost without prejudice to any other rights and recover the same from security deposit/ other dues.
27.0	INTEREST BEARING RECOVERABLE ADVANCE/ MOBILISATION ADVANCE Not applicable for this tender.
28.0	OVER RUN CHARGES Not applicable for this tender.
29.0	REVISION ON ACCEPTED CONTRACT RATE Not applicable in this tender.
30.0	PRICE VARIATION CLAUSE Not applicable in this tender.
31.0	EXTRA/ ADDITIONAL ITEMS OF WORK It shall be as per GCC.
32.0	SECURITY DEPOSIT, PERFORMANCE BOND & FINAL BILL
32.1	Security deposit shall be applicable as per relevant clause of GCC (Volume-IB).
32.2	Performance bond is not applicable for the tender.
32.3	RELEASE OF SD BANK GUARANTEE (BG) AND FINAL BILL In addition to other provisions of tender regarding release of SD and final bill, following provisions shall also be governing to this tender.
32.3.1	For SD BG- further extension beyond date of acceptance of final bill will not be enforced if the following is fulfilled.
32.3.1.1	Contractor discharges their responsibility in r/o of submission of final bill alongwith absolute 'No Demand Certificate' and other documents as detailed below to the satisfaction of BHEL
32.3.1.2	Joint protocol of set of documents as submitted as detailed in below is certified by site & contractor's representative.
32.3.1.3	There is no negative value of the final bill (after release of SD BG) - site to certify the same before release of SD BG.
32.3.1.4	Contractor has returned the property belonging to BHEL - site to certify the same before release of SD BG.
32.3.1.5	Contractor has submitted joint protocol against 'Delay analysis', if applicable for delayed execution of job.
32.3.2	List of documents to be submitted & jointly protocolled indicating acceptance of final bill by BHEL.
32.3.2.1	Final bill.
32.3.2.2	Measurement for final bill signed, jointly signed by BHEL & contractor's representative.
32.3.2.3	Statement having cumulative joint measurement for the contract, jointly signed by BHEL & contractor's representative.
32.3.2.4	Claim by contractor for refund of security deposit.
32.3.2.5	Jointly signed material reconciliation statement.
32.3.2.6	Statement of payment received from BHEL – Bill wise (Including RA/ PVC/ ORC/ rate revision/ extra work).
32.3.2.7	No claim certificate by contractor.
32.3.2.8	Clearance certificates wherever applicable, viz clearance certificates from customer, various statutory authorities, like Labour Department, PF Authorities, Commercial Department, etc.

32.3.2.9	Notarized Indemnity Bond as per prescribed format.
33.0	TAXES, DUTIES ETC
33.1	All taxes excluding GST & BOCW Cess (as specified elsewhere in the tender) but including, Charges, Royalties, any State or Central Levy and other taxes for materials if any obtained for the work and for execution of the contract shall be borne by successful bidder and shall not be payable extra by BHEL. Any increase of above at any stage during execution of contract, including extension of the contract, shall have to be borne by successful bidder contractor. Bidder's quoted/ accepted rates/ price shall be inclusive of all such requirements.
33.2	GST along with Cess (as applicable) legally leviable& payable by successful bidder as per GST Law shall be paid by BHEL, extra. Hence, bidder shall not include GST along with Cess (as applicable) in their quoted rates/ price.
33.3	Successful bidder shall furnish proof of GST registration with GSTN Portal covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by successful bidder on BHEL for this project / work.
33.4	Since GST on output will be paid by BHEL separately as enumerated above, bidder's your quoted rates / price should be after considering the Input Credit under GST law at bidder's end.
33.5	TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills (RA bills) unless exemption certificate from the appropriate authority / authorities is furnished.
33.6	TDS under GST shall be deducted at applicable rates on gross invoice value from the running bills (RA bills).
33.7	Bidder shall note that GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred thereunder) wherein the 'Bill To' details shall encompass following. BHEL GSTN – Refer attached GSTN code table of BHEL. Name - BHARAT HEAVY ELECTRICALS LIMITED Address - Shall be intimated later. Specific details of BHEL GSTN, Name and Address as stated above, have been specified elsewhere in the tender.
33.8	Successful bidder to intimate immediately on the day of removal of goods (in case of any supply of goods) to BHEL along with all relevant details and send a scanned copy of Tax Invoice to BHEL through following communication mode for enabling BHEL to meet its GST related compliances. Portal address. and Email address – Shall be intimated later. Specific details of above shall be intimated to successful bidder by BHEL at appropriate juncture.
33.9	In case of delay in submission of above mentioned documents on the date of despatch, BHEL may incur penalty / interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from successful bidder, in case such delay is not attributable to BHEL.
33.10	In case of raising any Supplementary Tax Invoice (Debit / Credit Note), successful bidder shall issue the same containing all the details as referred to in Section 34 read with Section 31 of GST Act & Rules referred there under.
33.11	Successful bidder shall comply with the Time Limit prescribed under the GST Law and rules thereof for raising of the Tax Invoice. If any supply of goods is applicable, successful bidder shall also ensure prompt delivery of goods after despatch.
33.12	Bidder shall note that in case GST credit is delayed / denied to BHEL due to delayed / non receipt of goods and / or Tax Invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons, not attributable to BHEL, GST amount shall be recoverable from successful bidder along with interest levied/ leviable on BHEL, as the case may be.
33.13	Successful bidder shall upload the invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Bidder shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the successful bidder along with interest levied / leviable on BHEL.
33.14	Way Bill: Successful bidder to arrange for way bill / e-waybill for any transfer of goods for the execution of the contract. Successful bidder has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit / Way Bill, if required, shall be arranged by successful bidder and BHEL will not supply any Road Permit/ Way Bill for this purpose.

33.15	Any new taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period (including extension, if the same is not attributable to you), shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.
33.16	Benefits and / or abolition of all existing taxes must be passed on to BHEL against new taxes, if any, proposed to be introduced at a later date.
34 .0	INTERIM PAYMENTS
34.1	For all items of work as per Volume-III, Price Schedule, interim payment shall be limited to 95 % of the gross value of interim bill on item rate basis as per the Billing schedule (Annexure-X). The balance 5 % shall be payable on completion of guarantee period and subject to confirmation of full GST. However, this 5 %, retained from each RA bill, may be released against submission of a separate bank guarantee as per Performance Bank Guarantee format, to be kept valid till final bill & guarantee period, subject to (i) Receipt of certificate that all works are completed in all respects; (ii) Reconciliation of materials / T&P / IMTE; (iii) Completion of final bill formalities (iv) handing over to BHEL / customer and (v) subject to confirmation of full GST. Any Interest if levied thereon for reasons elaborated in Tax & duties clause of the contract and attributable to you shall be recovered for the Final Payment/ Retention amount.
34.2	All admissible recovery / adjustments etc. shall be made from the interim payable amount.
34.3	Out of this 95 %, 1.5 % of gross bill amount shall be paid in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by vendor in each month, no payment shall be made by BHEL against corresponding activity and no claim of bidder at a later date, whatsoever, in this regard shall be entertained by BHEL.
34.3.1	0.7 % shall be paid on compliance of house keeping of vendor's working area and store/ office areas.
34.3.2	0.3 % shall be paid on compliance of general illumination of vendor's working area and stores, office area.
34.3.3	0.2 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.
34.3.4	0.3 % shall be paid on compliance of applicable safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.
34.4	BHEL site at its discretion may further split up the above percentages of break up and effect payment to suit the site condition, cash flow requirement, according to the progress of work.
34.5	The contractor shall submit his running bill, once in a month at the end of each month. The RA bill complete in all respect, accompanied by BHEL engineers certified measurement sheets, jointly signed, will be paid after 45 days of submission of bill, subject to completeness and correctness. Income Tax at the prevailing rates on gross value of work done & applicable surcharge shall be deducted from contractor's bill, unless exempted by Income Tax Authority.
34.6	Applicable GST, which can be claimed at any point, shall be released to you upon compliance of following:
34.7	You declaring such Invoice in your GSTR-1
34.8	Receipt of Goods / services and Tax Invoice by BHEL
34.9	Confirmation of payment of GST thereon by you on GSTN Portal
34.10	Above is subject to receipt of goods / service and tax invoice thereof along with you declaring invoice in your return and paying GST within timeline prescribed for availing ITC by BHEL.
35.0	CONTRACT PRICE
35.1	The bidder shall quote their price/rates strictly in accordance with prescribed price/rate schedule - Volume-III (SCH-1).
35.2	The quantities of the various items mentioned in the respective Price schedules, Volume-III are approximate, based on very preliminary information and may vary to any extent or to be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons whatsoever, as long as variation in the total value of the work executed under any part of this contract including extra items, if any, but excluding any price variation, remains within +/- 15 % of the awarded price (as per LOI / WO).
36.0	OTHER TERMS
36.1	While bidder's scope includes deployment of all resources, like T&P, materials, consumables,

	manpower including supervision etc for proper completion of the subject job and no sub-contracting for execution of the job is allowed by BHEL, depending on project's requirement and on prior acceptance of BHEL, bidder may associate agencies for deployment of skilled/ unskilled manpower only for site execution. Bidder should arrange all resources, like T&P, materials, consumables, supervision etc directly for the subject job.
36.2	All other term & conditions of this specification, not mentioned above shall be governed by the pertinent provisions of GCC, Volume-IB.

Annexure-A**TENTATIVE LIST OF T&Ps and MMEs TO BE PROVIDED BY THE CONTRACTOR FOR EACH
UNIT AT HIS COST**

Contractors may please note that this list is not exhaustive & given for guidance purpose. The contractor may be required to deploy additional T&Ps not mentioned in this list at their own cost for proper execution of the job.

01	Crawler crane - 50 T	1 no
02	Tyre mounted Mobile crane with telescopic boom - 40T	1 no.
03	10/12/14/18 MT Nextgen pick & carry type tyre mounted mobile crane.(like Escorts F15 Pick and Carry Eqpt.)	1 st – From start of work (SOW). 2 nd – As per requirement
04	Tractor-trailor 20 T (with long bed)	2 no
05	40 T trailor	1 no
06	Wheel barrows	1 no
07	Electrical winch 8T	2 no
08	Electrical winch 5T	3 no
09	Electrical winch 2T	5 no
10	Electrical winch 1T	5 no
11	Chain pulley block 10T	
12	Chain pulley block 5T, 3T, 2T	As per requirement
13	Pull lift 6T, 5T, 3T, 1.5T	
14	Multipurpose pulling and lifting m/c 5T, 3T, 1.6T	
15	Hydraulic jack 100T, 50T, 20T, 10T, 5T	
16	Single sheave snatch pulley 10T, 5T	
17	Double sheave snatch pulley 10T, 5T	
18	D shackles 10T, 20T, 50T	
19	Turnbuckles 3T, 5T, 8T, 10T, 15T, 20T	
20	Welding generator K320	
21	Oil cooled welding transformer 300 amp, 450 amp	
22	Air cooled welding transformer 300 amp	
23	TIG welding torch	
24	Stress relieving transformer 600 amp	
25	High frequency unit	
26	Oxygen regulator	
27	Acetylene regulator	
28	Cutogen 5	
29	Oxygen hose 10 mm	
30	Acetylene hose 10 mm	
31	Electrode drying oven	
32	Portable electrode drying cabinet	
33	Copper welding cable 600 amp, 400 amp	
34	Aluminium cable 600 amp, 400 amp	
35	Temperature recorder	
36	Thermochalk 100 deg C to 800 deg C	
37	Air compressor 250 cfm, 80 cfm	
38	Stationery compressor 350 cfm	
39	Filling pump 80 M head, 15 ltr/sec (at least one month prior to Hydraulic test)	As required

40	Electrode baking oven	
41	Vernier theodolite –1 to 2 sec accuracy	
42	Dumpy level	
43	Spirit level 12 inch, 0.1 mm accuracy	
44	Combination squares	
45	Micrometers of different sizes	
46	Vernier callipers of different size	
47	Dial Guage	
48	Flood light with bulb	
49	Step down transformer	
50	Drilling m/c of different sizes	
51	Megger	
52	Tong tester	
53	Grinding m/c of different sizes	
54	Chamfering m/c of different sizes	
55	Trip torque wrench	
56	Aluminium telescopic ladder	
57	Manila ropes of different sizes	
58	Steel wire ropes of different sizes	
59	Drawing board	
60	Radiography equipment	
61	Moving platform	
62	Magnetic particle test equipment	
63	Ultrasonic flaw detector	
64	Dye Penetrant test kit	
65	Sheet grooving m/c for outer sheet casing	
66	Sheet bending m/c for outer sheet casing	
67	Recordable ultrasonic test equipment (UFD KrauftKammer make USN-50 or higher version to meet the requirements)	
68	3 Phase distribution board with complete set up for drawl of construction power-600Amp	1 Set.
69	Mechanized hydraulic pipe bending machine with die of various sizes	1 Set.
70	Gas burner arrangement	1 Set.
71	Hardness tester	1 Set.
72	Air compressor (electric) – 7 kg/cm ² /100 psi/ 80 cfm	As Reqd.

NOTE:-

1. In case the bidder fails to mobilize the above T&P as per requirement and the work progress/safety is affected for non-mobilization of any required T&P, gadgets, equipment, system; BHEL shall inform the bidder writing that BHEL shall provide the required items and recover the actual cost of providing such item / system plus BHEL's overhead as per rule.
2. The Make of these items has to be approved either by BHEL or by NTPC. The same has to be tested/calibrated/certified by statutory authorities as the case may be.

TENDER NO – PSER:SCT:BAR-M2048:20		
VOLUME-IF-TCC-CML (REV-00)	TECHNICAL CONDITIONS OF CONTRACT, SCOPE ETC	PAGE 31 OF 51

Annexure-B

TENTATIVE LIST OF T&Ps TO BE PROVIDED BY BHEL ON SHARING BASIS

SI no	Description	Qty	Tentative Deployment schedule from the date of start of work
1.0	CRAWLER CRANE - 100 T CAPACITY	01	From start of work (SOW).
2.0	Hydraulic Test Pump – 600 KG	01	As per requirement
3.0	Industrial Air Blower - 20000 Cum/Hr	01	As per requirement
4.0	Chemical circulating pumps as per the required capacity	01	As per requirement
5.0	Huck Bolting Machine	As per requirement	As per requirement

NOTE:

01	The above T&Ps will be made available for the project. Contractor may make use of the T&Ps as per the provision of tender document.
02	All other T&Ps required for proper execution of the job shall be provided by the contractor.
03	All the T&P listed above shall be issued and used as per relevant clause in the contract.

Annexure-I**SAFETY PLAN**

01. Safety Policy of the Contractor to be enclosed:
02. When was the Safety Policy last reviewed:
03. Details of implementation procedure / methods to implement Safety Policy / Safety Rules:
04. Name, Qualification, experience of Safety Officer
05. Review of Accidents Analysis Method, Methods to ensure Safety and Health:
06. Unit executive responsible to ensure Safety at various levels in work area:
07. List of employees trained in safety employed before execution of the job. Give the details of training:
08. Safety Training Targets, Schedules, methods Adopting to providing safety training to all employees:
09. Details of checklist for different jobs / work and responsible person to ensure compliance (copy of checklist to be enclosed):
10. Regular Safety Inspection Methods and Periodicity and list of members to be enclosed:
11. Risk Assessment, Safety Audit by Professional Agencies, Periodicity:
12. Implementation of Recommendations of Audit / Inspections. Procedures for implementation and follow up:
13. Provision for treatment of injured persons at work site:
14. Review of overall safety by top Management and Periodicity:
15. System for Implementation of Statutory legislations:
16. Issue of PPEs to employees, Periodicity / stock on hand etc:

Annexure-II

Weight Summary for the E/T/C of the FGD System				
Sl.no.	Unit	Description of Supplies	Tonnage (MT)	Remarks
1	Ranipet	FGD System (Mechanical)	27956 MT	Annexure-III,IV
2	PSER	Fabricated structural steel incl. materials handling.	7386 MT	
3	PEM	Mechanical BOIs	28 MT	Annexure-V
4	PC Chennai	Piping System	364 MT	Annexure-VI
5	Bhopal	Motors	176 MT	Annexure-VII
6	PESD	Fire Protection System	162 MT	Annexure-VIII
7	TRICHY VALVE	Various types of valve	9 MT	Annexure-IX
		Total Tonnage	36081 MT	(AROUND)

Notes:

1.	Weight mentioned in the annexures II, III, IV, V, VI, VII, VIII & IX are tentative only and based on the engineering/drawings/documents/inputs from MUs available as on date of NIT and liable for variation.
2.	The contractor is required to erect actual tonnage (irrespective of any variation plus or minus) which may be necessary to complete their work and commissioning the FGD system in all respects as detailed in tender specifications and as per the drawings/documents for which payments shall be released on finally accepted tonnage rates.
3.	The contractor undertakes to erect/commission actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments will also be regulated for the same.

Annexure-III

A.		Product Group (PG) Wise Weight Schedule For FGD System (BHEL Ranipet Supply for 03 units & common systems) + PSER supplied shop fabricated steel structures		
SL NO.	Total Weight under the FGD system including common system:	35342 MT		Ref. Rate Sch. Item no.
I.	Structure, Duct/Dampers	(23162 + 7386) MT i.e 30548 MT		STRUCTURE, DUCT/DAMPER (1.1)
II.	Tanks	466 MT		TANKS (1.2)
III.	Rotating Machines	1997 MT		ROTATING MACHINE (1.3)
IV.	Insulation	834 MT		INSULATION (1.4)
V.	Piping & valves	1496 MT		CS PIPING (1.5.2)
SL NO.	PGMA	PGMA DESCRIPTION	Per Unit Weight (MT)	Weight for 03 Units (MT)
1	55081	BOOSTER FAN FOUNDN MATL	3	9
2	55082	BOOSTER FAN HANDRAILS & INSERT	2	6
3	55084	AXIAL BOOSTER COOLING/SEAL FAN	3	9
4	55089	BOOSTER FAN CANOPY FOR MOTOR	1	3
5	55091	FISRT FILL LUBRICANTS	2	6
6	55287	AXIAL BOOSTER FAN ROTOR	21	63
7	55587	AXIAL BOOSTER FAN STATOR	82	246
8	55880	AXIAL BOOSTER FAN COUPLING	2	6
9	55980	BOOSTER FAN LOS WITH LUBRICANT	4	12
10	55983	BOOSTER FAN ACTUATOR	0.1	0.3
11	57141	SEAL AIR HAG AND ID FAN OUTGAT	20	60
12	57209	MTG BKT FOR CL DAMPER AIR CYL	1.5	4.5
13	57491	BLOWER WITH MOTOR	4	12
14	57497	KNIFE GATE VALVE	2	6
15	57540	GATE-FGD BOOSTER FAN INLET	50	150
16	57550	GATE-FGD BOOSTER FAN OUTLET	50	150
17	57566	PLATFORMS AND LADDERS-FGD GD	23	69
18	57570	GATE-FGD OUTLET	45	135
19	57577	ELECT ACTUATOR FOR GATE, DAMPER	16	48

					DUCT/DAMPER (1.1)
20	57583	DAMPER FGD BYPASS	57	171	STRUCTURE, DUCT/DAMPER (1.1)
21	FW212	SLURRY RECIRCULATION PUMP SYST	160	480	ROTATING MACHINE (1.3)
22	FW213	ABSORBER SYSTEM INTERNALS	30	90	STRUCTURE, DUCT/DAMPER (1.1)
23	FW214	ABS BAFFLE GRATING	10	30	STRUCTURE, DUCT/DAMPER (1.1)
24	FW215	MIST ELIMINATOR & ACCESSORIES	54	162	STRUCTURE, DUCT/DAMPER (1.1)
25	FW216	ABS BAFFLE GRATING SUPP	8	24	STRUCTURE, DUCT/DAMPER (1.1)
26	FW217	ABS ME SUPPORT	10	30	STRUCTURE, DUCT/DAMPER (1.1)
27	FW218	ABS SPRAY PIPE SUPP	10	30	STRUCTURE, DUCT/DAMPER (1.1)
28	FW219	ABSORBER SYSTEM-BASE	20	60	STRUCTURE, DUCT/DAMPER (1.1)
29	FW220	ABSORBER SYSTEM-STRUCTURES	312	936	STRUCTURE, DUCT/DAMPER (1.1)
30	FW221	ABSORBER SYSTEM-CASING BOTTOM	203	609	STRUCTURE, DUCT/DAMPER (1.1)
31	FW222	ABSORBER SYSTEM-CASING TOP	304	912	STRUCTURE, DUCT/DAMPER (1.1)
32	FW223	ABSORBER SYSTEM ACCESSORIES	19	57	STRUCTURE, DUCT/DAMPER (1.1)
33	FW226	EMERGENCY QUENCH WATER TANK	20	60	TANKS (1.2)
34	FW227	EMERGENCY QUENCH SYSTEM	12	36	STRUCTURE, DUCT/DAMPER (1.1)
35	FW228	ABSORBER-W/D INTERFACE	16	48	STRUCTURE, DUCT/DAMPER (1.1)
36	FW229	W/D WASH SYSTEM	5	15	STRUCTURE, DUCT/DAMPER (1.1)
37	FW230	OXIDATION BLOWER & ACC	23	69	ROTATING MACHINE (1.3)
38	FW231	ABSORBER SHEAR PLATE	10	30	STRUCTURE, DUCT/DAMPER (1.1)
39	FW232	DUCT SUP BYP & BUF/GGH	131	393	STRUCTURE, DUCT/DAMPER (1.1)
40	FW233	DUCT SUPPORT BUF/GGH & ABS	86	258	STRUCTURE, DUCT/DAMPER (1.1)
41	FW234	DUCT SUP ABS & STACK/BYP	98	294	STRUCTURE, DUCT/DAMPER (1.1)
42	FW235	SPECIAL FASTNERS	10	30	STRUCTURE, DUCT/DAMPER (1.1)
43	FW236	STRUCTURES FOR RC PUMP HOUSE	120	360	STRUCTURE, DUCT/DAMPER (1.1)
44	FW237	GALLERIES & RAILING FOR STAIR	80	240	STRUCTURE, DUCT/DAMPER (1.1)
45	FW238	HOOK UP DUCT WITH STRUCTURE	20	60	STRUCTURE, DUCT/DAMPER (1.1)
46	FW239	VIEWING PORTS	5	15	STRUCTURE, DUCT/DAMPER (1.1)
47	FW243	SLURRY DIST RC PUMP & ABS	50	150	ROTATING MACHINE (1.3)
48	FW244	OXIDATION AIR DISTRIBUTION SYS	14	42	ROTATING MACHINE (1.3)
49	FW249	HANDLING EQUIP- RC PUMP	5	15	ROTATING MACHINE (1.3)

50	FW250	FLOOR GRILLS -UNIT SYS	10	30	STRUCTURE, DUCT/DAMPER (1.1)
51	FW251	EXPNSN JNT METALLIC	74	222	STRUCTURE, DUCT/DAMPER (1.1)
52	FW252	EXPNSN JNT NON METALLIC	22	66	STRUCTURE, DUCT/DAMPER (1.1)
53	FW255	DUCT BYP & BUF/GGH/ABS	837	2511	STRUCTURE, DUCT/DAMPER (1.1)
54	FW256	DUCT BUF/GGH & ABS	460	1380	STRUCTURE, DUCT/DAMPER (1.1)
55	FW257	DUCT ABS & BYP/STACK	650	1950	STRUCTURE, DUCT/DAMPER (1.1)
56	FW260	DUCT STR BYP & BUF/GGH/ABS	899	2697	STRUCTURE, DUCT/DAMPER (1.1)
57	FW261	DUCT STR BUF/GGH & ABS	376	1128	STRUCTURE, DUCT/DAMPER (1.1)
58	FW262	DUCT STR ABS & BYP/STACK	748	2244	STRUCTURE, DUCT/DAMPER (1.1)
59	FW265	LINING OF DUCT	90	270	STRUCTURE, DUCT/DAMPER (1.1)
60	FW267	INSULATION MATERIALS FOR DUCT	94	282	INSULATION (1.4)
61	FW268	FIXING COMP FOR DUCT	94	282	INSULATION (1.4)
62	FW269	CLADDING SHEET FOR DUCT	90	270	INSULATION (1.4)
63	FW280	FOUNDATION MATL FOR DUCT STRUC	107	321	STRUCTURE, DUCT/DAMPER (1.1)
64	FW281	FOUNDATION MATL FOR ABS	5	15	STRUCTURE, DUCT/DAMPER (1.1)
65	FW282	FOUNDATION MATL FOR ELEVATOR	10	30	STRUCTURE, DUCT/DAMPER (1.1)
66	FW283	FOUNDATION MATL RC PUMP SHED	20	60	STRUCTURE, DUCT/DAMPER (1.1)
67	FW285	SUPRTING STR FOR EMERGENCY QWT	7	21	STRUCTURE, DUCT/DAMPER (1.1)
68	FW292	STRUCTURES FOR ELEVATOR	120	360	STRUCTURE, DUCT/DAMPER (1.1)
69	FW310	STRU FOR BOOSTER FAN HANDLING	60	180	STRUCTURE, DUCT/DAMPER (1.1)
70	FW610	GALLARIES & RAIL FOR GGH	40	120	STRUCTURE, DUCT/DAMPER (1.1)
71	FW612	GALLARIES AND RAILINGS FOR DAM	35	105	STRUCTURE, DUCT/DAMPER (1.1)
72	FW613	GALLARIES AND RAILINGS FOR DUC	35	105	STRUCTURE, DUCT/DAMPER (1.1)
		TOTAL WEIGHT OF THREE UNITS (MT)		21350	
PSER SUPPLIED SHOP FABRICATED STEEL STRUCTURES (MT) INCLUDING MATERIALS HANDLING (UNLOADING, STACKING & SHIFTING)				7386	STRUCTURE, DUCT/DAMPER (1.1)

Annexure-IV

B.	FGD (Common System)			
SL NO.	PGMA	PGMA DESCRIPTION	Weight of Common system (MT)	Category/Sub group
1	FW701	SLURRY PUMPS & ACCESSORIES	80	ROTATING MACHINE (1.3)
2	FW702	WATER PUMPS & ACCESSORIES	60	ROTATING MACHINE (1.3)
3	FW705	WATER PUMP & ACCESSORIES	60	ROTATING MACHINE (1.3)
4	FW710	MONORAIL FOR HOIST & CRANES	60	STRUCTURE, DUCT/DAMPER (1.1)
5	FW712	FLOOR GRILLS-COMM SYS	5	STRUCTURE, DUCT/DAMPER (1.1)
6	FW713	CHAIN PULLEYS	75	STRUCTURE, DUCT/DAMPER (1.1)
7	FW714	HOISTS	75	STRUCTURE, DUCT/DAMPER (1.1)
8	FW717	MAN HOLE DOOR	5	STRUCTURE, DUCT/DAMPER (1.1)
9	FW720	AGITATORS	60	ROTATING MACHINE (1.3)
10	FW721	AGITATOR SUPPORT	174	STRUCTURE, DUCT/DAMPER (1.1)
11	FW722	GALLERIES & RAILINGS FOR TANK	100	STRUCTURE, DUCT/DAMPER (1.1)
12	FW723	AIR CANNON-SILO	6	STRUCTURE, DUCT/DAMPER (1.1)
13	FW724	BAGFILTER & FAN ASSY SILO	6	STRUCTURE, DUCT/DAMPER (1.1)
14	FW725	NOZZLES & FLANGES	10	CS PIPING (1.5.2)
15	FW729	LIMESTONE SILO-SS 304 LINING	23	STRUCTURE, DUCT/DAMPER (1.1)
16	FW730	LIMESTONE SILO STRUCTURE	291	STRUCTURE, DUCT/DAMPER (1.1)
17	FW731	LIMESTONE SILO	230	STRUCTURE, DUCT/DAMPER (1.1)
18	FW733	LIMESTONE SILO APPROACH PLATF	83	STRUCTURE, DUCT/DAMPER (1.1)
19	FW734	LIMESTONE MILL	627	ROTATING MACHINE (1.3)
20	FW738	GYPSUM BELT FILTER AND ACCESS	133	STRUCTURE, DUCT/DAMPER (1.1)
21	FW740	FOUNDATION MATL FOR TANKS	20	STRUCTURE, DUCT/DAMPER (1.1)
22	FW741	LINING FOR TANK AND SUMPS COMM	29	TANKS (1.2)
23	FW742	LIMESTONE SLURRY STORAGE TANK	180	TANKS (1.2)
24	FW743	AUXILIARY ABSORBER TANK	73	TANKS (1.2)

25	FW744	FILTRATE TANK	12	TANKS (1.2)
26	FW745	WASTE WATER TANK	19	TANKS (1.2)
27	FW747	HYDROCLONE WASTE WATER TANK	13	TANKS (1.2)
28	FW748	PROCESS WATER TANK	28	TANKS (1.2)
29	FW749	ALL TANKS INTERNAL STRUCTURE	45	STRUCTURE, DUCT/DAMPER (1.1)
30	FW750	TANK ACCESSORIES	50	STRUCTURE, DUCT/DAMPER (1.1)
31	FW751	PROCESS WATER PIPE ACCESSORIES	36	CS PIPING (1.5.2)
32	FW752	COOLING WATER PIPE ACCESSORIES	36	CS PIPING (1.5.2)
33	FW753	SLURRY PIPE ACCESSORIES	800	CS PIPING (1.5.2)
34	FW754	SERVICE AIR PIPE ACCESSORIES	400	CS PIPING (1.5.2)
35	FW755	INSTRUMENT AIR PIPE ACCESSORIE	80	CS PIPING (1.5.2)
36	FW760	FOUNDATION MATL FOR PIPE RACKS	30	STRUCTURE, DUCT/DAMPER (1.1)
37	FW761	STRUCTURE FOR PIPERACKS	320	STRUCTURE, DUCT/DAMPER (1.1)
38	FW762	FNDN MATL FOR SILO STRUCTURE	100	STRUCTURE, DUCT/DAMPER (1.1)
39	FW763	FNDN MATL SUB PIPE RACK	30	STRUCTURE, DUCT/DAMPER (1.1)
40	FW765	STR FOR SUB PIPE RACK	321	STRUCTURE, DUCT/DAMPER (1.1)
41	FW766	PLATFORM FOR PIPE RACK	118	STRUCTURE, DUCT/DAMPER (1.1)
42	FW767	PLATFORM SUB PIPE RACK	119	STRUCTURE, DUCT/DAMPER (1.1)
43	FW768	TRESTLE FOR MAIN PIPE RACK	667	STRUCTURE, DUCT/DAMPER (1.1)
44	FW769	TRESTLE-SUB PIPE RACK	667	STRUCTURE, DUCT/DAMPER (1.1)
45	FW784	HSFG BOLTS	10	STRUCTURE, DUCT/DAMPER (1.1)
46	FW785	BELT FILTER WASHING TANK	10	TANKS (1.2)
47	FW786	PRIMARY HYDROCYCLONE FEED TANK	18	TANKS (1.2)
48	FW787	STRUCTURES INSIDE GDWB & BMB	50	STRUCTURE, DUCT/DAMPER (1.1)
49	FW798	AIR RECEIVERS	10	TANKS (1.2)
50	FW800	CLARIFIED WATER TANK	10	TANKS (1.2)
51	FW802	NEUTRALISATION TANK & ACCESSOR	4	TANKS (1.2)
52	FW814	ROOFING SHEET	10	STRUCTURE, DUCT/DAMPER (1.1)
53	FW815	RC PUMP INLT & OUTLT VALVE	64	CS PIPING (1.5.2)
54	FW816	MANL BTRFLY VALV- UTLTY	2	CS PIPING (1.5.2)
55	FW817	MOTOR BTRFL VALV-UTLTY	0.4	CS PIPING (1.5.2)
56	FW818	PNEM BTRFLY VALV-UTLTY	1	CS PIPING (1.5.2)
57	FW819	MAN BTRFLY VALV-LS SLRY	3	CS PIPING (1.5.2)
58	FW820	MOTOR BTRFLY VALV-LS SLRY	1	CS PIPING (1.5.2)
59	FW821	PNEUM BTRFLY VALV-LS SLRY	6	CS PIPING (1.5.2)
60	FW822	MAN BTRFLY VALV-GYP SLRY	5	CS PIPING (1.5.2)
61	FW823	MOTOR BTRFLY VALV -GYP SLRY	3	CS PIPING (1.5.2)
62	FW824	PNEUM BTRFLY VALV-GYP SLRY	17	CS PIPING (1.5.2)

63	FW828	MAN GATE VALV-UTLTY	13	CS PIPING (1.5.2)
64	FW829	MOTOR GATE VALV-UTLTY	1	CS PIPING (1.5.2)
65	FW834	MAIN GLOBE VALV-UTLTY	7	CS PIPING (1.5.2)
66	FW840	CERAMIV VALVES	0.3	CS PIPING (1.5.2)
67	FW841	CONTROL VALVES	1	CS PIPING (1.5.2)
68	FW842	MAN PINCH VALV-GYP SLRY	1	CS PIPING (1.5.2)
69	FW845	BALL VALVES- WATER	0.4	CS PIPING (1.5.2)
70	FW848	CHECK VALVES- WATER	1	CS PIPING (1.5.2)
71	FW851	DIAPHRAGM VALV-SLURRY	1	CS PIPING (1.5.2)
72	55000	AXL FAN TOOL & FIXTU	0.3	STRUCTURE, DUCT/DAMPER (1.1)
		TOTALWEIGHT OF COMMON SYSTEM (MT)	6606	

Annexure-V

PEM Supplied BOIs Detail (only Mechanical)					
Sl. No.	Item Description	UOM	Total	Total Weight in Tonnes	Category/Sub group
			Qty.		
1	Misc. Pumps (Horz.) Type-I (Flow<300 CMH)	Nos.	9	6.75	ROTATING MACHINE (1.3)
2	Self Cleaning Strainers	Nos.	2	3	Misc. Equpt./Str steel (1.6)
3	Conical Strainers	Nos.	4	1	Misc. Equpt./Str steel (1.6)
4	Heat Exchangers (Plate Type)	Nos.	4	6	Misc. Equpt./Str steel (1.6)
5	Control Valve	Nos.	1	0.5	CS PIPING (1.5.2)
6	Flow Element-Orifice	Nos.	2	0.7	CS PIPING (1.5.2)
7	Chemical Dosing System (LP)	Nos.	1	2	Misc. Equpt./Str steel (1.6)
8	Electric Hoist	Nos.	2	2	Misc. Equpt./Str steel (1.6)
9	Single Girder EOT/Hot Misc. Cranes	Nos.	1	6	Misc. Equpt./Str steel (1.6)
Total Weight of PEM Supplies (MT)				27.95	

Annexure-VI

Weight Schedule of Pipes (PC-Chennai)					
SL NO.	PG	MA	MARK NO./DESCRIPTION	WEIGHT (MT)	Category/Sub group
1	80	463	PIPE OD 323.9X6.4 EP-D-D1=312	2.07	CS PIPING (1.5.2)
2	80	463	PIPE DIA 273.1 X 6.0 EP-D-D1=261.1	1.30	CS PIPING (1.5.2)
3	80	463	PIPE DIA 219.1 X 6.0 EP-D-D1=207.1	0.87	CS PIPING (1.5.2)
4	80	463	PIPENB150X5.4 EP-D-D1=156.8	1.17	CS PIPING (1.5.2)
5	80	463	PIPENB100X5.4 EP-D-D1=105.3	0.06	CS PIPING (1.5.2)
6	80	463	PIPENB80X 4.8 EP-D-D1=80.8	0.17	CS PIPING (1.5.2)
7	80	463	BW LR 90DEG MITRE BEND OD323.9X6.35	0.41	CS PIPING (1.5.2)
8	80	463	BW LR 90DEG MITRE BEND OD219.1X6.4	0.22	CS PIPING (1.5.2)
9	80	463	90DEG ELL NB150 IS1239 BLACK	0.46	CS PIPING (1.5.2)
10	80	463	90DEG ELL NB100 IS1239 BLACK	0.03	CS PIPING (1.5.2)
11	80	463	BL. 90 DEG ELL NB80 IS1239 BLACK	0.02	CS PIPING (1.5.2)
12	80	463	BW EQUAL TEE NB300	0.17	CS PIPING (1.5.2)
13	80	463	ASMEB16.9 UEQT OD323.9X6.35/219.1X6.35	0.16	CS PIPING (1.5.2)
14	80	463	ASMEB16.9 UEQT OD323.9X6.35/168.3X7.11	0.40	CS PIPING (1.5.2)
15	80	463	BW UEQT 323.9X6.35/114.3X6.02 SA234WPB	0.04	CS PIPING (1.5.2)
16	80	463	ASMEB16.9 UEQT OD273X6.35/219.1X6.35	0.09	CS PIPING (1.5.2)
17	80	463	ASMEB16.9 UEQT OD273.1X6.35/168.3X7.11	0.29	CS PIPING (1.5.2)
18	80	463	ASMEB16.9 UEQT OD273X6.35/88.9X5.49	0.08	CS PIPING (1.5.2)
19	80	463	P.F.REDUCER NB300/NB200	0.03	CS PIPING (1.5.2)
20	80	463	P.F.REDUCER NB300/NB150	0.04	CS PIPING (1.5.2)
21	80	463	ASMEB16.9 RED OD273X6.35/168.3X7.11	0.02	CS PIPING (1.5.2)
22	80	463	ASMEB16.9 RED OD273X6.35/114.3X6.02	0.01	CS PIPING (1.5.2)
23	80	463	ASMEB16.9 RED OD114.3X6.02/88.9X5.49	0.002	CS PIPING (1.5.2)
24	80	463	BW ECCRED219.1X8.18/168.3X7.14SA234WPB	0.15	CS PIPING (1.5.2)
25	80	463	ASMEB16.9 RED OD168.3X7.11/114.3X6.02	0.03	CS PIPING (1.5.2)
26	80	463	SOW FLANGE NB 300 CL150	0.05	CS PIPING (1.5.2)
27	80	463	SOW FLANGE NB 250 CL150 BMC16	0.03	CS PIPING (1.5.2)
28	80	463	SOW FLANGE NB 200 CL150	0.33	CS PIPING (1.5.2)
29	80	463	SOW FLANGE NB 150 CL150 BMC 16	0.45	CS PIPING (1.5.2)
30	80	463	SOW FLANGE NB 100 CL150 BMC 20	0.02	CS PIPING (1.5.2)
31	80	463	SOW FLANGE NB 80 CL150	0.02	CS PIPING (1.5.2)
32	80	463	SW STUB-CS-NB 25 CLASS 3000 CS SA105	0.02	CS PIPING (1.5.2)
33	80	463	SW STUB-CS-NB 50 CLASS 3000 CS	0.01	CS PIPING (1.5.2)
34	80	463	TEMP STUB RC 1" L=45 CS	0.02	CS PIPING (1.5.2)
35	80	463	CARBON STEEL PLUG 1"	0.004	CS PIPING (1.5.2)
36	80	463	PLATE 10X300X300 -EP1	0.23	CS PIPING (1.5.2)
37	80	463	PLATE 10X250X250 -EP2	0.03	CS PIPING (1.5.2)

38	80	463	PLATE 10X400X400 -EP3	0.07	CS PIPING (1.5.2)
39	80	463	PIPE OD 355.6X6.35 EP-D-D1=343.0	138.37	CS PIPING (1.5.2)
40	80	463	PIPE OD 273.1X6.0 EP-D-D1=261.1	2.61	CS PIPING (1.5.2)
41	80	463	PIPE OD 219.1X6.0 EP-D-D1=207.1	18.04	CS PIPING (1.5.2)
42	80	463	PIPE NB 150X5.4 EP-D-D1=156.8	7.00	CS PIPING (1.5.2)
43	80	463	PIPE NB 100X5.4 E P-D-D1=105.3	57.02	CS PIPING (1.5.2)
44	80	463	PIPE NB 80X 4.8 EP-D-D1=80.8	0.56	CS PIPING (1.5.2)
45	80	463	PIPE OD 355.6X6.35 EP-D-D1=343.0	78.21	CS PIPING (1.5.2)
46	80	463	PIPE OD 273.1X6.0 EP-D-D1=261.1	2.61	CS PIPING (1.5.2)
47	80	463	PIPE OD 219.1X6.0 E P-D-D1=207.1	6.24	CS PIPING (1.5.2)
48	80	463	PIPE NB 150X5.4 E P-D-D1=156.8	3.50	CS PIPING (1.5.2)
49	80	463	PIPE NB 100X5.4 E P-D-D1=105.3	4.75	CS PIPING (1.5.2)
50	80	463	PIPE NB 80X 4.8 E P-D-D1=80.8	1.22	CS PIPING (1.5.2)
51	80	463	PIPE NB50X4.50 BL EP STY-D; D1-52.7	0.68	CS PIPING (1.5.2)
52	80	463	PIPE NB25X4.0 BL EP STY-D; D1-26.9	0.33	CS PIPING (1.5.2)
53	80	463	SW STUB-CS-NB 25 CLASS 3000 CS SA105	0.02	CS PIPING (1.5.2)
54	80	463	SW STUB-CS-NB 50 CLASS 3000 CS	0.01	CS PIPING (1.5.2)
55	80	463	TEMP STUB RC 1" L=45 CS	0.02	CS PIPING (1.5.2)
56	80	463	CARBON STEEL PLUG 1"	0.004	CS PIPING (1.5.2)
57	80	463	BL. 90 DEG ELL NB25 IS1239 BLACK	0.004	CS PIPING (1.5.2)
58	80	463	BL. 90 DEG ELL NB50 IS1239 BLACK	0.02	CS PIPING (1.5.2)
59	80	463	BL. 90 DEG ELL NB80 IS1239 BLACK	0.02	CS PIPING (1.5.2)
60	80	463	BL. 90 DEG ELL NB100IS1239 BLACK	0.18	CS PIPING (1.5.2)
61	80	463	BL. 90 DEG ELL NB150IS1239 BLACK	0.21	CS PIPING (1.5.2)
62	80	463	BW LR 90DEG MITREBEND NB200	0.24	CS PIPING (1.5.2)
63	80	463	BW LR 90DEG MITREBEND NB250	0.16	CS PIPING (1.5.2)
64	80	463	MITRE BEND 90DEG NB350,R=1.5D	2.80	CS PIPING (1.5.2)
65	80	463	MITRE BEND 45DEG NB350,R=1.5D	0.07	CS PIPING (1.5.2)
66	80	463	ASMEB16.9 RED OD355.6X7.92/219.1X6.35	0.04	CS PIPING (1.5.2)
67	80	463	ASMEB16.9 RED OD219.1X6.35/168.3X7.11	0.02	CS PIPING (1.5.2)
68	80	463	ASMEB16.9 RED OD273.1X6.35/219.1X6.35	0.02	CS PIPING (1.5.2)
69	80	463	ASMEB16.9 RED OD273X6.35/114.3X6.02	0.01	CS PIPING (1.5.2)
70	80	463	ASMEB16.9 UEQT OD355.6X7.92/219.1X6.35	0.12	CS PIPING (1.5.2)
71	80	463	ASMEB16.9 BW EQUAL TEE OD273X6.35	0.19	CS PIPING (1.5.2)
72	80	463	ASMEB16.9 UEQT OD273X6.35/114.3X6.02	0.06	CS PIPING (1.5.2)
73	80	463	ASMEB16.9 UEQT OD219.1X6.35/168.3X7.11	0.06	CS PIPING (1.5.2)
74	80	463	ASMEB16.9 UEQT OD219.1X6.35/88.9X5.49	0.04	CS PIPING (1.5.2)
75	80	463	BL. EQT NB50 IS1239 BLACK	0.02	CS PIPING (1.5.2)
76	80	463	BL. UEQT NB50 / 25 IS1239 BLACK	0.01	CS PIPING (1.5.2)
77	80	463	BL. EQT NB25 IS1239 BLACK	0.003	CS PIPING (1.5.2)
78	80	463	RED NB 100/80 IS1239 BLACK	0.01	CS PIPING (1.5.2)
79	80	463	PIPE OD 60.3X3.91 L=1835M EP AT SITE	10.98	SS Piping (1.5.1)
80	80	463	PIPE DIA 88.9X3.05 L=10M EP AT SITE	0.07	SS Piping (1.5.1)
81	80	463	PIPE DIA 33.4X3.38 L=60M EP AT SITE	0.17	SS Piping (1.5.1)
82	80	463	ASMEB16.9 BW EQUAL TEE OD60.3X3.91	0.01	SS Piping (1.5.1)
83	80	463	ASMEB16.9 UEQT OD60.3X3.91/33.4X3.38	0.002	SS Piping (1.5.1)
84	80	463	ASMEB16.9 BW EQUAL TEE OD33.4X3.38	0.001	SS Piping (1.5.1)

85	80	463	ASMEB16.9 RED OD60.3X3.91/33.4X3.38	0.001	SS Piping (1.5.1)
86	80	463	ASMEB16.9 BWLR 90DEG ELBOW OD60.3X3.91	0.04	SS Piping (1.5.1)
87	80	463	ASMEB16.9 BWLR 90DEG ELBOW OD60.3X3.91	0.004	SS Piping (1.5.1)
88	80	463	ASMEB16.9 BWLR 90DEG ELBOW OD88.9X3.05	0.01	SS Piping (1.5.1)
89	80	463	ASMEB16.9 BWLR 90DEG ELBOW OD33.4X3.38	0.002	SS Piping (1.5.1)
90	80	933	C S TUBE CLIP NB 25 (SHORT) IS2062GRB	0.005	CS PIPING (1.5.2)
91	80	933	C S TUBE CLIP NB 25 (LONG) IS2062GRB	0.02	CS PIPING (1.5.2)
92	80	933	C S TUBE CLIP NB 50 (SHORT) IS2062GRB	0.09	CS PIPING (1.5.2)
93	80	933	C S TUBE CLIP NB 50 (LONG) IS2062GRB	0.28	CS PIPING (1.5.2)
94	80	933	U-ROD CLAMP SS NB25 (M8)	0.004	SS Piping (1.5.1)
95	80	933	U-ROD CLAMP SS NB50(M8)	0.07	SS Piping (1.5.1)
96	80	933	U-ROD CLAMP SS NB80 (M8)	0.001	SS Piping (1.5.1)
97	80	933	BL HEXBOLT M8X1.25X30 PCL4.6 GRC IS:1363	0.002	CS PIPING (1.5.2)
98	80	933	BOLT-M12X40 -4.6-IS1363P1	0.02	CS PIPING (1.5.2)
99	80	933	NUT -M 8 -CL4-IS1363P3	0.01	CS PIPING (1.5.2)
100	80	933	NUT -M10 -CL4-IS1363P3	0.02	CS PIPING (1.5.2)
101	80	933	NUT -M12 -CL4-IS1363P3	0.01	CS PIPING (1.5.2)
102	80	933	PUN WASHER-M 8 -IS:2016-A	0.003	CS PIPING (1.5.2)
103	80	933	PUN WASHER-M10 -IS2016-A	0.02	CS PIPING (1.5.2)
104	80	933	PUN WASHER-M12 -IS2016-A	0.003	CS PIPING (1.5.2)
105	80	933	SS SHEET 1.0 - SA240TY304	0.01	SS Piping (1.5.1)
106	80	933	NON-ASBESTOS JOINTING SHEET 3.0MM	0.03	CS PIPING (1.5.2)
107	80	933	C S TUBE CLIP NB 25 (SHORT) IS2062GRB	0.005	CS PIPING (1.5.2)
108	80	933	C S TUBE CLIP NB 25 (LONG) IS2062GRB	0.02	CS PIPING (1.5.2)
109	80	933	C S TUBE CLIP NB 50 (SHORT) IS2062GRB	0.005	CS PIPING (1.5.2)
110	80	933	C S TUBE CLIP NB 50 (LONG) IS2062GRB	0.02	CS PIPING (1.5.2)
111	80	933	C S ROD TYPE PIPE CLAMP NB 25 IS2062GRB	0.004	CS PIPING (1.5.2)
112	80	933	C S ROD TYPE PIPE CLAMP NB 50 IS2062GRB	0.01	CS PIPING (1.5.2)
113	80	933	C S ROD TYPE PIPE CLAMP NB 80 IS2062GRB	0.02	CS PIPING (1.5.2)
114	80	933	CS ROD TYPE PIPE CLAMP NB 100 IS2062GRB	0.98	CS PIPING (1.5.2)
115	80	933	CS ROD TYPE PIPE CLAMP NB 150 IS2062GRB	0.13	CS PIPING (1.5.2)
116	80	933	CS ROD TYPE PIPE CLAMP NB 200 IS2062GRB	0.23	CS PIPING (1.5.2)
117	80	933	CS ROD TYPE PIPE CLAMP NB 250 IS2062GRB	0.05	CS PIPING (1.5.2)
118	80	933	CS ROD TYPE PIPE CLAMP NB 300 IS2062GRB	0.01	CS PIPING (1.5.2)
119	80	933	PIPE CLAMP ROD TYP NB 350 (CS) SA105	1.71	CS PIPING (1.5.2)
120	80	933	BL HEXBOLT M8X1.25X30 PCL4.6 GRC IS:1363	0.001	CS PIPING (1.5.2)
121	80	933	BOLT-M12X40 -4.6-IS1363P1	0.001	CS PIPING (1.5.2)
122	80	933	NUT -M 8 -CL4-IS1363P3	0.001	CS PIPING (1.5.2)
123	80	933	NUT -M10 -CL4-IS1363P3	0.001	CS PIPING (1.5.2)
124	80	933	NUT -M12 -CL4-IS1363P3	0.002	CS PIPING (1.5.2)
125	80	933	NUT -M16 -CL4-IS1363P3	0.06	CS PIPING (1.5.2)
126	80	933	NUT -M20 -CL4-IS1363P3	0.02	CS PIPING (1.5.2)
127	80	933	NUT -M24 -CL4-IS1363P3	0.10	CS PIPING (1.5.2)
128	80	933	PUN WASHER-M 8 -IS:2016-A	0.0004	CS PIPING (1.5.2)

129	80	933	PUN WASHER-M10 -IS2016-A	0.001	CS PIPING (1.5.2)
130	80	933	PUN WASHER-M12 -IS2016-A	0.001	CS PIPING (1.5.2)
131	80	933	PUN WASHER-M16 -IS2016-A	0.02	CS PIPING (1.5.2)
132	80	933	PUN WASHER-M20 -IS2016-A	0.005	CS PIPING (1.5.2)
133	80	933	PUN WASHER-M24 -IS2016-A	0.03	CS PIPING (1.5.2)
134	80	933	ANGLE 50X50X6 ASME-SA/IS2062E250A	2.48	Misc. Equpt./Str steel (1.6)
135	80	933	ANGLE 65X65X6 -ASME-SA/IS2062E250A	4.79	Misc. Equpt./Str steel (1.6)
136	80	933	CHANNEL 200X75 -ASME-SA/IS2062E250A	1.23	Misc. Equpt./Str steel (1.6)
137	80	933	CHANNEL 150X75 ASME-SA/IS2062E250A	2.77	Misc. Equpt./Str steel (1.6)
138	80	933	CHANNEL 100X50 -ASME-SA/IS2062E250A	2.10	Misc. Equpt./Str steel (1.6)
139	80	933	PLATE 10 MM ASME-SA/IS2062E250A	0.86	Misc. Equpt./Str steel (1.6)
TOTAL WEIGHT OF PIPING CENTRE - CHENNAI SUPPLIES (MT)				364	

Annexure-VII

E. Weight Schedule of Motors (Bhopal)							
SL NO.	Item description	Qty	Unit	Approx. dimen. (L X W X H)	Approx unit wt.	Total weight (MT)	Category/Sub group
				(in mtr)	(MT)		
1	Booster Fan Motor	6	No.	3.95 x 3.17 x 3.42	18.5	111	ROTATING MACHINE (1.3)
2	RC Pump Motor	15	No.	1.9 x 1.5 x 1	2.6	39	ROTATING MACHINE (1.3)
3	Oxidation Blower	6	No.	1.9 x 1.5 x 1	2.6	15.6	ROTATING MACHINE (1.3)
4	Wet Ball Mill Motor	2	No.	1.9 x 1.5 x 1	2.6	5.2	ROTATING MACHINE (1.3)
5	Hammer Mill Motor	2	No.	1.9 x 1.5 x 1	2.6	5.2	ROTATING MACHINE (1.3)
TOTAL WEIGHT OF BHOPAL SUPPLIES (MT)						176	

Annexure-VIII

BOQ of the Fire Protection System (BHEL PESD, Hyderabad supply)						
	Description	Weight in MT	Category/Sub group of Rate Sch.			
F1	CS piping (A/G) along with valves, fittings etc. including fire protection piping	118	CS PIPING (1.5.2)			
F2	Buried CS Piping (Wrapping & Coating)	36	CS BURIED PIPING (1.5.3)			
F3	Misc. Equpt./Str steel/ etc.	7.5	Misc. Equpt./Str steel (1.6)			
Total weight under PESD supplies		161.5				
HYDRANT SYSTEM						
Sl. No.	Description	Unit	Quantity	Unit Weight (kg)	Total weight (Tonnes)	Category/Sub group of Rate Sch.
1	MS Pipe-3589 Grade 410 ERW MS Black					
1.1	200 mm dia	Mts	450	33	14.80	CS PIPING (1.5.2)
2	MS Pipe-1239 Medium Grade ERW MS Black					
2.1	150 mm dia	Mts	1800	19.5	35.10	CS BURIED PIPING (1.5.3)
2.2	100 mm dia	Mts	250	12.5	3.13	CS PIPING (1.5.2)
2.3	80 mm dia	Mts	150	8.53	1.28	CS PIPING (1.5.2)
3	SS Hydrant Valve	No.	41	20	0.82	CS PIPING (1.5.2)
4	Air Release Valve					
4.1	25 mm dia	No.	8	5	0.04	CS PIPING (1.5.2)
5	Gun Metal Valve					
5.1	25 mm dia	No.	8	5	0.04	CS PIPING (1.5.2)
6	Drain Valve	No.	8	1	0.01	CS PIPING (1.5.2)
7	Hose Pipe (15 M length)	No.	82	20	1.64	Misc. Equpt./Str steel (1.6)
8	Hose Box					
8.1	External + Internal	No.	41	15	0.62	Misc. Equpt./Str steel (1.6)
9	Branch Pipe with Nozzle	No.	41	10	0.41	CS PIPING (1.5.2)
10	Gate Valve (CI -valve)					
10.1	200 mm dia	No.	4	126	0.50	CS PIPING (1.5.2)
10.2	150 mm dia	No.	12	76	0.91	CS PIPING (1.5.2)
10.3	100 mm dia	No.	12	44	0.53	CS PIPING (1.5.2)
10.4	80 mm dia	No.	7	27	0.19	CS PIPING (1.5.2)
11	Hose reel	Nos.	24	50	1.20	Misc. Equpt./Str steel (1.6)
12	Structural Steel	lot	1	1000	1.00	Misc. Equpt./Str steel (1.6)
13	M.S Fittings	lot	1	23	22.60	CS PIPING (1.5.2)
14	Water Monitor	No.	5	50	0.25	Misc. Equpt./Str

						steel (1.6)
15	Paint and Primers	Ltr	600	1	0.60	Misc. Equpt./Str steel (1.6)
16	Wrapping and coating of UG pipe (150NB Pipe)	sqmt	1319	0.5	0.66	CS BURIED PIPING (1.5.3)
HVWS SYSTEM						
1	Deluge Valve along with Trim Assembly for Transformers					
1.1	100 mm dia	No.	3	97	0.29	CS PIPING (1.5.2)
2	ERW G.I. Pipe as Per IS:1239 Medium Class					
2.1	100 NB G.I. Pipe	Mtrs	80	16	1.28	CS PIPING (1.5.2)
2.2	80 NB G.I. Pipe	Mtrs	800	12	9.6	CS PIPING (1.5.2)
2.3	65 NB G.I. Pipe	Mtrs	396	10	3.96	CS PIPING (1.5.2)
2.4	50 NB G.I. Pipe	Mtrs	300	9	2.7	CS PIPING (1.5.2)
2.5	40 NB G.I. Pipe	Mtrs	600	5	3	CS PIPING (1.5.2)
2.6	25 NB G.I. Pipe	Mtrs	250	2.5	0.62	CS PIPING (1.5.2)
3	ERW, MS black pipe as Per IS:1239 Medium Class					
3.1	25 NB	Mtrs	250	2.5	0.62	CS PIPING (1.5.2)
4	Cast iron wafer Butterfly Valve					
4.1	100 NB	No.	6	9	0.05	CS PIPING (1.5.2)
5	MS Y- Type Strainer					
5.1	100 NB	No.	3	25	0.075	CS PIPING (1.5.2)
6	Spray Nozzle - Stainless Steel	No.	165	0.125	0.02	Misc. Equpt./Str steel (1.6)
7	Q.B Detector - 79 °	No.	150	0.1	0.015	Misc. Equpt./Str steel (1.6)
9	Solenoid Valve	No.	3	0.2	0.0006	CS PIPING (1.5.2)
10	SS orifice plate					
10.1	100 NB	No.	3	2	0.006	Misc. Equpt./Str steel (1.6)
11	Structural Steel	Lot	1	500	0.5	Misc. Equpt./Str steel (1.6)
12	Pipe Fittings	Lot	1	7.69	7.69	CS PIPING (1.5.2)
MVWS SYSTEM						
1	Deluge Valve with trim assembly for Cable Galleries					
1.1	100 mm dia	No.	7	97	0.68	CS PIPING (1.5.2)
2	ERW G.I. Pipe as Per IS:1239 Medium Class					
2.1	100 NB G.I. Pipe	Mtrs	350	16	5.6	CS PIPING (1.5.2)
2.2	80 NB G.I. Pipe	Mtrs	550	12	6.6	CS PIPING (1.5.2)
2.3	65 NB G.I. Pipe	Mtrs	800	10	8	CS PIPING (1.5.2)
2.4	50 NB G.I. Pipe	Mtrs	500	9	4.5	CS PIPING (1.5.2)
2.5	40 NB G.I. Pipe	Mtrs	750	5	3.75	CS PIPING (1.5.2)
2.6	25 NB G.I. Pipe	Mtrs	1200	2.5	3	CS PIPING (1.5.2)
3	ERW, MS black pipe as Per IS:1239 Medium Class					
3.1	80 NB pipe	Mtrs	50	8.53	0.43	CS PIPING (1.5.2)
3.2	100 NB pipe	Mtrs	50	12.5	0.63	CS PIPING (1.5.2)
4	Cast iron wafer Butterfly Valve					

4.1	100 NB	No.	14	9	0.13	CS PIPING (1.5.2)
5	M.S Y- Type Strainer					
5.1	100 NB	No.	7	25	0.18	CS PIPING (1.5.2)
6	Spray Nozzle - Stainless Steel	No.	490	0.125	0.06	Misc. Equpt./Str steel (1.6)
7	Solenoid Valve	No.	7	0.2	0.0014	CS PIPING (1.5.2)
8	SS orifice plate					
8.1	100 NB	No.	7	2	0.014	Misc. Equpt./Str steel (1.6)
9	Structural Steel	Lot	1	800	0.8	Misc. Equpt./Str steel (1.6)
10	Pipe Fittings	Lot	1	9.54	9.54	CS PIPING (1.5.2)
PORTABLE FIRE EXTINGUISHERS						
1	Hand held portable pressurized water CO2 - 9litres	No.	12	15	0.18	Misc. Equpt./Str steel (1.6)
2	4.5 kg CO2	No.	15	14	0.21	Misc. Equpt./Str steel (1.6)
3	6kg DCP	No.	18	10	0.18	Misc. Equpt./Str steel (1.6)

Annexure-IX

G BOQ of VARIOUS VALVES (BHEL Trichy -Valves supply)				
Valve Description (Size-Class rating-Type-End connection-Operation- Material)	Qty.	Unit Wt.	Total Wt.	Category/Sub group of Rate Sch.
		(kg)	(kg)	
12-C150-GV-FL-HO-WCB	4	278	1112	CS PIPING (1.5.2)
1-C800-CV-SW-F316-SST	1	2.3	2.3	
1-C800-SV-SW-HO-A105-SST	23	3.4	78.2	
1-C800-SV-SW-HO-F316-SST	3	3.4	10.2	
2-C800-SV-SW-HO-F316-SST	4	11.1	44.4	
3-C150-GV-FL-HO-WCB	2	36	72	
3-C300-SV-FL-HO-WCB	1	76	76	
4-C150-GV-FL-HO-WCB	1	61	61	
4-C300-SV-FL-HO-WCB	1	116	116	
6-C150-GV-FL-HO-WCB	19	76	1444	
6-C300-FV-FL-WCB	9	134	1206	
6-C300-SV-FL-HO-WCB	3	177	531	
8-C150-GV-FL-HO-WCB	2	119	238	
2-C800-GLV-SW-MO-F316	2	72	144	
3-C150-GV-FL-MO-WCB	1	81	81	
4-C150-GV-FL-MO-WCB	1	115	115	
6-C150-GV-FL-MO-WCB	9	126	1134	
8-C150-GV-FL-MO-WCB	9	180	1620	
14-C150-GV-FL-GO-WCB	1	509	509	
TOTAL			8594.1	Around 9 MT

Notes:

The erection work shall include necessary welding, fittings, clamps, fixtures, etc. including finishing work as may be required for completion of the work.
Consumables like rawl plugs, screws, check nuts, nuts & bolts, saddles, saddle bars, cable (nylon) ties, washers, cable tags (strips), etc. which are not covered in the list but required for successful completion of above erection activity shall be supplied by the contractor with in the quoted rate.
Erection activities like cutting/ threading/welding etc. of conduit/pipe/ISMC/ISA shall be carried out by the successful bidder as per requirement for installation of equipment's.
Surface preparation and base coat of primer shall be carried and final painting shall be done after completion of structural steel erection.

Annexure-X

(BILLING SCHEDULE)

85% of Unit Rate (Applicable for ITEM No: 1.1, 1.1a, 1.2, 1.3, 1.4, 1.5.1, 1.5.2, 1.5.3 & 1.6 of Rate Schedule.)

Sl No	Activity	For item No: 1.1 (Str. & Duct / Dampers)	For item No: 1.1a (Aux support, small beam, inserts, keys etc)	For item No: 1.2 (Tanks)	For item No: 1.3 (Rotating Machines)	For item No: 1.4 (Insulation)	For item No: 1.5.1, 1.5.2 & 1.5.3 (Piping)	For item No: 1.6 (Misc Equipment / Strl Steel)
1	Procurement of raw steel and Completion of Preassembly, (if not applicable this portion shall be clubbed with Placement in position)		45%					
2	Completion of Preassembly, (if not applicable this portion shall be clubbed with Placement in position)	20%		20%	20%		20%	20%
3	Placement in position	25%	15%	20%	20%	50%	20%	25%
4	Alignment	20%	10%	10%	20%		10%	20%
5	Welding/Bolting /Fixing as required.	15%	10%	20%	20%	35%	15%	15%
6	Completion of Non Destructive Examination & Stress relieving /heat treatment, (if not applicable, then this portion to be paid along with welding)	5%	5%	10%	5%		10%	5%
7	H&S wherever applicable as per drawing						5%	
8	Hydro Test of Piping/Water Fill Test/ Vacuum Box test of Tanks/Holiday test (as			5%			5%	

applicable)							
TOTAL FOR PRORATA PAYMENTS	85%						

STAGE/ MILESTONE PAYMENTS (15%)

1	Completion of air & Gas tightness test for Ducts	3 X 0.50%	1.5%
2	Completion of Trial Run of Slurry Pumps	--	1.0%
3	Trial Run of Wet Ball Mills	3 X 0.50%	1.5%
4	Trial Run of Booster Fans	6 X 0.25%	1.5%
5	Trial Run of Oxidation Blower	6 X 0.25%	1.5%
6	Trial Run of FGD System	3 X 1.00%	3.0%
7	Completion of Painting	--	2.0%
8	Area Cleaning, Temporary Structures Cutting/Removal and return of Scrap	--	1.0%
9	Liquidation of Pending Points	--	1.0%
10	Completion of all Contractual Obligation and demobilization of site office.	--	1.0%
	TOTAL	--	15%

On completion of the PG test of each unit which is to be certified by the BHEL (ITEM NO.

1.7 OF RATE SCHEDULE) ALLOTED PERCENTAGE = 100%

NOTES

1	BHEL-Site, at their discretion, may further split up above percentages and effect payment to suit the site condition, cash flow requirement and according to the progress of work.
2	The billing break-up is drawn for progressive payment and shall not be construed as the value/ price of corresponding item, unless otherwise decided by BHEL.