**SINGRAULI ESP AND FGD**

# VOLUME-IA
# TECHNICAL CONDITIONS OF CONTRACT (TCC)

**Package-A:** Erection, Testing, commissioning & Trial Operation including application of lining, Insulation, supply & touch-up painting as and where required including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, and handing over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories, lining and insulation from ESP outlet to Chimney Inlet including installation of items as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist etc.. E & C of Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, including installation of items as per BOQ at **Unit#1** of 2X800 MW NTPC SINGRAULI STPP Stage-III project, Dist. Sonebhadra, UP

**Package-B:** Erection, Testing, commissioning & Trial Operation including application of lining, Insulation, supply & touch-up painting as and where required including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, and handing over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories, lining and insulation from ESP outlet to Chimney Inlet including installation of items as per BOQ and FGD system and related auxiliaries including E & C of Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, FGD DG set including installation of items as per BOQ at **Unit#2** of 2X800 MW NTPC SINGRAULI STPP Stage-III project, Dist. Sonebhadra, UP

BHARAT HEAVY ELECTRICALS LIMITED

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Website: www.bhel.com

# TECHNICAL CONDITIONS OF CONTRACT (TCC)
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**1.0 Project Information:**

| Sl. No. | Description | Details |
|---|---|---|
| **1** | **Project Title** | 2X800MW Singrauli Super Thermal Power Project, Stage-III |
| **2** | **Customer** | National Thermal Power Corporation Limited (NTPC Limited) |
| **3** | **Location** | Singrauli Super Thermal Power Station (Singrauli STPS) is located in Sonebhadra District of Uttar Pradesh. The Project is located at 118 Km towards South of District Head Quarters Robertsganj and is well connected by State Highway SH-5A. Nearest National Highway NH-39 is at a distance of about 5 Km from the Project.<br><br>Nearest major city is Renukoot, located at a distance of 60 Km to the project. The nearest Railway Station is Shaktinagar at 3 Km. The nearest major town is Robertsganj, which is approximately 118 Km from the project.<br><br>The Sonebhadra District is bounded by the State of Chhattisgarh to the South, Madhya Pradesh to the West & Jharkhand to the East. The nearest airport is Lal Bahadur Shastri International Airport, Varanasi at a distance of about 220 Km from project site. |
| **4** | **Nearest Airport** | Nearest Commercial Airport is Lal Bahadur Shastri International Airport, Varanasi About 220 Km from Singrauli STPP. |
| **5** | **Nearest Railway link** | Nearest Railway Station is Shaktinagar Station which is About 3.0 Km from Singrauli STPP. Other Nearby Important Stations are Renukoot Junction About 60 Km, Mirzapur Station About 198 Km, Mughal Sarai Junction About 196 Km and Varanasi Cantt About 202 Km. |
| **6** | **Access By Road/Major Cities** | Nearest National Highway NH-39 is at a distance of about 5 Km from the Project.<br><br>Nearest major city is Renukoot, located at a distance of 60 Km to the project. |
| **7** | **Temperature** | Meteorological data from nearest observatory is placed as a **Annexure-L** (Attached) |

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| **8** | **Seismic Zone** | As per Annexure of NTPC Technical Specifications, Section-VI, part-B (**Annexure-L attcahed**). |
| **9** | **Wind Speed** | Meteorological data from nearest observatory is placed as a **Annexure-L (attached)**. |

| | **INSTRUCTIONS TO BIDDERS** |
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| **1.1** | The Bidder shall visit project site and acquire full knowledge and information about conditions prevailing at site and in & around the plant premises, together with site conditions, transportation routes, various distances, all the statutory, obligatory, mandatory requirements of various authorities and all information that may be necessary for preparing the bid and entering into the Contract. All costs for and associated with site visits shall be borne by the bidder. |
| **1.2** | Other contractors would be working in this area and their structures are to be protected. The material brought and stacked for construction should not make hindrance to other contractors. |
| **1.3** | The information given herein is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder. |
| **1.4** | The contractor, in the event of this work awarded to him, shall establish an office at site and keep posted an authorized, responsible officer with valid Power of Attorney Attorney for the purpose of the contract. Any order or instructions of the `Engineer' or his duly authorized representative, communicated to the contractor's representative at site office will be deemed to have been communicated to the contractor at his legal address. |
| **1.5** | No claim will be entertained by BHEL on ground of lack of knowledge and the contractor's rates shall be deemed to have taken this into account. |
| **1.6** | Bidders may fix up their site visit in consultation with below mentioned contact person: |

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| Name: | Mr. Ajay Singh | Mr. Amrendra Kumar Thakur |
| Designation: | AGM | Manager |
| Location: | 2X800 Singrauli Project | PSNR Noida |
| Email: | ajaysingh@BHEL.in | pmgakthakur@BHEL.in |
| Ph. No. | (+91) 9650 590 899 | (+91) 954 069 0700 |

| 2.0 | **Scope of Works:** |
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| 2.1 | The Scope of works covered under which contract consists of the following: -<br><br>**Package-A** Erection, Testing, commissioning & Trial Operation including application of lining, Insulation, supply & touch-up painting as and where required including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, and handing over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories, lining and insulation from ESP outlet to Chimney Inlet including installation of items as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist etc.. E & C of Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, including installation of items as per BOQ at **Unit#1** of 2X800 MW NTPC SINGRAULI STPP Stage-III project, Dist. Sonebhadra, UP.<br><br>**Package-B** Erection, Testing, commissioning & Trial Operation including application of lining, Insulation, supply & touch-up painting as and where required including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, and handing over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories, lining and insulation from ESP outlet to Chimney Inlet including installation of items as per BOQ and FGD system and related auxiliaries including E & C of Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, FGD DG set including installation of items as per BOQ at **Unit#2** of 2X800 MW NTPC SINGRAULI STPP Stage-III project, Dist. Sonebhadra, UP.<br><br>**Note:** Ordering of Package A & B as above shall be governed as per modality of award described in NIT. All the clauses shall be applicable on both the agencies separately (until otherwise explicitly mentintion).<br><br>Before commencement of any work, the bidders have to check with Civil/Mechanical/Electrical drawings jointly with concerned BHEL Engineers. |
| 2.2 | The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipment at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, grinding, radiography, LPI/MPI/UT/PAUT/CRT testing wherever needed, heat treatment, carrying out air tightness test by soap solution / kerosene, Vacuum test, hydraulic test, steam / air blowing, light up, chemical cleaning, passivation, steam blowing and safety valve floating including inter connection of all the termination points, erection and dismantling of all temporary piping, valves, pumps, tanks etc., and all other tests as per Latest FQP and commissioning procedures,required for the above operations, all pre-commissioning tests and trial runs of ESP and its auxiliaries, FGD and related Auxiliaries, Gypsum Dewatering System, Ducting connecting ESP to Chimney and Absorber area Ducting, related Piping etc. |

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| 2.3 (a) | The work under this contract shall be carried out as per BOQ Cum Rate Schedule and in compliance of tender conditions including technical specifications and approved drawings/ documents. |
| 2.3(b) | FGD common systems like Gypsum Dewatering Equipments, Limestone Day silo along with accessories, elevators etc, Lime Dosing system are kept under package-A and covered in BOQ of same package. FGD DG set Erection and commissioning kept under package-B and covered in BOQ of same package. Supervision of Erection & commissioning of FGD DG set shall be done under the supervision of BHEL DG vendor/BHEL ISG Banaglore. |
| **2.4** | **GENERAL** |
| **2.4.1** | Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract. |
| **2.4.2** | The drawings enclosed with this tender are intended to give the tenderer a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings. |
| **2.4.3** | Further this is to be noted that the drawings and the documents furnished along with this specification are the sole property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company. |
| **2.4.4** | Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and fro the site, fuel, compressed air, water, transit and storage insurance for Own TnP and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handing over the works in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works. |
| **2.4.5** | VOID |
| **2.4.6** | The area of work shall be cleared of all vegetation, rubbish and other objectionable matter and materials by contractor. No separate payment for these operations shall be made for such works. |
| **2.4.7** | All the works areas shall be adequately flood lighted to the satisfaction of the Engineer-in-Charge when the work is in progress during the night shifts. |
| **2.4.8** | Drawings showing enough details for the construction as per the specification shall be furnished to the contractor in a phased manner as far as possible. |
| **2.4.9** | All necessary arrangement for safety like Hard Barricading with scaffolding pipes and providing of safety net is in bidder's scope. |
| **2.4.10** | The Customer may depute their representative for checking and supervision of important stages of work. The contractor shall be required to provide all facilities for inspection of works at no extra cost to BHEL. Any defect in quality of work or deviations from drawings |

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| | / specifications pointed out during such inspection shall be made good by the contractor in the same way as if pointed out by the BHEL Engineer, without any cost implication to BHEL. |
| **2.4.11** | Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that is required for all works including temporary works shall be in the scope of contractor. |
| **2.4.12** | Carrying out establish levels and coordinates at suitable intervals from existing grid levels and coordinates furnished by the owner established bench marks, setting out the locations and levels of proposed structures. The contractor shall provide the owner/BHEL such an assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used. |
| **2.4.13** | Arranging for joint checking (with BHEL / BHEL's Customer / Consultant) of all site construction activities Preparation of joint protocols for each & every activity and maintaining quality records for audit/inspection as per approved FQP by BHEL. |
| **2.4.14** | Medical/First aid center/medicine purchased for emergency/Doctor purpose along with ambulance services with fuel and operator (round the clock) shall be arranged by BHEL for handling medical emergencies. Cost against these facilities shall be distributed / shared among the vendors working in Singrauli Project site proportionately based on contract value. (Reference HSE plan for Singrauli project-Annexure C) |
| **2.4.15** | The complete works shall be carried out as per BOQ cum Rate schedule. If any work covered in the scope of contract cannot be executed using items available in BOQ, additional / extra items shall be made and rates for such items shall be worked out as per GCC. However, contractor shall be bound to execute all the works under the scope of the contract and decision whether an extra item is applicable or not, shall be taken by BHEL Engineer which will be binding on the contractor. |
| **2.4.16** | Any activity which is necessarily required for satisfactory execution of any item of BOQ in line with technical specifications shall be deemed to be included in BOQ item even if it is not described in the item description and no extra payment shall be made against such activity. |
| **2.4.17** | The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent construction manager having sufficient authority to take decisions at site. Contractor shall deploy experienced manpower for execution of the job. |
| **2.5** | **Field Quality Assurance:** |
| **2.5.1** | The contractor shall be responsible for day-to-day quality checks for works and other building materials in line with approved Field Quality Plan (FQP) and Manufacturing Quality Plan (MQP) during the progress of work. All quality records and log sheets shall be |

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| | maintained as per the requirement of BHEL/CUSTOMER and as per FQP/MQP approved by BHEL/CUSTOMER. |
| **2.6** | **Erection Clause:** |
| **2.6.1** | The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipment at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, grinding, wherever needed, application of touch up Painting (as and where required for limited area). |
| **2.6.2** | The works to be performed under this contract consist of providing all labour, supervision, material, scaffolding, construction equipment's, tools and plants, temporary works, supplies, transportation and all incidental items not shown or specified but reasonably implied or necessary for the proper completion of work in all respects. Testing of all materials etc. are included on the rates of items of work. Works shall be carried out only with approved erection drawings.<br><br>The unit rates shall include all material equipment, fixtures, labour construction plant, temporary works and everything whether of permanent or temporary nature necessary for the completion of job in all respects.<br><br>All rectifications/modifications, revamping and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation/maintenance requirements, mismatching or due to damages in transit, storage and erection/commissioning and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works and shall be dealt as per GCC clause 2.15 of GCC.<br><br>The vendor shall assist in providing their deployed T&P's for use by other vendors generally nearby their working area in best interest of Project. While it shall be BHEL's endeavour to mutually settle any reasonable commercial issue between the vendors, such assistance shall not be denied by the vendor on instructions of BHEL. |
| **2.6.3** | The bidder should fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, local conditions, soil strata and site-specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may have not been specifically brought out in the specifications. |
| **2.6.4** | The quantities indicated in the tender specification are approximate and are liable for variation at the discretion of BHEL. The work executed shall be measured and priced as per the unit rate arrived at for each work area as mentioned in the relevant clauses. Quantity variation shall be governed as per GCC clause 2.14. |
| **2.6.5** | All transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables etc, except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by Contractor unless otherwise specified in the relevant clauses. The Contractor's quoted rates should be inclusive of all such contingencies. |

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| **2.6.6** | It shall be specially noted that, the contractor may have to work round the clock (24x7) or may have to deploy additional manpower/resources to achieve the completion schedules / plans / targets during the entire course of erection and commissioning works. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including labours, engineers / supervisors, T&Ps etc.<br><br>Time is the essence of contract. Night shift working is envisaged for works not hazardous in nature Ex- Erection works at low level, Material shifting, Preassembly works etc. |
| **2.6.7** | The terminal points can be inferred from the relevant drawings and any further clarifications can be obtained/decided by BHEL and that is final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also, where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate. |
| **2.6.8** | The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be affected from contractor's bill towards expenditure incurred including BHEL's overhead charges. |
| **2.6.9** | Considering the area constrain in the subject project, Contractor has to work in close co-ordination with other erection/Civil agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less/more at a particular given time. Activities and erection program have to be planned in such a way that the project milestone events like boiler light up, Synchronisation, COD etc., are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly. |
| **2.6.10** | No member of the already erected structure/ platform, pipes, grills, platform, other component and auxiliaries should be cut without specific approval of BHEL engineer. In case it is necessary to cut, the contractor shall rectify / repair in a manner acceptable to BHEL / Customer without any additional cost. |
| **2.6.11** | The storage yard is located in multiple locations. All other materials have to be transported from storage yard to construction area by the contractor at his own cost, using own **Pick & Carry Crane (Farrana),** crane and trailer. Bidders are advised to visit site to ascertained all these aspects before quoting. |
| **2.6.12** | Painting: Touch-up Painting: All structures/ components shall be supplied from BHEL units/ workshops with finish coats of paint. Therefore, final painting is not applicable in the scope of contractor for Unit supplied items (until specifically mentioned in the tender). However, touch up painting (wherever required), incidental to the work, shall be in the scope of the contactor, including supply of the required paints and primers and associated consumables. |

**2.6.13** During the course of erection, certain rework / modification / rectification / repairs / fabrication etc will be necessary on account of feedback/revision from various relevant sources, and also on account of design discrepancies/ alterations, manufacturing defects, site operations/ maintenance requirements. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repairs etc promptly and expeditiously. This shall be dealt as per GCC clause 2.15 of GCC.

**2.6.14** The scope of work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management **including high standard safety management (as per relevant clause of tender document) and green belt management (Project Management, HSE & Quality etc.).** The contractor should ensure successful and timely completion of the work. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequately trained, qualified and experienced supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works. **(Refer HSE Manual)**

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

**2.6.15** **Manpower required exclusively for BHEL Menial and Secretarial Services:-**

| SN | Description of Work/Item | BOQ Pkg-A | BOQ Pkg-B |
|---|---|---|---|
| 1 | Skilled (like computer operator etc.) | 2 | 2 |
| 2 | Semiskilled (like service staff etc.) | 2 | 2 |

Payment from providing the above service shall be made on monthly basis as per as per BOQ item no "**Section C: Special Resources**".

**NOTE:-**

1. Monthly unit rates are based on minimum wages as per NTPC (Singrauli) circular (Annexure-H) at the time of NIT multiplied by **factor of 1.41**. Monthly unit rates shall be revised as when it is changed/informed by NTPC.
2. Monthly unit rates per month shall be paid as per the minimum wages rate given in circular issued by NTPC (Singrauli) (Annexure-H) multiplied by **factor of 1.41** (for statutory portion of monthly salary).
3. Since the rates against manpower services are variable according to periodic revision, the overrun compensation as per general condition of contract shall not be applicable for providing these manpower services.

Contractor has to deploy **personals** at site, within 15 days, from the date on which requirement is mentioned in Contractor performance review (F-14). In case the contractor does not deploy or delays deployment of above said manpower with reference to specific

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| | instructions from BHEL, BHEL will levy penalty of Rs. 500 per person per service day, for such delay. Payment during the absenteeism shall not be paid. |
| **2.6.16** | Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and fro the site, fuel, compressed air, water, transit and storage insurance for own T&P and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handling over the works, except in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works. |
| **2.6.17** | Furnishing samples of all materials required by the engineers for testing/inspection and approval for use in the works. The samples may be retained by the engineer for final incorporation in the works. |
| **2.6.18** | Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer. |
| **2.6.19** | Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that is required for all works including temporary works. |
| **2.6.20** | Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified. |
| **2.6.21** | The contractor shall provide the owner/BHEL such an assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used. |
| **2.6.22** | Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract. |
| **2.6.23** | Arranging for joint checking (with BHEL / BHEL's Customer / Consultant) of all site construction activities Preparation of joint protocols for each & every activity and maintaining quality records for audit/inspection as per approved FQP by BHEL. |
| **2.6.24** | Contractor shall set up suitable guarded storage facilities. Any theft or missing of BHEL material/Tools & Plant from contractor's custody shall be recovered from contractor's dues along with BHEL's applicable overheads. |
| **2.6.25** | The drawings enclosed with this tender are intended to give the tenderer a general idea of the layout or type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings.<br>Further this is to be noted that the drawings and the documents furnished along with this specification are the sole property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company. |
| **2.6.26** | The scope of work will also include such other related works although they may not be specifically mentioned above and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer. |

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| **2.6.27** | The detail scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual requirements. |
| **2.6.28** | Adequate lighting facilities such as hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre-assembly yard and contractor's material storage area etc. at his cost. |
| **2.6.29** | **Adequate water less/Bio urinals (at least 1 no. per 100 nos of manpower, at locations identified by BHEL site in-charge)** shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas with proper disposal arrangement. |
| **2.6.30** | Vendors have to comply requirements of HSE & Statutory requirement in line with BHEL HSE plan (Annexure-C), NTPC Safety requirement, State/Central statutory requirement. |
| **2.6.31** | Preparation of method statement, HIRA, Job Safety analysis, permit to work, lifting plans, and all supporting documents as required for starting & continuation of work/job is in vendor's scope. |
| **2.6.32** | Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes. |
| **2.7** | **Consumables** |
| **2.7.1** | All the required electrodes (in Contractor scope) as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL site, before procurement regarding, suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc. |
| **2.7.2** | The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), all gases (inert, welding, and cutting), soldering material, dye penetrants, radiography films. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor.<br><br>Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials (**structural steel, concrete sleeper, concrete blocks etc. required as per the discretion of BHEL Site**) hardware items etc. required for temporary works such as supports, scaffoldings, **pre-assembly bed etc.** can be issued from BHEL on returnable basis subject to availability with BHEL site store. In case of non-availability same has to be arranged by agency. |
| **2.7.3** | All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost. |
| **2.7.4** | All the required gases like Oxygen / Acetylene / argon / Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non-availability of gases cannot be considered as reason for not attaining the required progress. BHEL reserves the right to reject the use of any gas in case required purity is not maintained. |
| **2.7.5** | The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes. |
| **2.7.6** | The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc. |

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| **2.7.7** | Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate. |
| **2.7.8** | Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor. |
| **2.7.9** | All low hydrogen electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C - 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost. |
| **2.7.10** | **In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's subsequent bills at market value plus 5% overheads.** |
| **2.7.11** | BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time. |
| **2.7.12** | Sealing compounds and GI wires for insulation mattress binding and Self drilling screws / Self taping screws for sheeting works shall be provided by the agency within the quoted price/rates. |
| **2.8** | BHEL is entitled to engage a separate Contractor for NDT & PWHT / SR for the welding works executed in this contract, without assigning any reason to the contractor. In this regard, Contractor shall not be entitled for corresponding payment against as mentioned in Terms of payment Chapter VII of TCC. However, Contractor has to provide all possible support to NDT & PWHT / SR agency such as Scaffolding, area illumination, approach, wrench/sky climber with operator etc. Item no. 7.1.5.2 of Terms of payment Chapter VII of TCC shall be payable for such support.<br>In case, any defect is identified, repair work shall be done by contractor at no extra cost to BHEL. Extra NDT & PWHT / SR arise due to defect, shall be debited to contractor at prevailing rate with 5% overhead. Engagement of NDT & PWHT / SR agency by BHEL, shall not vacate contractor from their responsibility of workmanship till trial run/PG Test/warrantee period. Repair in weld joints, as and when required, shall be attended by the contractor." |
| **2.9** | **HEIRARCHY:** |
| **2.9.1** | In case of any conflict/deviations amongst various documents, the order of precedence shall be as follows:<br>1. Items Description in BOQ Cum Rate Schedule.<br>2. Technical Conditions of Contract (TCC).<br>3. Technical Specifications for Customer.<br>4. IS Standard.<br>5. BHEL's Standard Specification.<br>6. SCC/GCC |

**3.0 Facilities in the scope of Contractor/BHEL:**

| Sl. No | Description<br>PART I | Scope | | Remarks (for details refer relevant clause of tender document) |
|---|---|---|---|---|
| | | BHEL | Bidder | |
| **3.1** | **Establishment:** | | | |
| **3.1.1** | **For Construction Purpose:** | | | |
| a | Open space for office (as per availability within project premises) | Yes | | Location will be finalized after joint survey with owner. |
| b | Open space for storage (as per availability within project premises) | Yes | | Location will be finalized after joint survey with owner. |
| c | Construction of bidder's office, canteen and storage building including supply of materials and other services | | Yes | |
| d | Bidder's all office equipment, office / store / canteen consumables | | Yes | |
| e | Void | | | |
| f | Firefighting equipment like buckets, extinguishers etc. | | Yes | |
| g | Cordoning-Off of storage area, office, canteen etc of the bidder | | Yes | |
| **3.1.2** | **For living purpose of the bidder:** | | | |
| a | Open space for labour colony | | Yes | Contractor has to make his own arrangements for shelter and transportation of labours as per requirement. |
| b | Labour Colony with internal roads, sanitation, complying with statutory requirements | | Yes | Construction Plan shall be approved by BHEL |
| **3.2** | **Electricity:** | | | |
| **3.2.1** | **Electricity for construction purposes (for Site/Project works only) 3 Phase 415/440 V** within project premises | | | |

| Sl. No | Description<br>PART I | Scope | | Remarks (for details refer relevant clause of tender document) |
|---|---|---|---|---|
| | | BHEL | Bidder | |
| a | Single point source. | **Yes** | | Free of Cost Shall be provided at 2-3 points near the site at a distance of approx. 500 meter. |
| b | Further distribution including all materials, Energy Meter, Protection devices and its service | | Yes | |
| c | Duties and deposits including statutory clearances if applicable | **Yes** | | |
| **3.2.2** | **Electricity for office, stores, canteen etc. of the bidder (Chargeable) within project premises** | | | |
| a | Single point source **(Chargeable)** | **Yes** | | Chargeable at **prevailing tariff on project site at** one or two point near the site at a distance of approx. 500 meter. |
| b | Further distribution including all materials, Energy Meter, Protection devices and its service | | Yes | |
| c | Duties and deposits including statutory clearances if applicable | | Yes | |
| **3.2.3** | **Electricity for living accommodation of the bidder's staff, engineers, supervisors, labour Hutment etc.** | | | **Contractor has to make his own arrangements** |
| a | Single point source | | Yes | |
| b | Further distribution including all materials, Energy Meter, Protection devices and its service | | Yes | |
| c | Payment/Duties and deposits including statutory clearances if applicable | | Yes | |
| **3.3** | **Water Supply:** | | | |
| **3.3.1** | **For construction purposes:** | | | |
| a | Making the water available at single point or two points (Free of Cost) | Yes | | |
| b | Further distribution as per the requirement of work including supply of materials and execution | | Yes | |

| Sl. No | Description<br>PART I | Scope | | Remarks (for details refer relevant clause of tender document) |
|---|---|---|---|---|
| | | BHEL | Bidder | |
| **3.3.2** | **Water supply for bidder's office, stores, canteen etc** | | | |
| a | Making the water available at single point | | Yes | |
| b | Further distribution as per the requirement of work including supply of materials and execution | | Yes | |
| **3.3.3** | **Water supply for Living Purpose** | | | **Contractor has to make his own arrangement** |
| a | Making the water available at single point | | Yes | |
| b | Further distribution as per the requirement of work including supply of materials and execution | | Yes | |
| **3.4** | **Lighting** | | | General area lighting through high mast and other fixtures shall be in the scope of BHEL. However, localized area lighting for bidder's construction site/ storage yard/pre-assembly yard/ material handling location, etc. shall be in scope of contractor. |
| a | For construction work (supply of all the necessary materials)<br>1. At office/storage area<br>2. At the preassembly area<br>3. At the construction site /area | | Yes | |
| b | For construction work (execution of the lighting work/ arrangements)<br>1. At office/storage area<br>2. At the preassembly area<br>3. At the construction site /area | | Yes | |
| c | Providing the necessary consumables like bulbs, switches, etc. during the course of project work | | Yes | |

| Sl. No | Description<br>PART I | Scope | | Remarks (for details refer relevant clause of tender document) |
|---|---|---|---|---|
| | | BHEL | Bidder | |
| d | Lighting for the living purposes of the bidder at the colony / quarters | | Yes | |
| **3.5** | ***Communication facilities for site operations of the bidder*** | | | |
| a | Telephone, fax, internet, intranet, e-mail etc. | | Yes | |
| 3.6 | **Compressed air wherever required for the work** | | | |
| a | Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc. | | Yes | |
| b | Installation of above system and operation & maintenance of the same | | Yes | |
| c | Supply of the all the consumables for the above system during the contract period | | Yes | |
| **3.7.1** | **Demobilization of all the above facilities** | | Yes | |
| **3.7.2** | ***Transportation*** | | | |
| A | For site personnel of the bidder | | Yes | |
| B | For bidder's equipment and consumables (T&P, Consumables etc.) | | Yes | |
| **3.7.3** | **Erection Facilities** | | | |
| 3.7.3.1 | Engineering works for construction: | | | |
| a | Providing the erection/constructions drawings for all the equipment covered under this scope. | Yes | | **Shall be provided progressively.** |
| b | Drawings for construction methods | Yes | Yes | In consultation with BHEL |
| c | As-built drawings where ever deviations observed and executed and also based on the decisions taken at site | | Yes | Changes are to be marked in drawing & handover to BHEL on completion of work. |
| d | Shipping lists etc. for reference and planning the activities | Yes | | |
| e | Preparation of site erection schedules and other input requirements asper Form-14. | | Yes | In consultation with BHEL |

| Sl. No | Description<br>PART I | Scope | | Remarks (for details refer relevant clause of tender document) |
|---|---|---|---|---|
| | | BHEL | Bidder | |
| f | Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments | Yes | Yes | In consultation with BHEL |
| g | Weekly erection schedules based on Sl. No. e | | Yes | In consultation with BHEL |
| h | Daily erection / work plan based on Sl. No. g | | Yes | In consultation with BHEL |
| i | Periodic visit of the senior official of the bidder to site to review the progress so that works is completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months. | | Yes | |
| j | Preparation of preassembly bay | | Yes | Materials required for preassembly shall be in agency scope. However, If available, BHEL may provide such material on free returnable basis, which shall be returned without any damage. |

| | |
|---|---|
| **3.8** | **Land/Open Space:** |
| **3.8.1** | Availability of land within plant boundary is very limited and the contractor has to plan and use the existing land considering the use of land by other Civil /mechanical/ electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erection's agencies. BHEL shall provide free of charge limited open space for office, storage shed and laydown area as and where made available by Customer. It is the responsibility of the contractor to construct facilities such as sheds, fabrication/Preassembly yard, provide all utilities and dismantle and clear the site after completion of work or as and when required, as a part of his scope of work. |
| **3.9** | **Labour and Staff Colony:**<br>**Following are in the Bidder's scope of work for labour & staff colony:** |
| **3.9.1** | Labour colony is to be developed by bidder for all the labours required to be deployed for the works. All labour colony set-up is to be developed as per attached customer drawing |

| | |
|---|---|
| | (Annexure-B), BHEL's standard guidelines (Annexure-A) for worker's accommodation/establishment and in compliance of statutory requirements.<br><br>Contractor shall construct/arrange Labour Hutment as per minimum specifications mentioned in the attached drawing/guidelines, for which no separate payment shall be made by BHEL. Modifications if any proposed in the Hutment shall be in consent with BHEL/Customer.<br><br>Ownership of the labour hutment shall be of the contractor and contractor shall keep BHEL indemnified from any statutory obligations/ legal compliances w.r.t. labour hutment establishment during as well as after the completion of contract. |
| **3.9.2** | In case labour hutment is not completed as per the drawings, BHEL's guidelines and specification and any penalty is imposed by Customer, same shall be recovered from contract's RA Bill.<br><br>Rectification and Corrections in labour hutment as pointed out by BHEL/Customer shall be bidder's responsibility and any cost incurred by BHEL to complete the works, in case of non-compliance of the instructions, same shall be recovered from his RA Bills along with 5% overheads. |
| **3.9.3** | Land for labor colony shall be arranged by Contractor at their own cost as per availability outside project area preffarably within 5Km, Necessary levelling/dressing of land shall be done by the contractor. All arrangement for electricity and drinking/service water to be arranged by the contractor within his quoted price. All expenses towards installation of transformer, depositing requisite fees etc if required shall be borne by vendor. |
| **3.9.4** | Development of Bidder's temporary staff colony and labour colony having adequate no. of Bio Urinals. |
| **3.9.5** | All Civil and Structural work associated with drinking and service water for Bidder's labour and other personnel at the work site/colony/offices including pump houses, pipes, overhead tank, tube wells etc. |
| **3.9.6** | Providing and maintaining facilities for safety, welfare, drinking water and sanitation, hygiene, health check-up etc. for construction workers at their workplaces as well as at labour & staff colonies. |
| **3.9.7** | Development and maintenance of above facilities for construction workers deployed by the Contractor shall solely rest with the Contractor. |
| **3.9.8** | Contractor shall follow the BHEL's standard guidelines and customer drawings in respect of construction and maintenance of labour colony/accommodation attached with this tender at the direction of BHEL's engineer |
| **3.10** | Installation of necessary amenities- and temporary infrastructure for construction activities at Project site locations.<br><br>Following are the minimum amenities to be provided by the bidder within the quoted price including removal/disposal of the same in environment friendly manner after its intended use/completion of scope of work: |

| | |
|---|---|
| | i. Labour rest sheds near work spot.<br>ii. Canteen facility creation.<br>iii. Drinking water facility.<br>iv. Labour Bio toilets near work spot in sufficient nos. with regular cleaning & maintenance arrangement.<br>v. Labour colony should have all hygienic condition, dining hall, toilets, proper sewerage system, good drinking water arrangements.<br>vi. Regular fogging in the work place and labour colony to avoid mosquitoes.<br>vii. Royalty challan (if applicable) and statutory documents shall be submitted along with RA Bills for processing of Bills. |
| **3.11** | **Construction Power:** |
| **3.11.1** | Construction power (three phase, 415 V/ 440 V) will be provided near the site at a distance of approx. 500M **free of cost**. Further, distribution shall be arranged by the contractor at his own cost and services.<br>Construction power (three phase, 415 V/ 440 V) for office, stores, canteen etc. within the site premises will be provided on **chargeable basis** near the site at a distance of approx. 500M. Further, distribution shall be arranged by the contractor at his own cost and services. |
| **3.11.2** | Contractor shall deploy and install required energy meter (whereever applicable), cables, fuses, distribution boards, switchboards, bus bars, earthing arrangements, protection devices and any other installation as specified by statutory authority/act.<br>Contractor shall provide at his own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized/ accredited agency for working out the power consumption. In case of recalibration required for any reason the necessary charges including replacement by calibrated meters is to be borne by the contractor.<br>Contractor is advised to maintain the calibrated energy measuring instruments. |
| **3.11.3** | Sufficient power factor compensation equipment like capacitor shall be provided by contractor for reactive loads like welding machines etc. In case of any fine/penalty on account of low power factor, same shall be shared by contractor proportionately according to power consumption. |
| **3.11.4** | Contractor shall make necessary arrangements for onward distribution of construction power taking due care of surrounding construction activities like movement of cranes & vehicles, civil work, fabrication/construction/assembly/ erection etc. and safety of personnel. It may become necessary to relocate some of the installations to facilitate work by other agencies or by him. |
| **3.11.5** | It shall be the responsibility of the Contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced electrician. |

| | |
|---|---|
| **3.11.6** | While reasonable efforts will be made to ensure continuous electric power supply, interruptions cannot be ruled out and no claim from the Contractor shall be entertained on this account such as idle labour, extension of time etc. The Contractor shall adjust his working shift accordingly and deploy additional manpower, if necessary, so as to achieve the target. |
| **3.11.7** | Contractor shall be well equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc. to tackle situations arising due to failure of supplied power, so as to ensure continuity and completion of critical processes that are underway at the time of power failure or important activities planned in immediate future. |
| **3.11.9** | BHEL is not responsible for any loss or damage to the Contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply. |
| **3.11.10** | The bidder shall be responsible for General illumination system/arrangements during construction right from start of his work. This system will include temporary pole lighting, within the quoted price. The illumination should be such that minimum illumination requirement as specified by Indian standards for general illumination is maintained. |
| **3.11.11** | VOID |
| **3.11.12** | Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases. |
| **3.12** | **Construction water:** |
| **3.12.1** | Construction water at a single point shall be provided by BHEL **free of cost**. Bidder has to make arrangement of further distribution of water at his own cost. No extra payment shall be made under this account. |
| **3.12.2** | The Contractor should make arrangements for storage of sufficient quantity of water required for work |
| **3.12.3** | Contractor to satisfy himself that the water drawn by him is fit for construction / consumption and adequately treat such water at his cost when it is not found fit for the said purposes. |

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

**4.1 Major T&P**: Major Tools & Plants (T&P) shall be arranged for both Packages A & B by the Contractor for execution of work as per Technical Conditions of Contract of this tender within the quoted rate as mentioned below.

| S. N. | DESCRIPTION OF MAJOR T&Ps | CAPACITY | QUANTITY Pkg-A | QUANTITY Pkg-B | REMARKS |
|---|---|---|---|---|---|
| 1. | Crawler crane | 100 MT | 01 No. | 01 No. | Crane to be made available as per instruction from BHEL Site in-charge. Tentative schedule: from Start of ESP Erection till readiness for Synchronisation of the unit. |

**Note for clause 4.1:**

1. Contractor shall mobilise aforementioned cranes/T&Ps at site, in case stated capacity crane could not be made available, for any reason what so ever, a higher capacity crane shall be mobilised by the contractor without any extra cost.
2. Agency shall Mobilize / de-mobilize/ re-mobilise the Major T&Ps as per BHEL instruction without any extra cost to BHEL.

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

| SN | DESCRIPTION OF OTHER T&Ps | CAPACITY (MINIMUM) | MINIMUM QUANTITY | REMARKS |
|---|---|---|---|---|
| 1 | Tyre mounted mobile crane | 18/20/22 MT | As per requirement | As per requirement |
| 2 | Tyre mounted mobile crane | 14 MT | As per requirement | As per requirement |
| 3 | Trailer with prime mover | 20 MT | 1 Nos | As per requirement |
| 4 | Trailer with prime mover | 40 MT | 1 Nos | As per requirement |
| 5 | Man lifter | As Per Requirement | As Per Requirement | As Per Requirement |
| 6 | Calibrated Power driven HSFG bolt tightening machines | As per Requirment | As per requirement | As per requirement |
| 7 | Power Driven Torque tightening machine | As per Requirment | As per requirement | As per requirement |
| 8 | Torque calibrator | As per Requirment | As per requirement | As per requirement |
| 9 | Bolt Tension Calibrator | As per Requirment | As per requirement | As per requirement |

| SN | DESCRIPTION OF OTHER T&Ps | CAPACITY (MINIMUM) | MINIMUM QUANTITY | REMARKS |
|---|---|---|---|---|
| 10 | Pre-heating, post-heating and post-weld stress relieving equipment with automatic recording devices and chartless recorder / IIOT sensors duly password protected with a connectivity to remote server /Cloud along with heating control panel, cables, heating elements, thermocouples, thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment / stress-relieving operations. | NA | NA | *Note-If required in any job then same shall be arranged by contractor |
| 11 | Electrical torque wrench | As per Requirment | As per requirement | As per requirement |
| 12 | Impact wrench | As per Requirment | As per requirement | As per requirement |
| 13 | Mechanical Torque wrench | As per Requirment | As per requirement | As per requirement |
| 14 | Steel tape | As per Requirment | As per requirement | As per requirement |
| 15 | Steel ruler | As per Requirment | As per requirement | As per requirement |
| 16 | Ultrasonic hardness testing machine (Ultrasonic contact impedance (UCI)) | As per Requirment | As per requirement | GE or Kraut Kramer or Microdur make or reputed branded ultrasonic hardness testing machine. (Hardness test may be Brinell, Vickers and Rockwell tests as per the discretion of BHEL.) |
| 17 | VOID | | | |
| 18 | Air compressor/blower (electric/diesel operated) | 210 CFM, 7 KG/CM2 | 01 no. | As per requirement |
| 19 | VOID | | | |
| 20 | Tig welding set | As per Requirment | As per requirement | As per requirement |
| 21 | Oxy Acetelyne Gas cutting Machine | As per Requirment | As per requirement | As per requirement |
| 22 | GTAW Machine: HF Welding Machine & SMAW machine: Inverter based welding machine | As per Requirment | As per requirement | As per requirement |

| SN | DESCRIPTION OF OTHER T&Ps | CAPACITY (MINIMUM) | MINIMUM QUANTITY | REMARKS |
|---|---|---|---|---|
| 23 | DC arc welding machine & Submerged ARC welding M/C | As per Requirment | As per requirement | As per requirement |
| 24 | 3-phase distribution board with complete set up for drawl of construction power | As per Requirment | As per requirement | As per requirement |
| 25 | Power cable for drawl of construction power | As per Requirment | As per requirement | As per requirement |
| 26 | **Self-drilling cum tapping machine for screws** | As per Requirment | As per requirement | Prior to start of sheeting works. |
| 27 | Radiography arrangement with radioactive isotope source | As per Requirment | As per requirement | As per requirement |
| 28 | Theodolite of required accuracy | To ensure verticality of structural columns. | As per requirement | Required Since start of work |
| 29 | Arrangement for UT of higher thickness joints with recording facility & required calibration blocks. | Type USN 50 or equivalent/ up graded type | As per requirement | As per requirement |
| 30 | Welding rectifiers / MIG Welding (electrical) | As per requirement | As per requirement | As per requirement |
| 31 | Welding generator (diesel operated) | As per requirement | As per requirement | As per requirement |
| 32 | Radiography film viewer | As per Requirment | As per requirement | As per requirement |
| 33 | Pipe/Tube cutting/ beveling /chamfering machine | As per Requirment | As per requirement | During Pre-assembly & erection |
| 34 | Electro/hydraulic pipe bending machine | Up to 2" nb and 12 mm thick pipes | As per requirement | As per requirement |
| 35 | Baking oven with thermostat and temperature gauge for welding electrodes | As per Requirment | As per requirement | Required Since start of work |
| 36 | Holding oven with thermostat and temperature gauge for welding electrodes | As per Requirment | As per requirement | Required Since start of work |
| 37 | Portable oven for welding electrodes | As per Requirment | As per requirement | Required Since start of work |
| 38 | Pug Cutting machines | As per Requirment | As per requirement | As per requirement |
| 39 | Chain pulley blocks | As per Requirment | As per requirement | As per requirement |
| 40 | Electric winch | 1/2/3/5MT capacity | As per requirement | As per requirement |

| SN | DESCRIPTION OF OTHER T&Ps | CAPACITY (MINIMUM) | MINIMUM QUANTITY | REMARKS |
|---|---|---|---|---|
| 41 | Hand winch | 0.5 ton/1.0 MT capacity | As per requirement | As per requirement |
| 42 | Battery Driven emergency light | As per Requirment | As per requirement | As per requirement |
| 43 | Scaffolding materials with forged clamps for insulation, painting etc works | As per Requirment | As per requirement as decided by BHEL engineer | As per requirement |
| 44 | Profile making m/c | For aluminium sheet cladding work | As per requirement | As per requirement |
| 45 | Nibbling m/c | As per Requirment | As per requirement | As per requirement |
| 46 | Shearing m/c | As per Requirment | As per requirement | As per requirement |
| 47 | Portable grinding m/c | As per Requirment | As per requirement | As per requirement |
| 48 | Portable drilling m/c | As per Requirment | As per requirement | As per requirement |
| 49 | Hoisting and pulley devices/pulleys | As per Requirment | As per requirement | As per requirement |
| 50 | SPANNERS / EYE BOLTS ( OF ALL SIZES ) | As per Requirment | As per requirement | As per requirement |
| 51 | Magnetic particle testing equipment – DRY &WET Type | As per Requirment | As per requirement | As per requirement |
| 52 | Hydraulic Jacks | 10/20/50/100 MT | As per requirement | As per requirement |
| 53 | Dewatering pumps(Electrical & Diesel engine operated) | As per Requirment | As per requirement | As per requirement |
| 54 | Various sizes of clamps/ fixtures for assembling | As per Requirment | As per requirement | As per requirement |
| 55 | Portable hardness tester (UCI Hardness Tester M/C) | As per Requirment | As per requirement | As per requirement |
| 56 | Hand Operated Megger 500 / 1000 V | As per Requirment | As per requirement | As per requirement |
| 57 | Tong Tester 10, 20 Or 50 Amp + / - 3 % Accuracy | As per Requirment | As per requirement | As per requirement |
| 58 | Digital and Analogue Multimetres | As per Requirment | As per requirement | As per requirement |
| 59 | U Tube Manometer 0-2000 mm Water Column | As per Requirment | As per requirement | As per requirement |
| 60 | Inclined Manometer 0-50 mm Water Column | As per Requirment | As per requirement | As per requirement |

| SN | DESCRIPTION OF OTHER T&Ps | CAPACITY (MINIMUM) | MINIMUM QUANTITY | REMARKS |
|---|---|---|---|---|
| 61 | Special Slings for Erection of Ceiling Girders & other heavy components | NA | NA | |
| 62 | Concrete Blocks | As per Requirment | As per requirement | For making bed of steel structure for checking dimensional accuracy, configuration and minor rectification. |
| 63 | Wooden/Concrete sleeper 1.5-2.0 Mtr length | As per Requirment | As per requirement | As per requirement |
| 64 | PORTABLE MAGNETIC STRUCTURESCOPE | As per Requirment | As per Requirment | As per requirement |
| 65 | PMI (Positive Material Identification) | As per Requirment | As per Requirment | As per requirement |
| 66 | Equipment for carrying out NDT test like LPI/MPI etc along with consumables. | As per Requirment | As per requirement | As per requirement |
| 67 | Painting equipment sets complete with compressor, hopper, screen, blasting hose pipe, nozzle airless / conventional spray (within CGI temporary cover shed) | As per Requirment | As per requirement | As per requirement |
| 68 | Digital Elcometer for paint thickness checking | As per Requirment | As per requirement | As per requirement |
| 69 | Sufficient quantity of steel ladders for approach up to the top of each erected column to be required during erection of columns. | As per Requirment | As per requirement | As per requirement |
| 70 | Suspended working platform for sufficient size. | As per Requirment | As per Requirment | As per requirement |
| 71 | PAUT + TOFD Machine | As per BHEL "Guidelines for Selection of NDE & Heat Treatment Agencies" (PP-QLYAA-DC-106/01-20) | As per requirement | As per requirement |
| 72 | Tools for Reaming and Honing | NA | NA | |
| 73 | PVC Caps to cover Pipe/tube ends. | As per Requirment | As per requirement | As per requirement |
| 74 | Hydraulic test/ pressurizing pump (Alongwith Suitable/ different ranges of calibarated Pr. Gauges) | As per requirement | As per requirement | As per Requirement |

| SN | DESCRIPTION OF OTHER T&Ps | CAPACITY (MINIMUM) | MINIMUM QUANTITY | REMARKS |
|---|---|---|---|---|
| 75 | Venturimeter | NA | NA | |
| 76 | Spot Welding M/c | As per Requirment | As per requirement | As per requirement |
| 77 | MIG welding Machine | As per Requirment | As per requirement | As per requirement |

| B. | List of suggestive safety Equipments /PPEs to be included in List of minimum T&P for each package: | |
|---|---|---|
| 1. | Safety Net (Conforming IS 11057:1984)<br>Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12mm diameter polypropylene rope (tested as per IS: 5175). Two meters length shall be provided at all four corners. | Min-50 Nos/unit (Fire resistant) |
| 2. | Fall Arrester 'Rope grab fall arrester' & anchorage line. Anchorage Line: 14mm- 16 mm diameter, three strand twisted Polyamide rope.<br><br>Rope Grab fall arrester: Openable & Guided type Fall Arrestor (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope. Material: Nickel Chrome plated Steel.<br><br>Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN), material: Steel<br><br>Retractable Fall arrestor Block (Range 6 Mtr to 15 Mtr) | Min. 20 nos. of Rope Grab Fall arrester' and Karbiner each,<br>Min. 20 nos. anchorage line, 30 metre long each,<br><br>10 nos. anchorage line, 40 metre long each,<br><br>Min. 50 Nos. |
| 3. | **Horizontal life line**<br>Stainless Steel Wire rope of 8mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end). | Min 20 nos. of wire rope, each 40 metre long<br>Min 20 nos. of wire rope, each 25 metre long. |
| 4. | **Ladders on column**<br>The minimum design live load on metallic ladder shall be a single concentrated load of 100 kilo grams. All rungs shall have a minimum diameter of 16mm to 25 mm, and minimum clear length of rungs shall be 40.6 centimeters. The distance between rungs shall not exceed 30.5 centimeters. Each ladder shall have maximum height of 9.0 metre.<br>The ladder shall have proper fastenings for attaching it to a column using positive means such as bolt, weld or other type of fasteners. | Cumulative length of ladders is 500 metres |
| 5. | Height Rescue Kit and Confined space rescue kit | 1 No each |
| 6. | Lux Meter & Breathe Analyser | 2 Nos each |
| 7. | Multi Gas Meter | 1 No |
| 8. | ELCB & RCCB Tester | 1 No |
| 9. | Earth Resistance meter | 1 No |
| 10. | Scaffolding materials as per EN 74 for hard barricading | As per requirement |
| 11. | Axial Fan with exhaust hood for confined space working and DC Light Unit | Min 1 Nos each |

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| 12. | Oxygen Meter | 1 No |
| 13. | Fire Blanket | Min 100 Mtr |
| 14. | **Fire resistant tarpaulins** | 20 Nos |
| 15. | **Safety Posters as per BHEL Guidelines** | As per requirement and instruction of BHEL |
| 16. | **Fire Extinguishers:**<br>ABC – 6 Kg: 50 Nos, Co2 – 4.5 Kg: 20 Nos, Foam – 9 Kg: 5 Nos<br>Fire Bucket (set of ¾ buckets) with stand – 10 Nos | |
| 17. | Rubber Mat as per IS 15652 | Min 100 Sqm |
| 18. | Electrical rubber gloves | As per requirement |
| 19. | Water Sprinkling tanker for dust suppression | 1 No |

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

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| **4.3** | **Measuring and Monitoring Equipment (MMEs):** To be finalized as per site requirement. |
| **4.3.1** | **All above T&Ps are to be deployed by contractor as and when required as per instruction of BHEL engineer. If works gets delayed due to non-availability of above T&Ps, BHEL reserves the right to deploy the same and recover the charges thereof from the contractor** as per prevailing market rate/hiring rate/BHEL internal hiring rates + 5% overhead rates. |
| **4.3.2** | **Heavy Equipments (cranes, winch etc.) manufactured less than 15 Yrs. from the current Year shall be only allowed to be used at project Site.** |
| **4.3.3** | **Hydras are not permitted for the scope of work. Contractor shall deploy and use pick & carry crane of TRX or equivalent type only for the above purpose.** |
| **4.3.4** | **Tendum operation towards material handling is also not permitted in the project premises.** |
| **4.3.5** | Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor's account. |
| **4.3.6** | Contractor has to submit the Calibration certificates of all the precision Equipement to BHEL. BHEL may ask for recalibration of the MMEs /precision equipments for ensuring quality of work. Contractor must re-ascertain/ recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration/ deployment. |
| **4.3.7** | All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the NABL accredited agencies that are approved by BHEL or calibration tractability is established upto National Test House/Laboratory. Details of all MMDs mobilised to site necessariliy be entred into BHELs 'Field Calibration Monitoring System' (FCMS). |
| **4.3.8** | Contractor has to arrange slings of all sizes for completing the works covered under these specifications. |
| **4.3.9** | In the event of need of change of type of any of major T&Ps, approval shall be taken from BHEL Engineer in-charge prior to mobilization. The decision of Number of T&P required due to replacing the enlisted T&P as per above table, shall be taken after analysing the production capacity and suitability of both the T&Ps. |

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| **4.3.10** | The contractor shall submit the valid test certificate/calibration certificates for all the T&Ps before put into actual use at site. The certificates shall be renewed time to time as instructed by BHEL Engineer. |
| **4.3.11** | Crane operators deployed by the contractor shall be offered for testing by BHEL before they are allowed to operate the cranes. |
| **4.3.12** | The above list as mentioned in S.No. 4.2 (Other that mentioned in S.No. 4.1 Major T&Ps) is only indicative and these T&Ps may not be required for entire contract period but contractor shall ensure the availability of the T&Ps as per work requirement and T&P Deployment schedule. T&P Deployment schedule shall be finalized at site in consultation with BHEL Engineer based on the work fronts/work requirement. BHEL decision shall be final and binding regarding the T&P deployment schedule. Contractor shall mobilize / maintain the T&P's as per the deployment schedule notified time to time by BHEL Engineer. |
| **4.3.13** | APR (As per Requirement)- Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer. |
| **4.3.14** | Apart from above mentioned T&P, any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL in writing in a reasonable period within two weeks from the written instruction from BHEL. |
| **4.3.15** | If the work related to T & Ps mentioned above is completed then, BHEL can release that T&P during contract period / extended period (if any). However, written permission shall be taken by contractor from BHEL Construction Manager and gate pass formalities shall be followed by the contractor for releasing the T&P. |
| **4.3.16** | In the eventuality of contractor not deploying / abnormal down time of T&P/cranes in his scope during the period specified above, and BHEL arranges for the same [BHEL's own cranes], prevailing BHEL Corporate Crane hire charges (which may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed as part of tender document as File titled "**Annexure F- BHEL T&P Hire Charges"**. (Please note that these charges are as valid up to Aug, 2025 and may get revised further). In case BHEL arrange the T&P/Crane through hiring, actual hiring charges with 5% over head shall be recovered from the contractor's running bills. |
| **4.3.17** | The loading, unloading and transportation of contractors T&Ps shall be in the scope of contractor. All necessary items such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor at his own cost. |
| **4.3.18** | All the T&Ps required for this scope of work, except the Tools & Plants mentioned in **Chapter V of TCC: T&Ps to be provided by BHEL**, are to be arranged by the contractor with in the quoted rates. |
| **4.3.19** | All operators (for crane, winch etc.) deployed by contractor shall have valid licence from applicable authority (which ever applicable). |
| **4.3.20** | The contractor has to furnish a list of Tools and plants including cranes/ tractors/trailers/trucks etc. which he has proposed to deploy for this work. |
| **4.4.1** | T&Ps shown in the above in S.No. 4.2 mentioned list is suggestive requirement. However, mobilization schedule as mutually agreed at site for T&Ps, have to be adhered to. Numbers/time of requirement will be reviewed from time to time at site and contractor will provide required T&Ps/equipment to ensure completion of entire work within schedule/target date of completion without any additional financial implication to BHEL. |

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| **4.4.2** | Contractor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipment. Also, on completion of the respective activity, demobilization of T&Ps in total or in part can be done with the due approval of Engineer-In-Charge. Retaining of the T&Ps during the contract period will be mutually agreed in line with construction requirement. |
| **4.5** | The contractor shall arrange operator, diesel, petrol and other consumables including electrical / water / air connections required for the tools and plants, equipment such as crane, winch, temporary Jhoola, Sky Climber etc. Preventive and routine maintenance of T & P are also to be arranged by the contractor at his cost without any delay. Required number of experienced mechanics and helpers for routine maintenance of the above T&Ps shall be provided by the contractor within his quoted rate. |
| **4.6** | VOID |
| **4.7** | VOID |
| **4.8** | VOID |
| **4.9** | VOID |
| **4.10** | Filling pump, for hydro test shall be arranged by the contractor, if required. For testing LP lines, necessary hydraulic test pumps/ hand pumps are to be arranged by the contractor. |
| **4.11** | Such of those consumables as indicated as consumables provided by BHEL alone will be provided to the contractor by BHEL free of charge for erection activities. Other required consumables like electrodes, all gases, and other materials for this scope of work are to be arranged by the contractor at their cost. |
| **4.12** | Imported electrodes / TIG welding wires released under FU and FU PG will be given by BHEL. All other electrodes / TIG welding wires including stainless steel electrodes and Filler Wires required for shall be arranged by the contractor at his cost. However, BHEL will provide imported electrodes as provided by manufacturing units, in any case if the requirement of the electrodes is more than the supplied quantities, Bidder has to arrange the same at his cost. In case BHEL arranges the electrodes on Bidders behalf, the applicable cost along with 5% overheads towards the purchase of the electrodes shall be recovred from the monthly RAB of the bidder. The bidder shall use the Customer approved quality welding electrodes only. |
| **4.13** | Gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him. |
| **4.14** | **Penalty due to non-availability of T&Ps:**<br>In order to meeting the site requirement and in line with monthly plan and review format (F-14), Contractor has to mobilise their T&Ps and made available at site for required activities.<br>For Major T&Ps, if contractor fails due to, either of the case, mentioned hereunder, BHEL shall be entitled to impose penalty on Contractor till any alternate arrangement is made by 'Contractor' OR 'BHEL (on cost recovery basis)'.<br>Case 1: Contract fails to mobilise the same within the mobilisation period of 30 days from the date of intimation.<br>OR<br>Case 2: After mobilisation of T&P at site, the work is getting hampered due to non-availability of T&P for more than 5 days from the date of such intimation,<br>Penal rate for Major T&Ps is mentioned hereunder:<br>a. 100 MT Crane – Rs. 1000/day |

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

| SL NO | DESCRIPTION & CAPACITY OF T&P | QUANTITY Pkg-A | QUANTITY Pkg-B | REMARKS |
|---|---|---|---|---|
| 1 | Tower Cranes | 1 Nos | 1 Nos | For ESP and FGD erection. Assistance to be provided by Bidder for Erection, dismantling of the Tower Crane. |
| 2 | Crane | As required | As required | Cranes other than mentioned under 4.1 and Tower Crane Supplied by BHEL, which shall be required to complete the package shall be provided by BHEL. The Capacity of such Crane, Quantity and duration of deployment shall be drawn mutually during the review meeting held at site. BHEL decision on deployment of crane other than mentioned in Chapter-IV and Tower Crane shall be final. |
| 3 | Venturimeter | As required | As required | |
| 4 | Huck Bolting Machine | As required | As required | Only machine will be provided by BHEL, the consumables required for the machine shall be arranged by bidder. |

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| 5.2 | All the T&Ps mentioned in clause 5.1 above shall be given to contractor on sharable basis and the allotment is made by BHEL on need basis. Contractor shall plan activities well in advance and inform BHEL Engineer in charge/ Construction Manager the date of actual use. The decision of BHEL Engineer in-charge/CM on this will be final and binding. |
| 5.3 | Contractor shall provide assistance to transport from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores all T&Ps mentioned in Sr no 5.1 for his use. |
| 5.4 | Cranes provided by BHEL are only for erection purpose and shall not be available for material handling or transportation purpose. Contractor shall make their own arrangements for material transportation to erection site. |
| 5.5 | All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections for the BHEL issued T&Ps shall have to be arranged by the contractor at his cost. |
| 5.6 | The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to agency. Necessary grout materials are to be arranged by the contractor at his cost. |
| 5.7 | The day-to-day and routine maintenance including replacement of spares for the BHEL T&Ps will be carried out by the contractor at his own cost. However, BHEL shall supply spare parts free of charges for normal wear and tear only. |
| 5.8 | Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor. |
| 5.9 | T&Ps provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of T&Ps shall be the discretion of BHEL engineer, which shall be binding on the contractor. T&Ps will be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose. Augmentation of BHEL T&P under special circumstances shall be discretion of BHEL. |

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| 5.10 | BHEL may opt for providing suitable capacity crawler/tyre mounted crane in place of Tower crane for execution of work depending upon the feasibility and condition at site. Type of crane mentioned above shall not form any ground for contractor for non-accomplishment of targets when BHEL provides the suitable capacity cranes in place of mentioned cranes under clause 5.1 |
| Note | **For BHEL Owned or hired Crane:** |
| | 1. The cranes may be BHEL owned or may be obtained on hiring basis including operating and maintenance crew. |
| | 2. Operator and O&M for BHEL owned crane will be provided by BHEL (including extended hours), free of charge. |
| | 3. Contractor shall provide the fuel for BHEL provided cranes (Hired/owned) for his use. |
| | 4. Contractor shall make necessary arrangements like laying of special sleeper beds and steel plates (**Plates for BHEL owned/ hired cranes shall be provided by the BHEL**), assembly and dismantling of heavy attachment, boom, jib etc. for movement and operation of the crane. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work. Levelled & reasonably compacted area will be provided by BHEL/customer for the movement of BHEL cranes. If required, Further Consolidation of the ground with hard-crusting of Area required for movement of crane (including civil work with material) for placing crane for operation shall be facilitated by BHEL. Necessary plates required for marching operation shall be provided by the BHEL only for BHEL owned cranes. |

## 6. TIME SCHEDULE & MOBILIZATION

<table>
<tr><td>6.1</td><td>Time Schedule and Mobilization:</td></tr>
<tr><td rowspan="2">6.1.1</td><td>Initial Mobilization and Time Schedule:</td></tr>
<tr><td>After issue of LOA (though Fax/courier/email) the contractor shall report to the Construction Manager/Site In-Charge of BHEL at site within Two weeks (14 days) from date of LOA and make a Kick of meeting (KOM) for mobilization of manpower, T&Ps and date of start of work and detailed completion program etc. Contractor shall submit detailed mobilization plan to start work within 25 days from date of LOA; unless instructed otherwise by BHEL in writing.<br><br>The activities for Erection etc. shall be started as per directions of Construction Manager of BHEL. The contractor has to subsequently augment his resources in such a manner that the project milestones are completed on specified schedules and entire work completed within the entire contract period, as specified in the following clause from the date of start of work, in a manner required by BHEL to match with the project schedule.</td></tr>
<tr><td rowspan="2">6.1.2</td><td>COMMENCEMENT OF CONTRACT PERIOD</td></tr>
<tr><td>Erection/placement on its designated foundation / location, of the first major permanent equipment / component / column covered in the scope of these specifications, (whichever is earlier as decided by BHEL) shall be recognized as “Start of contract period” for each Package.<br><br>Smaller items like packer plates, shims, anchors, inserts etc. will not be considered as start of contract period. The date of Start of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy, the decision of BHEL engineer is final.<br>Based on the availability of civil foundations, drawings and material from BHEL, contractor may have to advance the erection activity after getting clearance from Construction Manager, or the erection activity may get delayed due to site conditions.<br><br>The contractor shall have to mobilize his resources before the start of contract period for preparatory work like taking over of Foundations, drawing & materials and chipping of foundations, blue-matching, grouting of packer plates etc. and start of pre-assembly. The contractor shall complete all the works in the scope of this contract within the contract period. Pending points identified by the customer/BHEL during the execution of the contract are to be liquidated during the contract period itself.</td></tr>
<tr><td rowspan="4">6.2</td><td>Schedule of Completion:</td></tr>
<tr><td>The contract period for completion of entire work under scope shall be as mentioned hereunder, from the “START OF CONTRACT PERIOD” as specified earlier for completion of the entire work in respective Package.</td></tr>
<tr><td colspan="2">
<table>
<tr><th>S.No.</th><th>Package</th><th>Contractual Schedule (Month)</th></tr>
<tr><td>1.</td><td>Unit # 1 ESP and FGD Package of 2X800 MW NTPC Singrauli Project.</td><td>32nd Month</td></tr>
<tr><td>2.</td><td>Unit#2 ESP and FGD Package of 2X800 MW NTPC Singrauli Project.</td><td>32nd Month</td></tr>
</table>
</td></tr>
</table>

6.3 The schedule of important milestones is as follows:

**6.3.1 ESP, FGD and Related Auxiliaries for Unit#1 (Package-A)**

| SL No. | Milestones | Tentative Schedule w.r.t date of start of work |
|---|---|---|
| 1. | Erection Start of ESP and FGD. | 1st Month |
| 2. | Completion of Air Tightness Test of ESP and ducting | 20th Month |
| 3. | Completion of Air Tightness Test/KLT of Ducting of FGD | 22nd Month |
| 4. | Readiness for Boiler Light Up (BLU) | 25th Month |
| 5. | Readiness for Synchronization on coal | 29th Month |
| 6. | Readiness for Full Load Operation | 30th Month |
| 7. | Completion of Trial Run Operations | 31st Month |
| 8. | Completion of Facilities | 32nd Month |

**6.3.1 ESP, FGD and Related Auxiliaries for Unit#2 (Package-B)**

| SL No. | Milestones | Tentative Schedule w.r.t date of start of work |
|---|---|---|
| 1. | Erection Start of ESP and FGD. | 1st Month |
| 2. | Completion of Air Tightness Test of ESP and Ducting | 20th Month |
| 3. | Completion of Air Tightness Test/KLT of Ducting of FGD | 22nd Month |
| 4. | Readiness for Boiler Light Up (BLU) | 25th Month |
| 5. | Readiness for Synchronization on coal | 29th Month |
| 6. | Readiness for Full Load Operation | 30th Month |
| 7. | Completion of Trial Run Operations | 31st Month |
| 8. | Completion of Facilities | 32nd Month |

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| **6.4.1** | The above schedule is only tentative. The above schedule shall be advanced, if there are requirements to advance the project to meet the project requirement. No extra payment whatsoever shall be paid on this account. |
| **6.4.2** | In order to meet the above schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, Contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL Engineer w.r.t. monthly plan and |
| | review format (F-14). |
| **6.5** | **Intermediate milestones:** |
| **6.5.1** | Two Major Intermediate Milestones are identified as M1 and M2 above. |

| | Milestones for Package-A | Tentative Schedule |
|---|---|---|
| **M1** | Completion of Air Tightness Test of ESP. | 20th Month |
| **M2** | Readiness for Full Load Operation of Unit#1 (First Unit) | 30th Month |
| | **Milestones for Package-B** | **Tentative Schedule** |
| **M1** | Completion of Air Tightness Test of ESP. | 20th Month |
| **M2** | Raediness for Full Load Operation of Unit#2 (Second Unit) | 30th Month |
| **6.6** | **Provision of Penalty in case of slippage of Intermediate Milestones:** | |
| | In case of slippage of Two Major Intermediate Milestones, mentioned as M1 & M2 above, delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to F-14. | |
| **6.6.1** | In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld. | |
| **6.6.2** | In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value, will be withheld. | |
| **6.6.3** | Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone. | |
| **6.6.4** | Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (corresponding RA Bill) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills. | |
| **6.6.5** | Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion/ closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be. | |
| **6.6.6** | In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery. | |
| **6.6.7** | Contractor shall make all possible efforts to expedite the activities, in case of delay of any intermediate milestone, to maintain over all project completion schedule. | |
| **6.7** | **COMPLETION OF WORK AND COMMENCEMENT OF GUARANTEE PERIOD** | |
| **6.7.1** | The works shall be completed to the entire satisfaction of the Engineer and in accordance with the completion schedule as specified in the Contract, and all unused stores and materials, tools, plant, equipment, temporary buildings, site office, labor hutments and other things shall be removed and the site and work cleared of rubbish and all waste materials and delivered up clean and tidy to the satisfaction of the Engineer at the Contractor's expenses. | |
| **6.7.2** | BHEL shall have power to take over from the Contractor from time to time such sections of the work as have been completed to the satisfaction of the Engineer. Such work however shall not be treated as have been completed until the remaining / pending works are executed to the satisfaction of Engineer. | |

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| **6.7.3** | The Engineer shall certify to the contractor the date on which the work is completed and the date thereof for commencement of Guarantee Period. Guarantee Period shall be as given in GCC. The work shall be deemed to be completed upon substantial completion of work leaving aside minor pending works/punch point liquidation/defects which are not likely to affect overall performance of the system. The decision of EIC shall be final and binding on the vendor. |
| **6.8** | The contractor shall submit and a detailed area/structure wise L3 schedule within 25 days from date of LOA, in consultation with BHEL, based on the tentative schedule provided as above. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Bidder shall submit L3 schedule in MS Projects and excel to meet the agreed project schedule covering various mile stone activities and their split-up details such as mobilization, procurement of materials & erection activities. This schedule shall also clearly indicate the interface facilities / inputs applicable in each package. Bidders shall submit Resource deployment plan Area wise with detail program in line with above schedule in the form of Bar Chart/ MS project planner |
| **6.9** | The under mentioned Records/ Log-books/ Registers applicable to be maintained. |
| | I. Hindrance Register. |
| | II. Site Order Book. |
| | III. Test Check of measurements. |
| | IV. Records of Test reports of Field tests. |
| | V. Records of manufacture's test certificates. |
| | VI. Records of disposal of scraps generated during and after the work completion. |
| **6.10** | Control and monitoring of progress of work |
| **6.10.1** | Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume - I BCD. Plan and review will be done as per the formats. |
| **6.10.2** | The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme. |
| **6.10.3** | It is the responsibility of the contractor to provide all relevant information on a regular basis regarding progress of work, labour availability, equipment deployment, testing, etc. |
| **6.10.4** | Contractor is required to draw mutually agreed monthly work programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL. |
| **6.10.5** | Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities. |
| **6.10.6** | The contractor shall submit quarterly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site. |
| **6.10.7** | The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes. |

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| **6.10.8** | The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard. No report would be considered as no shortage of materials. |
| **6.10.9** | The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged. |
| **6.11** | The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details :- |
| **a** | Progress photographs in colour. |
| **b** | Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned. |
| **c** | Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan. |
| **d** | Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas cutters, electricians, crane operators and helpers. Data shall be split up under the work areas like, Rotating machines, Electro static precipitator, FGD, Structure, Insulation etc. etc. |
| **e** | Consumables report giving consumption of all types of gases and electrodes during the previous month. |
| **f** | Availability report of cranes. |
| **g** | Safety implementation report in the format. |
| **h** | Pending material and any other inputs required from BHEL for activities planned during the subsequent month. |
| **6.12** | **Site Data Digitalisation:** Daily Activity Log, M-Book and Subcontracting Billing Module: - |
| **a** | |
| **b** | Login ID and Password shall be provided by respective package manager. |
| **c** | Contractor by clicking 'Daily Work Photos', shall upload area wise photos on daily basis. |
| **d** | Contractor by clicking 'Daily Activity Log', shall update site activities on daily basis. |
| **e** | Contractor by clicking 'Measurement Book', shall enter Measurement Book in Format and BOQ. |
| **f** | **Contractor shall raise their RA Bills along with supporting documents (such as Quality and HR Document – Vetted by Customer Etc.) and checklist through SDD portal only.** |
| **g** | Contractor shall comply the system requirement. |
| **h** | Refer Vendor Manual for further details. |
| | **Note:** The contractor shall be required to provide all facilities including manpower for the aforementioned activities, without any cost implications to the BHEL. |
| **6.13** | Agency shall extend all support towards inputs for IPMS system for project monitoring and control. |

## 7. Terms of payment

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

**Payment Terms for each Package:** Payment shall be regulated progressively as mentioned in Table 7.1 & 7.2 below:
**7.1** Progressive Payment against monthly running bills will be made upto 85 % of the value of the erected Pro-rata as per SL no 7.1.1 to 7.1.8 of the following table.

| Sl No. | Sub Packages -------> | ESP | Structures | Non-Pressure Parts | Rotating Machines | Piping (CS, GI, SS) | Insulation (Wool mattress, Iron com, Sheeting) |
|---|---|---|---|---|---|---|---|
| | **Rate schedule Identifier --->** | **1A** | **1B** | **1C** | **1D** | **2A,2B,2C** | **3A, 3B, 3C** |
| | **Pro rata payments (85%)** | | | | | | |
| 7.1.1 | On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position) | 20% | 20% | 20% | 15% | 15% | -- |
| 7.1.2 | Placement in position | 20% | 20% | 20% | 20% | 20% | 50% |
| 7.1.3 | Alignment | 20% | 20% | 15% | 20% | 20% | 15% |
| 7.1.4 | Welding/bolting/fixing/Torque check/tightness check of bolts | 20% | 20% | 20% | 20% | 20% | 15% |
| 7.1.5.1 | Completion of non-destructive examination –as per approved FQP/EWS (if not applicable, then this portion to be paid along with S.No. 7.1.4) | 5% | 5% | 5% | -- | 5% | -- |

| Sl No. | Sub Packages -------> | ESP | Structures | Non-Pressure Parts | Rotating Machines | Piping (CS,GI,SS) | Insulation (Wool mattress, Iron com, Sheeting) |
|---|---|---|---|---|---|---|---|
| | **Rate schedule Identifier --->** | **1A** | **1B** | **1C** | **1D** | **2A,2B,2C** | **3A, 3B, 3C** |
| 7.1.5.2 | Making support viz. safe access / approach, platform, doing necessary griding / buffing, arranging LT power point, proving illumination, providing unskilled man-power, etc. to the satisfaction of BHEL engineer for conducting NDT / Stress relieving/ heat treatment. (if not applicable, then this portion to be paid along with S.No. 7.1.4) | -- | -- | -- | -- | -- | -- |
| 7.1.5.3 | Completion of non-destructive examination – Hardness treatment as per approved FQP / EWS (if not applicable, then this portion to be paid along with S.No. 7.1.4) | -- | -- | -- | -- | -- | -- |
| 7.1.5.4 | Completion of Stress relieving/ heat treatment as per approved FQP / EWS (if not applicable, then this portion to be paid along S.No. 7.1.4) | -- | -- | -- | -- | 2% | -- |

| Sl No. | Sub Packages -------> | ESP | Structures | Non-Pressure Parts | Rotating Machines | Piping (CS, GI, SS) | Insulation (Wool mattress, Iron com, Sheeting) |
|---|---|---|---|---|---|---|---|
| | **Rate schedule Identifier --->** | **1A** | **1B** | **1C** | **1D** | **2A,2B,2C** | **3A, 3B, 3C** |
| 7.1.6 | Completion of al cladding works in individual area of work | -- | -- | -- | -- | -- | 5% |
| 7.1.7 | Hangers & supports etc wherever necessary as per drg | -- | -- | 5% | -- | 3% | -- |
| 7.1.8 | Equipment trial operation | -- | -- | -- | 10% | -- | -- |
| | **TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)** | **85%** | **85%** | **85%** | **85%** | **85%** | **85%** |

**7.2** Further 15 % payment on pro-rata basis common to all PGs of ESP and FGD and auxiliaries be released on achievement of the following stage / milestones events (as per Cl no 7.2.1 to 7.2.12 of the following table) for the tonnage erected.

| Sl No. | Sub Packages -------> | ESP | Structures | Non-Pressure Parts | Rotating Machines | Piping (CS, GI, SS) | Insulation (Wool mattress, Iron com, Sheeting) |
|---|---|---|---|---|---|---|---|
| | **Rate schedule Identifier --->** | **1A** | **1B** | **1C** | **1D** | **2A,2B,2C** | **3A, 3B, 3C** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **II** | **STAGE/MILESTONE PAYMENTS (15%)** | | | | | | |
| 7.2.1 | Completion of air & gas tightness test for Absorber, Ducts and ESP | 6% | 7% | 7% | 7% | -- | 5% |
| 7.2.2 | Hydraulic Test | -- | -- | -- | -- | 5% | -- |
| 7.2.3 | Boiler light up | 2% | -- | -- | -- | -- | -- |
| 7.2.4 | Full load | 2% | -- | -- | -- | -- | 2% |
| 7.2.5 | Trial operation of unit | -- | 3% | 3% | 3% | -- | 2% |
| 7.2.6 | Completion of all drains and vents to respective locations and placement of instrument sensors after steam blowing | -- | -- | -- | -- | 2% | -- |
| 7.2.7 | Painting | 1% | 1% | -- | -- | 2% | -- |
| 7.2.8 | Area cleaning, temporary structures cutting/removal and return of scrap | 1% | 1% | 1% | 1% | 2% | 2% |
| 7.2.9 | Punch List points/pending points liquidation | 1% | 1% | 2% | 2% | 1% | 2% |
| 7.2.10 | Submission of 'As Built Drawings' (If not applicable the same shall be clubbed with 7.2.9) | -- | -- | -- | -- | 1% | -- |
| 7.2.11 | Material Reconciliation | 1% | 1% | 1% | 1% | 1% | 1% |
| 7.2.12 | Completion of Contractual Obligation | 1% | 1% | 1% | 1% | 1% | 1% |
| | **TOTAL FOR STAGE/MILESTONE PAYMENTS (15%)** | **15%** | **15%** | **15%** | **15%** | **15%** | **15%** |
| | **TOTAL I + II** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |

7.3 **VOID**

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| **7.4** | **Progressive Payment/ Final Payment:** The payments for works under the scope of this contract for the package shall be as per clause no 2.6; 2.22; 2.23 of General Conditions of Contract and Volume-IB |
| **7.4.1** | **<u>Documents required for RA Bill:</u>** |
| | GST Complied Invoice of the work done as per approved BBU. |

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| | WAM -6 for RA Bill. |
| | Jointly signed Measurement sheet. |
| | Power of Attorney before submission of Bill. |
| | Validity of Bank Guarantees as applicable under the contract. |
| | Monthly HSE Compliance Certificate certified by BHEL- Safety |
| | Compliance of guidelines for worker's accommodation/establishment of BHEL-project sites |
| | Monthly Material reconciliation statement alongwith RA Bill. |
| | HR/IR compliance documents: |
| | i. Wages payment sheet as per applicable minimum wages. |
| | ii. Proof of PF contribution submission. |
| | iii. Proof of ESI/ WC contribution submission |
| | iv. Proof of Bonus payment as per Bonus Act if applicable. |
| | v. Proof of EL payment if applicable. |
| | vi. Any other statutory document if applicable. |
| **7.4.2** | **Documents required for Final Bill:** |
| | The final bill is drawn as soon as the entire work is completed. From the final amount due, all amounts already claimed up to the previous running account bill will be deducted. It should be ensured that in the final bill the following additional particulars have been provided: |
| | Final Bill in WAM-7 Format. |
| | 'No claim' certificate from the contractor. |
| | Clearance certificates where ever applicable viz. Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department etc. |
| | Final Material re-conciliation statement duly approved by BHEL. |
| | Indemnity Bond as per prescribed format. |
| | Deviation statement showing the difference between the actuals and as per the contract. |
| | Final Delay Analysis. |
| **7.4.3** | The payment for running bills will be released after submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc. and other dues in the meanwhile. No interest shall be payable for the delayed payment (if any). |
| | Few points of consideration are as below: |

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| | **i.** The measurements sheets of work done in a month shall be submitted in triplicate duly agreed/signed by BHEL Engineer. The contractor shall extend all necessary assistance for verification of measurements of works without any extra cost. |
| | **ii.** Material reconciliation shall be complied on monthly basis. |
| | **iii.** The RA bill payments are interim payments and bills shall be submitted in prescribed formats. |
| | **iv.** Recoveries on account of electricity for Office, water, statutory deductions etc. shall be made as per terms of contract. |
| | **v.** BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS. |
| | **vi.** Final bill shall be submitted after completion of works and upon material reconciliation along with all prescribed formats. |
| | Quoted Rates are inclusive of all labour, contractor's equipment, temporary works, consumables and all matters and things of whatsoever nature, charges for Safety Aspects/Compliance to Safety Rules including operations and maintenance services (if applicable) etc., and other services, as identified in the tender Documents, as necessary for the proper execution of the subject work. |
| **7.5** | **SECURED RECOVERABLE ADVANCES:**<br>Interest Free Secured Mobilization Advance as per GCC Clause No. 2.13.1 will be payable under exceptional circumstances on certification of BHEL Construction Manager at Site. Interest Free Mobilization Advance shall be disbursed in specifically mentioned stages of major respective resource mobilization for both packages as specified hereunder:<br>**a) For Package – A**<br>1. For Posting of Site Manager and team consisting of Construction/Erection Engineers, Quality Engineer, Safety Engineer etc. in Site Office – 1.5% of Contract value of Package-A.<br>2. For Mobilization of 1 no. of 100 MT Mobile crane – 2% of Contract value of Package-A.<br>3.For Mobilization of required T & Ps to start the work, skilled manpower like fitters, Riggers, Gas-cutter, Grinders & other skilled manpower - 1.5% of Contract value of Package-A.<br>**b) For Package - B**<br>1. For Posting of Site Manager and team consisting of Construction/Erection Engineers, Quality Engineer, Safety Engineer etc. in Site Office – 1.5% of Contract value of Package-B.<br>2. For Mobilization of 1 no. of 100 MT Mobile crane - 2% of Contract value of Package-B.<br>3. For Mobilization of required T & Ps to start the work, skilled manpower like fitters, Riggers, Gas-cutter, Grinders & other skilled manpower - 1.5% of Contract value of Package-B.<br>Note: |
| | 1. BHEL Site-CM shall be the deciding authority for assessing the admissibility of advance payment to contractor. |
| | 2. In case contractor do not fulfil the agreed conditions of payment of earlier mobilization advance, BHEL Construction Manager will have the authority to not allow the subsiquent mobilization advance to contractor. |

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| **8.0** | **TAXES & DUTIES** |
| **8.1** | The contractor shall pay all (save the specific exclusions as enumerated in this clause) taxes, fees, license, charges, deposits, duties, tools, royalty, commissions, other charges, etc. which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes/duties, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.<br>However, provisions regarding **GST** on output supply (goods/service) and TDS/TCS as per Income Tax Act shall be as per following clauses. |
| **8.2** | **GST (Goods and Services Tax)** |
| **8.2.1** | GST as applicable on output supply (goods/services) are excluded from contractor's scope; therefore, contractor's price/rates shall be **exclusive** of GST. Reimbursement of GST is subject to compliance of following terms and conditions. BHEL shall have the right to deny payment of GST and to recover any loss to BHEL on account of tax, interest, penalty etc. for non-compliance of any of the following condition. |
| **8.2.2** | The admissibility of GST, taxes and duties referred in this chapter or elsewhere in the contract shall be limited to direct transactions between BHEL & its Contractor. BHEL shall not consider GST on any transaction other than the direct transaction between BHEL & its Contractor. |
| **8.2.3** | Contractor shall obtain prior written consent of BHEL before billing the amount towards such taxes. Where the GST laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL shall have the right to adopt the appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor. |
| **8.2.4** | Contractor has to submit GST registration certificate of the concerned state. Contractor also needs to ensure that the submitted GST registration certificate should be in active status during the entire contract period. |
| **8.2.5** | Contractor/Vendor has to issue Invoice/Debit Note/Credit Note indicating HSN/SAC code, Description, Value, Rate, applicable tax and other particulars in compliance with the provisions of relevant GST Act and Rules made thereunder. |
| **8.2.6** | Vendor has to submit GST compliant invoice within the due date of invoice as per GST Law. In case of delay, BHEL reserves the right of denial of GST payment if there occurs any hardship to BHEL in claiming the input thereof. In case of goods, vendor has to provide scan copy of invoice & GR/LR/RR to BHEL before movement of goods starts to enable BHEL to meet its GST related compliances. Special care should be taken in case of month end transactions. |
| **8.2.7** | Vendor has to ensure that invoice in respect of such services which have been provided/completed on or before end of the month should not bear the date later than last working day of the month in which services are performed. |

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| **8.2.8** | Subject to other provisions of the contract, GST amount claimed in the invoice shall be released on fulfilment of all the following conditions by the Contractor: -<br>a. Supply of goods and/or services have been received by BHEL.<br>b. Original Tax Invoice has been submitted to BHEL.<br>c. Contractor/ Vendor has submitted all the documents required for processing of bill as per contract/ purchase order/ work order.<br>d. In cases where e-invoicing provision is applicable, vendor/contractor is required to submit invoice in compliance with e-invoicing provisions of GST Act and Rules made thereunder.<br>e. Contractor has filed all the relevant GST return (e.g. GSTR-1, GSTR-3B, etc.) pertaining to the invoice submitted and submit the proof of such return along with immediate subsequent invoice. In case of final invoice/ bill, contractor has to submit proof of such return within fifteen days from the due date of relevant return.<br>f. Respective invoice has appeared in BHEL's GSTR - 2A for the month corresponding to the month of invoice and in GSTR-2B of the month in which such invoices has been reported by the contractor along with status of ITC availability as "YES" in GSTR-2B. Alternatively, BG of appropriate value may be furnished which shall be valid at least one month beyond the due date of confirmation of relevant payment of GST on GSTN portal or sufficient security is available to adjust the financial impact in case of any default by the contractor.<br>g. Contractor has to submit an undertaking confirming the payment of all due GST in respect of invoices pertaining to BHEL. |
| **8.2.9** | Any financial loss arises to BHEL on account of failure or delay in submission of any document as per contract/purchase order/work order at the time of submission of Tax invoice to BHEL, shall be deducted from contractor's bill or otherwise as deemed fit. |
| **8.2.10** | TDS as applicable under GST law shall be deducted from contractor's bill. |
| **8.2.11** | Contractor shall comply with the provisions of e-way bill wherever applicable. Further wherever provisions of GST Act permit, all the e-way bills, road permits etc. required for transportation of goods needs to be arranged by the contractor. |
| **8.2.12** | Contractor shall be solely responsible for discharging his GST liability according to the provisions of GST Law and BHEL will not entertain any claim of GST/interest/penalty or any other liability on account of failure of contractor in complying the provisions of GST Law or discharging the GST liability in a manner laid down thereunder. |
| **8.2.13** | In case declaration of any invoice is delayed by the vendor in his GST return or any invoice is subsequently amended/altered/deleted on GSTN portal which results in any adverse financial implication on BHEL, the financial impact thereof including interest/penalty shall be recovered from the Contactor's due payment. |

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| **8.2.14** | Any denial of input credit to BHEL or arising of any tax liability on BHEL due to non-compliance of GST Law by the Contractor in any manner, will be recovered along with liability on account of interest and penalty (if any) from the payments due to the Contactor. |
| **8.2.15** | In the event of any ambiguity in GST law with respect to availability of input credit of GST charged on the invoice raised by the contractor or with respect to any other matter having impact on BHEL, BHEL's decision shall be final and binding on the contractor. |
| **8.2.16** | **Variation in Taxes & Duties:**<br>Any upward variation in GST shall be considered for reimbursement provided supply of goods and services are made within schedule date stipulated in the contract or approved extended schedule for the reason solely attributable to BHEL. However downward variation shall be subject to adjustment as per actual GST applicability.<br>In case the Government imposes any new levy/tax on the output service/goods after price bid opening, the same shall be reimbursed by BHEL at actual. The reimbursement under this clause is restricted to the direct transaction between BHEL and its contactor only and within the contractual delivery period only.<br>In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer but before opening of the price Bid, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of price bid. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer. |
| **8.3** | **Income Tax:**<br>**TDS/TCS** as applicable under Income Tax Act, 1961 or rules made thereunder shall be deducted/collected from contractor's bill. |

**8.4 BOCW Act & Cess Act**

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

| **Annexure-I:** | |
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| Bidder may please note that the sub-contractor/bidder of BHEL engaging building or construction worker in connection with building or other construction work, are required to follow the procedures enumerated below: | |
| 1. | It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. |
| 2. | It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other |

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| | Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities. |
| 3. | It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work. |
| 4. | It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may, by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager. |
| 5. | It shall be sole responsibility of the contractor as employer to get registered every Building Worker, who is between the age of 18 to 60 years of age and who has been engaged in any building or other construction work for not less than ninety days during the preceding twelve months as Beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996. |
| 6. | It shall be sole responsibility of the contractor as employer to maintain all the registers, records, notices and submit returns under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. |
| 7. | It shall be sole responsibility of the contractor as employer to provide notice of poisoning or occupation notifiable diseases, to report of accident and dangerous occurrences to the concerned authorities under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the rules made thereunder and to make payment of all statutory payments & compensation under the Employees' Compensation Act, 1923. |
| 8. | It shall be the responsibility of the sub-contractor as employer to make payment/deposit of applicable cess amount on the extent of work involving building or construction workers engaged by the sub-contractor within a period of one month from the receipt of payment. It shall also be responsibility of the Contractor to furnish BHEL on monthly basis, Receipts/ Challans towards Deposit of the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder along with following statistics:<br>i) Number of Building Workers employed during preceding one month.<br>ii) Number of Building workers registered as Beneficiary during preceding one month.<br>iii) Disbursement of Wages made to the Building Workers for preceding wage month.<br>iv) Remittance of Contribution of Beneficiaries made during the preceding month |

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| 9. | **BHEL shall reimburse the contractor the Cess amount deposited for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.** However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted. |
| 10. | It shall be responsibility of the Building Worker engaged by the Contractor and registered as a beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board, within the fifteen days from such deduction. |
| 11. | **Bidders may please note that though the quoted price is exclusive of BOCW (which will be reimbursed by BHEL as per sub-clause 9 above) , however, If at any point of time during the contract period, non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder is observed, BHEL reserves the right to deduct the applicable cess (1%) on the contract value and penalty ( if any, imposed by Cess Authorities) from the payables on account of non-compliance.** |
| 12. | The contractor shall declare to undertake any liability or claim arising out of employment of building workers and shall indemnify BHEL from all consequences / liabilities / penalties in case of non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. |

**BILL OF QUANTITY/WEIGHT SHCEDULE**

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

| Sr. No | Rate Schedule | Description | Package-A (Unit#1) Weight (MT) | Package-B (Unit#2) Weight (MT) |
|---|---|---|---|---|
| 1.1 | 1A | ESP | 12,928 | 12,928 |
| 1.2 | 1B | Structure (Absorber Structure, Duct Structure Etc.) | 3,944 | 3,557.5 |
| 1.3 | 1C | Non-Pressure Parts (Ducting, Gates and Dampers) | 1,627 | 1664 |
| 1.4 | 1D | Rotating Machines | 866 | 197 |
| 2.1 | 2A | Piping-CS | 366 | 222 |
| 2.2 | 2B | Piping-GI | 4 | 7 |
| 2.3 | 2C | Piping-SS | 2 | 1.5 |
| 3.1 | 3A | Insulation-Wool Mattress | 537 | 537 |
| 3.2 | 3B | Insulation-Iron Component | 144 | 144 |
| 3.3 | 3C | Insulation-Sheeting | 130 | 130 |
| | | **TOTAL** | **20,547** | **19,387** |

| **Note to weight schedule:** | |
|---|---|
| 1 | The weights/Quantities/dimentions mentioned above are approximate and liable to vary as per design consideration. There will be change in weight, description etc. However, payments will be made for the tonnage actually erected at the quoted rate. Quantity Variation will be dealt as per clause 2.14 of General Conditions of Contract (Volume I BCD). |
| 2 | A material breakup under category Structure, NPP, Piping-CS, SS, GI etc, Insulation etc. are indicated in the relevant chapter of this tender specification, but the contractor is required to erect actual tonnage which may be necessary to complete the work in all respects as detailed in the tender specifications, for which payments shall be released based on agreed rates. The weights and dimensions of material shown are approximate and are liable to vary. |
| 3 | Besides PG / PGMA indicated in the weight schedule, there is likely hood of addition product groups integral to ESP, FGD or Boiler etc. and its aux. The quoted rate shall be applicable for such product groups also. There may be variation or addition of PGMAs, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted / accepted rate in the respective category at the discretion of BHEL. Decision of BHEL Engineer shall be final and binding to the contractor in this regard. |
| 4 | Rate Schedule Identified are based on envisaged material specification. Payment shall be made on the basis of material specification of actual material received and erected at site irrespective of PGMA allocation in the weight schedule. BHEL's decision in this regard shall be final. |
| 5 | VOID |
| 6 | The Erection of HT/LT MOTORS are covered in this scope of contract (payable under Rotating machines (RM)). However, dry out, testing and commissioning is not in the scope of this contract. |
| 7 | Payment for additional CONTROL VALVES / STEAM TRAPS/ FLOW NOZZLES / ORIFICES & OTHER VALVES AND FITTINGS will be made as per the quoted / accepted tonnage rate of respective piping category in which these material is installed. i.e. Ducts, LP Piping & SS piping. |

**9.1 Detailed (PGMA wise) weight of BOQ for ESP, FGD-Absorber, Limestone handling System, Gypsum Dewatering System, Ducts, Structure, Piping in ESP and FGD area, Gates & dampers, Rot. M/c, Insulation: -**

## Package-A (Unit # 1)

| Area | PGMA | PGMA_DESC_SHORT | Estimate_WT in MT | BHEL Unit | Items | Rate Schedule |
|---|---|---|---|---|---|---|
| ESP | 79181 | SUPPOTING STRUCTURES FOR ESP | 1200.0 | Ranipet | ESP | 1A |
| ESP | 89618 | HSFG BOLTS FOR ESP STRUT | 24.0 | Ranipet | ESP | 1A |
| ESP | 79101 | ROLL/SLIDE SUPPORTS | 41.0 | Ranipet | ESP | 1A |
| ESP | 79143 | HOPPER RIDGES | 153.0 | Ranipet | ESP | 1A |
| ESP | 79148 | CASING STRUCTURE | 880.0 | Ranipet | ESP | 1A |
| ESP | 79149 | CASING SHELL/PANEL | 1000.0 | Ranipet | ESP | 1A |
| ESP | 79128 | ESP ROOF BEAM | 410.0 | Ranipet | ESP | 1A |
| ESP | 89610 | EP GALLERIESSTAIRS | 175.0 | Ranipet | ESP | 1A |
| ESP | 89612 | FLOOR GRILL AND STEP TREAD | 142.0 | Ranipet | ESP | 1A |
| ESP | 79111 | GAS SCREEN-EP | 9.0 | Ranipet | ESP | 1A |
| ESP | 79113 | EMIT SYST SUSPENSION | 33.0 | Ranipet | ESP | 1A |
| ESP | 79114 | SUPPORT INSULATORS | 33.0 | Ranipet | ESP | 1A |
| ESP | 79119 | COL ELEC SUSPENSION | 212.0 | Ranipet | ESP | 1A |
| ESP | 79120 | COLLECTING ELECTRODE | 2270.0 | Ranipet | ESP | 1A |
| ESP | 79121 | EMIT SYS FRAME-TOP | 200.0 | Ranipet | ESP | 1A |
| ESP | 79124 | SHOCK BARS | 164.0 | Ranipet | ESP | 1A |
| ESP | 79146 | INSULATOR SUPP PANEL | 180.0 | Ranipet | ESP | 1A |
| ESP | 79155 | PENT HOUSE FOR E P | 290.0 | Ranipet | ESP | 1A |
| ESP | 89614 | PENT HOUSE ROOFING SHEETS | 67.0 | Ranipet | ESP | 1A |
| ESP | 79122 | EMIT SYS FRAME BOTOM | 250.0 | Ranipet | ESP | 1A |
| ESP | 79132 | EMIT SYS FRAME-MIDLE | 350.0 | Ranipet | ESP | 1A |
| ESP | 79142 | OUTER ROOF-EP | 415.0 | Ranipet | ESP | 1A |
| ESP | 79144 | HOPPER UPPER PART | 1400.0 | Ranipet | ESP | 1A |
| ESP | 79145 | HOP MLDLOWER PART | 575.0 | Ranipet | ESP | 1A |
| ESP | 79147 | ROOF PANEL ASSY | 255.0 | Ranipet | ESP | 1A |
| ESP | 79150 | INLET-OUTLET FUNNEL | 240.0 | Ranipet | ESP | 1A |
| ESP | 79157 | SPLITTERGUIDE VANES | 42.0 | Ranipet | ESP | 1A |
| ESP | 79189 | GUIDE PLATE/VANE EP INLET DUCT | 19.0 | Ranipet | ESP | 1A |
| ESP | 79108 | GAS DIST. ASSY | 108.0 | Ranipet | ESP | 1A |
| ESP | 79125 | COLL ELECT RAPP MECH | 129.0 | Ranipet | ESP | 1A |
| ESP | 79106 | INSULATOR HOUSING AS | 95.0 | Ranipet | ESP | 1A |
| ESP | 79116 | EMIT ELECT RAPP MECH | 64.0 | Ranipet | ESP | 1A |
| ESP | 79117 | DRIVE ARGT. FOR EMIT. SYS | 62.0 | Ranipet | ESP | 1A |

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|---|---|---|---|---|---|---|
| ESP | 79141 | ELECTRICAL MISCELLANEOUS ITEMS | 33.0 | Ranipet | ESP | 1A |
| ESP | 79165 | APP PLATFORM-HOPPER | 220.0 | Ranipet | ESP | 1A |
| ESP | 89611 | ESP ROOF HANDRAILS | 21.0 | Ranipet | ESP | 1A |
| ESP | 89613 | FLOOR GRILL AND MOBILE LADDER | 142.0 | Ranipet | ESP | 1A |
| ESP | 79105 | ESP-SUB-DELIVERY COMPONENTS | 1.2 | Ranipet | ESP | 1A |
| ESP | 79109 | GD-RAPPING MECHANISM | 19.0 | Ranipet | ESP | 1A |
| ESP | 79110 | GD_DRIVE ARRANGEMENT | 2.0 | Ranipet | ESP | 1A |
| ESP | 79115 | EMITTING ELECTRODES | 46.3 | Ranipet | ESP | 1A |
| ESP | 79123 | INSPECTION DOORS | 24.0 | Ranipet | ESP | 1A |
| ESP | 79126 | COLL ELEC RAPP DRIVE | 14.0 | Ranipet | ESP | 1A |
| ESP | 79131 | GEARED MOTORS FOR RAPPING MECH | 37.0 | Ranipet | ESP | 1A |
| ESP | 79161 | EP PERF TEST EQUIPT | 26.0 | Ranipet | ESP | 1A |
| ESP | 79163 | ASH LEVEL INDICATOR | 6.1 | Ranipet | ESP | 1A |
| ESP | 79164 | MISCELLANEOUS ITEMS | 5.0 | Ranipet | ESP | 1A |
| ESP | 79172 | INTERLOCKS-EP | 3.1 | Ranipet | ESP | 1A |
| ESP | 79173 | ELECTRICALLY OPERTD HOISTACCE | 9.0 | Ranipet | ESP | 1A |
| ESP | 79190 | HEATING ELEMENTS | 2.0 | Ranipet | ESP | 1A |
| ESP | 79160 | CABLE-CABLE RACKS | 490.0 | Ranipet | ESP | 1A |
| ESP | 79166 | WATER WASHING SYSTEM | 10.0 | Ranipet | ESP | 1A |
| ESP | 79191 | PANEL TYPE HOPPER HEATERS AC | 30.0 | Ranipet | ESP | 1A |
| ESP | | HV Rectifier (HVR) with EC panels | 300 | Jhansi | ESP | 1A |
| | | | **12,927.7** | | | |
| | | | | | | |
| ESP | 89615 | INSULATION CLADDING SH FOR ESP | 115.0 | Ranipet | Insul-sheet | 3C |
| FGD | FU269 | CLADDING SHEET FOR DUCT | 15.0 | Ranipet | Insul-sheet | 3C |
| | | | **130.0** | | | |
| | | | | | | |
| ESP | 79168 | FIXING COMP. FOR ESP INSULATIN | 129.0 | Ranipet | Insul-Iron Comp | 3B |
| FGD | FU268 | FIXING COMP FOR DUCT | 15.0 | Ranipet | Insul-Iron Comp | 3B |
| | | | **144.0** | | | |
| | | | | | | |
| ESP | 79167 | MIN WOOL FOR ESP INSULATION | 507.0 | Ranipet | Insul-Wool | 3A |
| FGD | FU267 | INSULATION MATERIALS FOR DUCT | 30.0 | Ranipet | Insul-Wool | 3A |
| | | | **537.0** | | | |
| | | | | | | |
| FGD | FU251 | EXPNSN JNT METALLIC | 12.0 | Ranipet | NPP | 1C |
| FGD | FU255 | DUCT BYP BUF/GGH/ABS | 172.0 | Ranipet | NPP | 1C |
| FGD | FU375 | DUCT- EREC BOLTSNUTS | 2.0 | Ranipet | NPP | 1C |

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|---|---|---|---|---|---|---|
| FGD | FW201 | ABSORB. RC PUMP NOZZLE | 6.0 | Ranipet | NPP | 1C |
| FGD | FU257 | DUCT ABS BYP/STACK | 60.0 | Ranipet | NPP | 1C |
| FGD | FU315 | CONDENSATE COLLECTION SYSTEM | 2.0 | Ranipet | NPP | 1C |
| FGD | FU325 | SAMPLING NOZZLES FOR DUCT | 1.0 | Ranipet | NPP | 1C |
| FGD | FW202 | ABS NOZL NB 300 ABOVE | 0.6 | Ranipet | NPP | 1C |
| FGD | FW331 | LEAK DETECTION PIPES | 0.5 | Ranipet | NPP | 1C |
| FGD | FU252 | EXPNSN JNT NON METALLIC | 5.0 | Ranipet | NPP | 1C |
| FGD | FW227 | EMERGENCY QUENCH SYSTEM | 3.0 | Ranipet | NPP | 1C |
| FGD | FW229 | W/D WASH SYSTEM | 1.0 | Ranipet | NPP | 1C |
| FGD | FW725 | NOZZLES FLANGES | 1.0 | Ranipet | NPP | 1C |
| FGD | FB241 | ABSORBER AGITATOR | 11.0 | Ranipet | NPP | 1C |
| FGD | FP467 | RUBBER GASKET SHEET | 1.0 | Ranipet | NPP | 1C |
| G&D | 57C83 | DMPR-FGD BYPASS | 42.7 | Ranipet | NPP | 1C |
| G&D | 57209 | MOUNTING BRACKET | 5.0 | Ranipet | NPP | 1C |
| G&D | 57C70 | GATE-FGD OUTLET | 50.6 | Ranipet | NPP | 1C |
| G&D | 57F09 | MOUNTING BRACKET-FGD | 1.0 | Ranipet | NPP | 1C |
| G&D | 57F41 | SEAL AIR PIPING-FGD | 13.8 | Ranipet | NPP | 1C |
| G&D | 57F77 | ELECTRIC ACTUATR-FGD | 5.2 | Ranipet | NPP | 1C |
| G&D | 57F78 | ELECTRIC ITEM-FGD GD | 7.3 | Ranipet | NPP | 1C |
| G&D | 57F91 | BLOWER WITH MOTR-FGD | 6.2 | Ranipet | NPP | 1C |
| G&D | 57F97 | KGV CHECK VALV-FGD | 4.6 | Ranipet | NPP | 1C |
| G&D | 57N60 | GATE-FGD INLET | 65.5 | Ranipet | NPP | 1C |
| G&D | 57141 | SEAL AIR PIPING | 7.0 | Ranipet | NPP | 1C |
| G&D | 57497 | KGV CHECK VALVE | 2.5 | Ranipet | NPP | 1C |
| G&D | 57470 | GATE-ESP OUTLET | 79.8 | Ranipet | NPP | 1C |
| G&D | 57480 | GATE-ID FAN INLET | 74.5 | Ranipet | NPP | 1C |
| G&D | 57490 | GATE-ID FAN OUTLET | 74.5 | Ranipet | NPP | 1C |
| Ducting | 48496 | SQ DUCT,ID FAN-CHIMNEY,RIGHT | 180.4 | Trichy | NPP | 1C |
| Ducting | 48482 | DUCT - ESP TO ID FAN | 465.2 | Trichy | NPP | 1C |
| Ducting | 48484 | EXPNJT - ESP TO ID FAN | 29.6 | Trichy | NPP | 1C |
| Ducting | 48912 | Slide Brg Pl-Id Sys | 1.3 | Trichy | NPP | 1C |
| Ducting | 48492 | DUCT - IDFAN-CHIMNY | 193.3 | Trichy | NPP | 1C |
| Ducting | 48498 | DUCT - ,ID FAN-CHIM, | 6.4 | Trichy | NPP | 1C |
| Ducting | 48494 | EXPNJT - IDFAN-CHIMNY | 18.0 | Trichy | NPP | 1C |
| FGD | FU200 | INSTRUMENT TAPPING FOR DUCT | 1.0 | Ranipet | NPP | 1C |
| FGD | FU206 | MAN HOLE DOOR FOR DUCT | 3.0 | Ranipet | NPP | 1C |
| FGD | FU329 | ALLOY LINING-DUCT | 0.5 | Ranipet | NPP | 1C |
| FGD | | Lime Dosing System | 10.1 | PEM | NPP | 1C |
| | | | **1,627.3** | | | |
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| FGD | FP411 | RC PUMP INLE VALVE | 25.0 | Ranipet | Piping-CS | 2A |

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|---|---|---|---|---|---|---|
| FGD | FP412 | RC PUMP OUTLET VALVE | 25.0 | Ranipet | Piping-CS | 2A |
| FGD | FP816 | MANL BTRFLY VALV - UTLTY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP817 | MOTOR BTRFL VALV-UTLTY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP818 | PNEM BTRFLY VALV-UTLTY | 3.5 | Ranipet | Piping-CS | 2A |
| FGD | FP819 | MAN BTRFLY VALV-LS SLRY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP820 | MOTOR BTRFLY VALV-LS SLRY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP821 | PNEUM BTRFLY VALV-LS SLRY | 3.5 | Ranipet | Piping-CS | 2A |
| FGD | FP822 | MAN BTRFLY VALV-GYP SLRY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP823 | MOTOR BTRFLY VALV -GYP SLRY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP824 | PNEUM BTRFLY VALV-GYP SLRY | 3.5 | Ranipet | Piping-CS | 2A |
| FGD | FP828 | MAN GATE VALV-UTLTY | 18.0 | Ranipet | Piping-CS | 2A |
| FGD | FP829 | MOTOR GATE VALV-UTLTY | 5.0 | Ranipet | Piping-CS | 2A |
| FGD | FP830 | PNEUM GATE VALVE-UTLTY | 7.0 | Ranipet | Piping-CS | 2A |
| FGD | FP834 | MAIN GLOBE VALV-UTLTY | 25.0 | Ranipet | Piping-CS | 2A |
| FGD | FP840 | CERAMIV VALVES | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP841 | CONTROL VALVES | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP842 | MAN PINCH VALV-GYP SLRY | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP845 | BALL VALVES- WATER | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP848 | CHECK VALVES- WATER | 0.5 | Ranipet | Piping-CS | 2A |
| FGD | FP851 | DIAPHRAGM VALV-SLURRY | 2.0 | Ranipet | Piping-CS | 2A |
| FGD | FP460 | FRP PIPING (LSGS) | 45.0 | Ranipet | Piping-CS | 2A |
| FGD | FP462 | CSRL PIPE-2 (GSLS) | 100.0 | Ranipet | Piping-CS | 2A |
| FGD | FP463 | CS PIPING (PWCWSW) | 60.0 | Ranipet | Piping-CS | 2A |
| FGD | FP466 | FASTENERS CS SS | 20.0 | Ranipet | Piping-CS | 2A |
| FGD | FP470 | PIPING ACC. | 2.0 | Ranipet | Piping-CS | 2A |
| FGD | FP475 | FRP PIPING (LOT-2) | 5.0 | Ranipet | Piping-CS | 2A |
| FGD | FP477 | CS PIPING (LOT-2) | 10.0 | Ranipet | Piping-CS | 2A |
| FGD | FP480 | PIPING ACC (LOT-2) | 1.0 | Ranipet | Piping-CS | 2A |
| | | | **366.0** | | | |
| | | | | | | |
| FGD | FP465 | GI PIPING (IA DW) | 1.5 | Ranipet | Piping-GI | 2B |
| FGD | FP479 | GI PIPING (LOT-2) | 2.0 | Ranipet | Piping-GI | 2B |
| | | | **3.5** | | | |
| | | | | | | |
| FGD | FP464 | SS PIPING (W/D) | 1.5 | Ranipet | Piping-SS | 2C |
| | | | **1.5** | | | |
| | | | | | | |
| FGD | Common | MILL SHELL COMPLETE | 73.3 | Hyd | RM | 1D |
| FGD | Common | BEARING HOUSING (FLOATING SIDE) | 6.4 | Hyd | RM | 1D |
| FGD | Common | BEARING HOUSING (FIXED SIDE) | 6.8 | Hyd | RM | 1D |

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|---|---|---|---|---|---|---|
| FGD | Common | GIRTH GEAR | 23.6 | Hyd | RM | 1D |
| FGD | Common | GIRTH GEAR GUARD | 3.3 | Hyd | RM | 1D |
| FGD | Common | MATERIAL INLET COMPLETE | 6.7 | Hyd | RM | 1D |
| FGD | Common | MATERIAL OUTLET COMPLETE | 12.5 | Hyd | RM | 1D |
| FGD | Common | MILL SHELL LINING | 30.6 | Hyd | RM | 1D |
| FGD | Common | SLIDE SHOE BEARINGS | 9.8 | Hyd | RM | 1D |
| FGD | Common | DRIVE PINIION & PINION SHAFT | 6.0 | Hyd | RM | 1D |
| FGD | Common | PINION SHAFT BEARING | 2.8 | Hyd | RM | 1D |
| FGD | Common | DRIVE UNIT MAIN GEAR BOX | 12.5 | Hyd | RM | 1D |
| FGD | Common | DRIVE UNIT MAIN MOTOR | 20.0 | Hyd | RM | 1D |
| FGD | Common | DRIVE UNIT AUX.GEAR BOX | 3.0 | Hyd | RM | 1D |
| FGD | Common | DRIVE UNIT AUX. MOTOR | 0.6 | Hyd | RM | 1D |
| FGD | Common | DRIVE UNIT TORSION SHAFT | 1.2 | Hyd | RM | 1D |
| FGD | Common | DRIVE UNIT FORCE LUB. SYSTEM FOR MAIN GEAR BOX | 1.3 | Hyd | RM | 1D |
| FGD | Common | LUBRICATION SYSTEM FOR GIRTH GEAR | 2.4 | Hyd | RM | 1D |
| FGD | Common | DIS.CHUTE BETWEEN MILL & CIRCUIT TANK | 0.3 | Hyd | RM | 1D |
| FGD | Common | GRINDING MEDIA FILLING DEVICE | 1.4 | Hyd | RM | 1D |
| FGD | Common | LUBRICATION SYSTEM FOR SLIDE SHOE BRG. | 4.4 | Hyd | RM | 1D |
| FGD | Common | BASE FRAME FOR PINION | 1.5 | Hyd | RM | 1D |
| FGD | Common | ANCHORAGE FOR PINION BASE FRAME | 3.6 | Hyd | RM | 1D |
| FGD | Common | TRAMP IRON CHUTE | 0.5 | Hyd | RM | 1D |
| FGD | Common | BALL CHARGE | 138.0 | Hyd | RM | 1D |
| FGD | Common | CIRCUIT PUMP | 8.0 | Hyd | RM | 1D |
| FGD | Common | MILL FEEDER ASSY | 20.0 | Hyd | RM | 1D |
| FGD | Common | CIRCUIT TANK | 10.0 | Hyd | RM | 1D |
| FGD | Common | PIPING AND SUPPORTS | 60.0 | Hyd | RM | 1D |
| FGD | Common | HYDROCYCLONE | 10.0 | Hyd | RM | 1D |
| FGD | Common | DISTRIBUTION BOX | 4.0 | Hyd | RM | 1D |
| FGD | | RC pumps (05 nos.) | 60.0 | Hyd | RM | 1D |
| FGD | | Oxidation Blower (02 nos.) | 20.5 | Hyd | RM | 1D |
| G&D | 57491 | BLOWER WITH MOTOR | 3.5 | Ranipet | RM | 1D |
| G&D | 57577 | ELECT ACTUATOR FOR GATEDAMPER | 17.9 | Ranipet | RM | 1D |
| G&D | 57578 | ELECTRICAL ITEMS FOR GATEDAMP | 0.1 | Ranipet | RM | 1D |
| HT Motor | | RC Pump HT Motor (05 nos) | 75.0 | Bhopal | RM | 1D |

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|---|---|---|---|---|---|---|
| HT Motor | | Oxidation Blower HT Motor (02 nos) | 20.0 | Bhopal | RM | 1D |
| HT Motor | Common | Wet Ball Mill HT Motor (02 nos) | 20.0 | Bhopal | RM | 1D |
| FGD | FP701 | SLURRY PUMPS ACCESSORIES | 15.0 | Ranipet | RM | 1D |
| FGD | FP702 | WATER PUMPS ACCESSORIES | 8.0 | Ranipet | RM | 1D |
| GDWE | Common | Secondary Hydrocyclone & Accessories | 4.0 | PEM | RM | 1D |
| GDWE | Common | Vacuum Belt Filter & Accessories | 100.0 | PEM | RM | 1D |
| GDWE | Common | Vacuum Receiver | 3.0 | PEM | RM | 1D |
| GDWE | Common | Primary Hydrocyclone & Accessories | 3.6 | PEM | RM | 1D |
| GDWE | Common | Motor of Vacuum Pump | 7.0 | PEM | RM | 1D |
| GDWE | Common | Cake Wash Pump with Motor | 1.0 | PEM | RM | 1D |
| GDWE | Common | Belt/Cloth Wash Pump with Motor | 1.2 | PEM | RM | 1D |
| GDWE | Common | Vacuum Pump | 14.0 | PEM | RM | 1D |
| | Common | FGD Make up Pump | 4.5 | PEM | RM | 1D |
| | Common | FGD Gypsum Wash Pump | 3.0 | PEM | RM | 1D |
| | | | **865.8** | | | |
| | | | | | | |
| G&D | 57466 | PLATFORMS AND LADDERS | 70.0 | Ranipet | Structure | 1B |
| FGD | FU298 | PLATFORM FOR GD | 15.0 | Ranipet | Structure | 1B |
| FGD | FW219 | ABSORBER SYSTEM-BASE | 27.0 | Ranipet | Structure | 1B |
| FGD | FW309 | MONORAIL BEAM ABSORBER AREA | 59.0 | Ranipet | Structure | 1B |
| FGD | FW317 | NOZZLES MANHOLE DOORS EQWT | 5.0 | Ranipet | Structure | 1B |
| FGD | FW318 | ROOF SHEETING | 26.0 | Ranipet | Structure | 1B |
| FGD | FB214 | ABS BAFFLE GRATING | 1.0 | Ranipet | Structure | 1B |
| FGD | FB323 | ABSORBER JAS | 2.0 | Ranipet | Structure | 1B |
| FGD | FU232 | DUCT SUP BYP BUF/GGH | 40.0 | Ranipet | Structure | 1B |
| FGD | FU297 | PLATFORM FOR DUCT | 15.0 | Ranipet | Structure | 1B |
| FGD | FU312 | PLATFORM FOR-DUCT INSTRSAMPLG | 15.0 | Ranipet | Structure | 1B |
| FGD | FW203 | NOZZLE NB25 TO NB250 | 1.0 | Ranipet | Structure | 1B |
| FGD | FW209 | MAN HOLE DOOR FOR ABSORBER | 5.0 | Ranipet | Structure | 1B |
| FGD | FW216 | ABS BAFFLE GRATING SUPP | 20.0 | Ranipet | Structure | 1B |
| FGD | FW218 | ABS SPRAY PIPE SUPP | 38.0 | Ranipet | Structure | 1B |
| FGD | FW221 | ABSORBER SYSTEM-CASING BOTTOM | 99.0 | Ranipet | Structure | 1B |
| FGD | FW224 | ABSORBER SYSTEM-LINING-C276 | 20.0 | Ranipet | Structure | 1B |
| FGD | FW226 | EMERGENCY QUENCH WATER TANK | 20.0 | Ranipet | Structure | 1B |
| FGD | FW236 | STRUCTURES FOR RC PUMP HOUSE | 104.0 | Ranipet | Structure | 1B |

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|---|---|---|---|---|---|---|
| FGD | FW285 | SUPRTING STR FOR EMERGENCY QWT | 10.0 | Ranipet | Structure | 1B |
| FGD | FW322 | ABSORBER SYSTEM-CASING INTERM | 83.0 | Ranipet | Structure | 1B |
| FGD | FW371 | HSFG BOLT-RC SHED | 2.0 | Ranipet | Structure | 1B |
| FGD | FB708 | SUMP-DRAIN SCREENS | 0.2 | Ranipet | Structure | 1B |
| FGD | FU324 | HOOD OVER ABSORBER | 98.0 | Ranipet | Structure | 1B |
| FGD | FU330 | C276-Ti CLAD PLATE | 0.5 | Ranipet | Structure | 1B |
| FGD | FW208 | RC PUMP OB SUPPORT | 13.0 | Ranipet | Structure | 1B |
| FGD | FB239 | VIEWING PORTS | 0.2 | Ranipet | Structure | 1B |
| FGD | FU228 | ABSORBER-W/D INTERFACE | 40.0 | Ranipet | Structure | 1B |
| FGD | FU234 | DUCT SUP ABS STACK/BYP | 12.0 | Ranipet | Structure | 1B |
| FGD | FU260 | DUCT STR BYP BUR/GGH/ABS | 90.0 | Ranipet | Structure | 1B |
| FGD | FU262 | DUCT STR ABS BYP/STACK | 69.0 | Ranipet | Structure | 1B |
| FGD | FU328 | W/D INTERFACE (CARBON STEEL) | 48.0 | Ranipet | Structure | 1B |
| FGD | FU373 | HSFG BOLT-DUCT STRU | 2.0 | Ranipet | Structure | 1B |
| FGD | FU399 | DUCT EREC MATERIALS | 3.0 | Ranipet | Structure | 1B |
| FGD | FU612 | GALLARIES AND RAILINGS FOR DAM | 15.0 | Ranipet | Structure | 1B |
| FGD | FU613 | GALLARIES AND RAILINGS FOR DUC | 10.0 | Ranipet | Structure | 1B |
| FGD | FU615 | GALLERIES AND RAILINGS-INSSAM | 10.0 | Ranipet | Structure | 1B |
| FGD | FW217 | ABS ME SUPPORT | 62.0 | Ranipet | Structure | 1B |
| FGD | FW222 | ABSORBER SYSTEM-CASING TOP | 100.0 | Ranipet | Structure | 1B |
| FGD | FW231 | ABSORBER SHEAR PLATE | 7.0 | Ranipet | Structure | 1B |
| FGD | FW300 | ABSORBER COLUMNS | 71.0 | Ranipet | Structure | 1B |
| FGD | FW301 | ABSORBER BEAMS AND BRACINGS | 156.0 | Ranipet | Structure | 1B |
| FGD | FW302 | ABSORBER LOWER FLOORS | 16.0 | Ranipet | Structure | 1B |
| FGD | FW303 | ABSORBER UPPER FLOORS | 11.0 | Ranipet | Structure | 1B |
| FGD | FW304 | ABSORBER FLOOR GRILLS | 49.0 | Ranipet | Structure | 1B |
| FGD | FW305 | ABSORBER STAIRS HANDRAILS | 29.0 | Ranipet | Structure | 1B |
| FGD | FW306 | ABSORBER HSFG FASTNERS | 12.0 | Ranipet | Structure | 1B |
| FGD | FW307 | ABSORBER MISCELLANEOUS | 3.0 | Ranipet | Structure | 1B |
| FGD | FW372 | HSFG BOLT-ELEV STRUC | 2.0 | Ranipet | Structure | 1B |
| FGD | FW380 | ELEVATOR COLUMN | 57.0 | Ranipet | Structure | 1B |
| FGD | FW381 | ELEVATOR BEAM AND BRACING | 61.0 | Ranipet | Structure | 1B |
| FGD | FW382 | ELEVATOR FLOORS | 6.0 | Ranipet | Structure | 1B |
| FGD | FW383 | ELEVATOR STAIR AND HAND RAIL | 21.0 | Ranipet | Structure | 1B |
| FGD | FW384 | ELEVATOR FLOOR GRILL | 32.0 | Ranipet | Structure | 1B |
| FGD | FW385 | ELEVATOR M/C ROOM GUIDE | 31.0 | Ranipet | Structure | 1B |
| FGD | FW386 | INTER-CONNECTING PLTF TO ABS | 10.0 | Ranipet | Structure | 1B |
| FGD | FY779 | SUPPORTS FOR CABLE TRAYS/CONTR | 48.0 | Ranipet | Structure | 1B |
| FGD | FY806 | CONTROL JUNCTION BOX | 1.5 | Ranipet | Structure | 1B |
| FGD | FB213 | ABSORBER SYSTEM INTERNALS | 22.0 | Ranipet | Structure | 1B |

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|---|---|---|---|---|---|---|
| FGD | FB215 | MIST ELIMINATOR ACCESSORIES | 18.0 | Ranipet | Structure | 1B |
| FGD | FB223 | ABSORBER SYSTEM ACCESSORIES | 4.0 | Ranipet | Structure | 1B |
| FGD | FB249 | HANDLING EQUIP - RC PUMP | 20.0 | Ranipet | Structure | 1B |
| FGD | FB293 | ELEVATOR AND ACCESSORIES | 18.0 | Ranipet | Structure | 1B |
| FGD | FB313 | ABSORBER SPRAY NOZZLES | 6.0 | Ranipet | Structure | 1B |
| FGD | FB713 | CHAIN PULLEYS | 0.5 | Ranipet | Structure | 1B |
| FGD | FB714 | HOISTS | 27.0 | Ranipet | Structure | 1B |
| FGD | FP468 | U-BOLTS | 10.0 | Ranipet | Structure | 1B |
| FGD | FP471 | PIPING SUPPORT STR. | 70.0 | Ranipet | Structure | 1B |
| FGD | Common | LS Day Silo (02 nos.) | 160.0 | HYD | Structure | 1B |
| FGD | Common | Bag Filter for Silo | 3.0 | HYD | Structure | 1B |
| FGD | Common | Air Blaster for Silo | 2.2 | HYD | Structure | 1B |
| FGD | Common | Elevator for LS Day Silo & WBM Building | 3.0 | HYD | Structure | 1B |
| FGD | Common | MISC. PLATFORMS AND LADDERS | 40.0 | HYD | Structure | 1B |
| FGD | Common | HOISTS | 20.0 | HYD | Structure | 1B |
| G&D | 57566 | PLATFORMS AND LADDERS-FGD GD | 42.4 | Ranipet | Structure | 1B |
| Ducting | 39150 | COL FRAMES BETN I.D. | 93.0 | Trichy | Structure | 1B |
| Ducting | 39142 | COLS FRAMES NEAR ID | 800.0 | Trichy | Structure | 1B |
| Ducting | 39810 | FLOOR GRILL | 57.5 | Trichy | Structure | 1B |
| Ducting | 39141 | COLS FRAMES NEAR ID | 185.0 | Trichy | Structure | 1B |
| Ducting | 39300 | PLATFORMS - AFTER ESP | 126.0 | Trichy | Structure | 1B |
| Ducting | 39820 | STAIRS | 14.2 | Trichy | Structure | 1B |
| Ducting | 39306 | FAN HANDLING STRUCTU | 97.1 | Trichy | Structure | 1B |
| Ducting | 39850 | HAND RAIL AND HAND R | 31.5 | Trichy | Structure | 1B |
| Ducting | 48495 | SUPORT IDFAN-CHIMNEY | 87.6 | Trichy | Structure | 1B |
| Ducting | 48485 | SUPPORT - ESP TO ID FAN | 55.4 | Trichy | Structure | 1B |
| Hoist | Common | Electric Hoist (12 nos.) | 7.0 | PEM | Structure | 1B |
| GDWE | Common | Platforms for VBF & Hydrocyclones | 25.0 | PEM | Structure | 1B |
| GDWE | Common | Miscellaneous | 25.0 | PEM | Structure | 1B |
| | | | **3,943.8** | | | |
| | | | | | | |
| | | **Total for packag-A(Unit-1)** | **20,546.6** | | | |
| | | | | | | |
| ESP | 79988 | COMMISSIONING SPARES | 1.1 | | Void | Void |
| ESP | 79996 | TOOLS TACKLES | 1.0 | | Void | Void |
| FGD | FU392 | TI- SPL WELD ELECTRODE P-1 | 0.1 | | Void | Void |
| FGD | FU393 | TI- SPL WELD ELECTRODES P-2 | 0.1 | | Void | Void |
| FGD | FU993 | TEST PIECE-TI | 0.2 | | Void | Void |
| G&D | 57992 | SPL MATL ELECTRODES | 0.3 | | Void | Void |

| | | | | | | |
|---|---|---|---|---|---|---|
| FGD | FW992 | TEST PIECE-C276 | 0.2 | | Void | Void |
| FGD | FW390 | C276- SPL WELD ELECTRODE P-1 | 2.2 | | Void | Void |
| FGD | FU394 | C276 ELECTRODE DUCT | 0.2 | | Void | Void |
| FGD | FW391 | C276- SPL- WELD ELECTRODE P-2 | 2.2 | | Void | Void |
| FGD | FB988 | COMMISSIONING SPARES | 10.0 | | Void | Void |
| FGD | FB996 | TOOLS TACKLES | 10.0 | | Void | Void |

## Package-B (Unit # 2)

| Area | PGMA | PGMA_DESC_SHORT | Estimate_WT in MT | BHEL Unit | Items | Rate Schedule |
|---|---|---|---|---|---|---|
| ESP | 79181 | SUPPOTING STRUCTURES FOR ESP | 1200.0 | Ranipet | ESP | 1A |
| ESP | 89618 | HSFG BOLTS FOR ESP STRUT | 24.0 | Ranipet | ESP | 1A |
| ESP | 79101 | ROLL/SLIDE SUPPORTS | 41.0 | Ranipet | ESP | 1A |
| ESP | 79143 | HOPPER RIDGES | 153.0 | Ranipet | ESP | 1A |
| ESP | 79148 | CASING STRUCTURE | 880.0 | Ranipet | ESP | 1A |
| ESP | 79149 | CASING SHELL/PANEL | 1000.0 | Ranipet | ESP | 1A |
| ESP | 79128 | ESP ROOF BEAM | 410.0 | Ranipet | ESP | 1A |
| ESP | 89610 | EP GALLERIESSTAIRS | 175.0 | Ranipet | ESP | 1A |
| ESP | 89612 | FLOOR GRILL AND STEP TREAD | 142.0 | Ranipet | ESP | 1A |
| ESP | 79111 | GAS SCREEN-EP | 9.0 | Ranipet | ESP | 1A |
| ESP | 79113 | EMIT SYST SUSPENSION | 33.0 | Ranipet | ESP | 1A |
| ESP | 79114 | SUPPORT INSULATORS | 33.0 | Ranipet | ESP | 1A |
| ESP | 79119 | COL ELEC SUSPENSION | 212.0 | Ranipet | ESP | 1A |
| ESP | 79120 | COLLECTING ELECTRODE | 2270.0 | Ranipet | ESP | 1A |
| ESP | 79121 | EMIT SYS FRAME-TOP | 200.0 | Ranipet | ESP | 1A |
| ESP | 79124 | SHOCK BARS | 164.0 | Ranipet | ESP | 1A |
| ESP | 79146 | INSULATOR SUPP PANEL | 180.0 | Ranipet | ESP | 1A |
| ESP | 79155 | PENT HOUSE FOR E P | 290.0 | Ranipet | ESP | 1A |
| ESP | 89614 | PENT HOUSE ROOFING SHEETS | 67.0 | Ranipet | ESP | 1A |
| ESP | 79122 | EMIT SYS FRAME BOTOM | 250.0 | Ranipet | ESP | 1A |
| ESP | 79132 | EMIT SYS FRAME-MIDLE | 350.0 | Ranipet | ESP | 1A |
| ESP | 79142 | OUTER ROOF-EP | 415.0 | Ranipet | ESP | 1A |
| ESP | 79144 | HOPPER UPPER PART | 1400.0 | Ranipet | ESP | 1A |
| ESP | 79145 | HOP MLDLOWER PART | 575.0 | Ranipet | ESP | 1A |
| ESP | 79147 | ROOF PANEL ASSY | 255.0 | Ranipet | ESP | 1A |
| ESP | 79150 | INLET-OUTLET FUNNEL | 240.0 | Ranipet | ESP | 1A |
| ESP | 79157 | SPLITTERGUIDE VANES | 42.0 | Ranipet | ESP | 1A |
| ESP | 79189 | GUIDE PLATE/VANE EP INLET DUCT | 19.0 | Ranipet | ESP | 1A |
| ESP | 79108 | GAS DIST. ASSY | 108.0 | Ranipet | ESP | 1A |
| ESP | 79125 | COLL ELECT RAPP MECH | 129.0 | Ranipet | ESP | 1A |

| | | | | | | |
|---|---|---|---|---|---|---|
| ESP | 79106 | INSULATOR HOUSING AS | 95.0 | Ranipet | ESP | 1A |
| ESP | 79116 | EMIT ELECT RAPP MECH | 64.0 | Ranipet | ESP | 1A |
| ESP | 79117 | DRIVE ARGT. FOR EMIT. SYS | 62.0 | Ranipet | ESP | 1A |
| ESP | 79141 | ELECTRICAL MISCELLANEOUS ITEMS | 33.0 | Ranipet | ESP | 1A |
| ESP | 79165 | APP PLATFORM-HOPPER | 220.0 | Ranipet | ESP | 1A |
| ESP | 89611 | ESP ROOF HANDRAILS | 21.0 | Ranipet | ESP | 1A |
| ESP | 89613 | FLOOR GRILL AND MOBILE LADDER | 142.0 | Ranipet | ESP | 1A |
| ESP | 79105 | ESP-SUB-DELIVERY COMPONENTS | 1.2 | Ranipet | ESP | 1A |
| ESP | 79109 | GD-RAPPING MECHANISM | 19.0 | Ranipet | ESP | 1A |
| ESP | 79110 | GD_DRIVE ARRANGEMENT | 2.0 | Ranipet | ESP | 1A |
| ESP | 79115 | EMITTING ELECTRODES | 46.3 | Ranipet | ESP | 1A |
| ESP | 79123 | INSPECTION DOORS | 24.0 | Ranipet | ESP | 1A |
| ESP | 79126 | COLL ELEC RAPP DRIVE | 14.0 | Ranipet | ESP | 1A |
| ESP | 79131 | GEARED MOTORS FOR RAPPING MECH | 37.0 | Ranipet | ESP | 1A |
| ESP | 79161 | EP PERF TEST EQUIPT | 26.0 | Ranipet | ESP | 1A |
| ESP | 79163 | ASH LEVEL INDICATOR | 6.1 | Ranipet | ESP | 1A |
| ESP | 79164 | MISCELLANEOUS ITEMS | 5.0 | Ranipet | ESP | 1A |
| ESP | 79172 | INTERLOCKS-EP | 3.1 | Ranipet | ESP | 1A |
| ESP | 79173 | ELECTRICALLY OPERTD HOISTACCE | 9.0 | Ranipet | ESP | 1A |
| ESP | 79190 | HEATING ELEMENTS | 2.0 | Ranipet | ESP | 1A |
| ESP | 79160 | CABLE-CABLE RACKS | 490.0 | Ranipet | ESP | 1A |
| ESP | 79166 | WATER WASHING SYSTEM | 10.0 | Ranipet | ESP | 1A |
| ESP | 79191 | PANEL TYPE HOPPER HEATERS AC | 30.0 | Ranipet | ESP | 1A |
| ESP | | HV Rectifier (HVR) with EC panels | 300 | Jhansi | ESP | 1A |
| | | | **12,927.7** | | | |
| | | | | | | |
| ESP | 89615 | INSULATION CLADDING SH FOR ESP | 115.0 | Ranipet | Insul-Sheet | 3C |
| FGD | FU269 | CLADDING SHEET FOR DUCT | 15.0 | Ranipet | Insul-Sheet | 3C |
| | | | **130.0** | | | |
| | | | | | | |
| ESP | 79168 | FIXING COMP. FOR ESP INSULATIN | 129.0 | Ranipet | Insul-Iron Comp | 3B |
| FGD | FU268 | FIXING COMP FOR DUCT | 15.0 | Ranipet | Insul-Iron Comp | 3B |
| | | | **144.0** | | | |
| | | | | | | |
| ESP | 79167 | MIN WOOL FOR ESP INSULATION | 507.0 | Ranipet | Insul-Wool | 3A |
| FGD | FU267 | INSULATION MATERIALS FOR DUCT | 30.0 | Ranipet | Insul-Wool | 3A |
| | | | **537.0** | | | |
| | | | | | | |

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|---|---|---|---|---|---|---|
| FGD | FU251 | EXPNSN JNT METALLIC | 12.0 | Ranipet | NPP | 1C |
| FGD | FU255 | DUCT BYP BUF/GGH/ABS | 172.0 | Ranipet | NPP | 1C |
| FGD | FU375 | DUCT- EREC BOLTSNUTS | 2.0 | Ranipet | NPP | 1C |
| FGD | FW201 | ABSORB. RC PUMP NOZZLE | 6.0 | Ranipet | NPP | 1C |
| FGD | FU200 | INSTRUMENT TAPPING FOR DUCT | 1.0 | Ranipet | NPP | 1C |
| FGD | FU206 | MAN HOLE DOOR FOR DUCT | 3.0 | Ranipet | NPP | 1C |
| FGD | FU257 | DUCT ABS BYP/STACK | 60.0 | Ranipet | NPP | 1C |
| FGD | FU315 | CONDENSATE COLLECTION SYSTEM | 2.0 | Ranipet | NPP | 1C |
| FGD | FU325 | SAMPLING NOZZLES FOR DUCT | 1.0 | Ranipet | NPP | 1C |
| FGD | FU329 | ALLOY LINING-DUCT | 0.5 | Ranipet | NPP | 1C |
| FGD | FW202 | ABS NOZL NB 300 ABOVE | 0.6 | Ranipet | NPP | 1C |
| FGD | FW331 | LEAK DETECTION PIPES | 0.5 | Ranipet | NPP | 1C |
| FGD | FU252 | EXPNSN JNT NON METALLIC | 5.0 | Ranipet | NPP | 1C |
| FGD | FW227 | EMERGENCY QUENCH SYSTEM | 3.0 | Ranipet | NPP | 1C |
| FGD | FW229 | W/D WASH SYSTEM | 1.0 | Ranipet | NPP | 1C |
| FGD | FB241 | ABSORBER AGITATOR | 11.0 | Ranipet | NPP | 1C |
| FGD | FP467 | RUBBER GASKET SHEET | 1.0 | Ranipet | NPP | 1C |
| G&D | 57C83 | DMPR-FGD BYPASS | 42.7 | Ranipet | NPP | 1C |
| G&D | 57209 | MOUNTING BRACKET | 5.0 | Ranipet | NPP | 1C |
| G&D | 57C70 | GATE-FGD OUTLET | 50.6 | Ranipet | NPP | 1C |
| G&D | 57F09 | MOUNTING BRACKET-FGD | 1.0 | Ranipet | NPP | 1C |
| G&D | 57F41 | SEAL AIR PIPING-FGD | 13.8 | Ranipet | NPP | 1C |
| G&D | 57F77 | ELECTRIC ACTUATR-FGD | 5.2 | Ranipet | NPP | 1C |
| G&D | 57F78 | ELECTRIC ITEM-FGD GD | 7.3 | Ranipet | NPP | 1C |
| G&D | 57F91 | BLOWER WITH MOTR-FGD | 6.2 | Ranipet | NPP | 1C |
| G&D | 57F97 | KGV CHECK VALV-FGD | 4.6 | Ranipet | NPP | 1C |
| G&D | 57N60 | GATE-FGD INLET | 65.5 | Ranipet | NPP | 1C |
| G&D | 57141 | SEAL AIR PIPING | 7.0 | Ranipet | NPP | 1C |
| G&D | 57497 | KGV CHECK VALVE | 2.5 | Ranipet | NPP | 1C |
| G&D | 57470 | GATE-ESP OUTLET | 79.8 | Ranipet | NPP | 1C |
| G&D | 57480 | GATE-ID FAN INLET | 74.5 | Ranipet | NPP | 1C |
| G&D | 57490 | GATE-ID FAN OUTLET | 74.5 | Ranipet | NPP | 1C |
| Ducting | 48496 | SQ DUCT,ID FAN-CHIMNEY,RIGHT | 180.4 | Trichy | NPP | 1C |
| Ducting | 48482 | DUCT - ESP TO ID FAN | 465.2 | Trichy | NPP | 1C |
| Ducting | 48484 | EXPNJT - ESP TO ID FAN | 29.6 | Trichy | NPP | 1C |
| Ducting | 48912 | Slide Brg Pl-Id Sys | 1.3 | Trichy | NPP | 1C |
| Ducting | 48492 | DUCT - IDFAN-CHIMNY | 193.3 | Trichy | NPP | 1C |
| Ducting | 48498 | DUCT - ,ID FAN-CHIM, | 6.4 | Trichy | NPP | 1C |
| Ducting | 48494 | EXPNJT - IDFAN-CHIMNY | 18.0 | Trichy | NPP | 1C |
| DG set | | Pacement of DG set on foundation | 18.0 | ISG Bangalore | NPP | 1C |

| | | | | | | |
|---|---|---|---|---|---|---|
| DG set | | Installation/assembly of Acoustic Enclosure | 6.0 | ISG Bangalore | NPP | 1C |
| DG set | | Erection of Silencer, Exhaust Piping (MS Class 500 NB pipes, Class-B), Support, and Stack of 30 Meters Height (MS Class 500 NB pipe-Class B) | 5.0 | ISG Bangalore | NPP | 1C |
| DG set | | Erection of Exhaust Support Structure with Platforms (Height-30 Mtrs) | 15.0 | ISG Bangalore | NPP | 1C |
| DG set | | Installation of DG AMF panel, Distribution board, Battery charger and Battery | 2.0 | ISG Bangalore | NPP | 1C |
| DG set | | Insulation & Aluminium cladding of silencer, Exhaust piping and stck upto 30 meters height | 1.0 | ISG Bangalore | NPP | 1C |
| DG set | | Erection of Fuel Tank and Fuel Piping (MS class 2 inch pipes). Flushing of tanks and fuel lines at the time of commissioning. Painting of fuel lines. Filling of 1000 Ltrs of High speed Diesel during commissioning | 0.5 | ISG Bangalore | NPP | 1C |
| | | | **1,663.7** | | | |
| | | | | | | |
| FGD | FP411 | RC PUMP INLE VALVE | 25.0 | Ranipet | Piping-CS | 2A |
| FGD | FP412 | RC PUMP OUTLET VALVE | 25.0 | Ranipet | Piping-CS | 2A |
| FGD | FP460 | FRP PIPING (LSGS) | 20.0 | Ranipet | Piping-CS | 2A |
| FGD | FP462 | CSRL PIPE-2 (GSLS) | 100.0 | Ranipet | Piping-CS | 2A |
| FGD | FP463 | CS PIPING (PWCWSW) | 40.0 | Ranipet | Piping-CS | 2A |
| FGD | FP466 | FASTENERS CS SS | 10.0 | Ranipet | Piping-CS | 2A |
| FGD | FP470 | PIPING ACC. | 2.0 | Ranipet | Piping-CS | 2A |
| | | | **222.0** | | | |
| | | | | | | |
| FGD | FP465 | GI PIPING (IA DW) | 7.0 | Ranipet | Piping-GI | 2B |
| | | | **7.0** | | | |
| | | | | | | |
| FGD | FP464 | SS PIPING (W/D) | 1.5 | Ranipet | Piping-SS | 2C |
| | | | **1.5** | | | |
| | | | | | | |
| FGD | | RC pumps (05 nos.) | 60.0 | Hyd | RM | 1D |
| FGD | | Oxidation Blower (02 nos.) | 20.5 | Hyd | RM | 1D |
| G&D | 57491 | BLOWER WITH MOTOR | 3.5 | Ranipet | RM | 1D |

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|---|---|---|---|---|---|---|
| G&D | 57577 | ELECT ACTUATOR FOR GATEDAMPER | 17.9 | Ranipet | RM | 1D |
| G&D | 57578 | ELECTRICAL ITEMS FOR GATEDAMP | 0.1 | Ranipet | RM | 1D |
| FGD | HT Motor | RC Pump HT Motor (05 nos) | 75.0 | Bhopal | RM | 1D |
| FGD | HT Motor | Oxidation Blower HT Motor (02 nos) | 20.0 | Bhopal | RM | 1D |
| | | | **197.0** | | | |
| | | | | | | |
| Ducting | 48495 | SUPORT IDFAN-CHIMNEY | 87.6 | Trichy | Structure | 1B |
| Ducting | 48485 | SUPPORT - ESP TO ID FAN | 55.4 | Trichy | Structure | 1B |
| Ducting | 39150 | COL FRAMES BETN I.D. | 93.0 | Trichy | Structure | 1B |
| Ducting | 39142 | COLS FRAMES NEAR ID | 800.0 | Trichy | Structure | 1B |
| Ducting | 39810 | FLOOR GRILL | 57.5 | Trichy | Structure | 1B |
| Ducting | 39141 | COLS FRAMES NEAR ID | 185.0 | Trichy | Structure | 1B |
| Ducting | 39300 | PLATFORMS - AFTER ESP | 126.0 | Trichy | Structure | 1B |
| Ducting | 39820 | STAIRS | 14.2 | Trichy | Structure | 1B |
| Ducting | 39305 | FAN HANDLING STRUCTU | 20.0 | Trichy | Structure | 1B |
| Ducting | 39306 | FAN HANDLING STRUCTU | 97.1 | Trichy | Structure | 1B |
| Ducting | 39850 | HAND RAIL AND HAND R | 31.5 | Trichy | Structure | 1B |
| G&D | 57566 | PLATFORMS AND LADDERS-FGD GD | 42.4 | Ranipet | Structure | 1B |
| G&D | 57466 | PLATFORMS AND LADDERS | 70.0 | Ranipet | Structure | 1B |
| FGD | FP471 | PIPING SUPPORT STR. | 30.0 | Ranipet | Structure | 1B |
| FGD | FP468 | U-BOLTS | 5.0 | Ranipet | Structure | 1B |
| FGD | FB249 | HANDLING EQUIP - RC PUMP | 20.0 | Ranipet | Structure | 1B |
| FGD | FB293 | ELEVATOR AND ACCESSORIES | 18.0 | Ranipet | Structure | 1B |
| FGD | FB313 | ABSORBER SPRAY NOZZLES | 6.0 | Ranipet | Structure | 1B |
| FGD | FB213 | ABSORBER SYSTEM INTERNALS | 22.0 | Ranipet | Structure | 1B |
| FGD | FB215 | MIST ELIMINATOR ACCESSORIES | 18.0 | Ranipet | Structure | 1B |
| FGD | FB223 | ABSORBER SYSTEM ACCESSORIES | 4.0 | Ranipet | Structure | 1B |
| FGD | FW372 | HSFG BOLT-ELEV STRUC | 2.0 | Ranipet | Structure | 1B |
| FGD | FW380 | ELEVATOR COLUMN | 57.0 | Ranipet | Structure | 1B |
| FGD | FW381 | ELEVATOR BEAM AND BRACING | 61.0 | Ranipet | Structure | 1B |
| FGD | FW382 | ELEVATOR FLOORS | 6.0 | Ranipet | Structure | 1B |
| FGD | FW383 | ELEVATOR STAIR AND HAND RAIL | 21.0 | Ranipet | Structure | 1B |
| FGD | FW384 | ELEVATOR FLOOR GRILL | 32.0 | Ranipet | Structure | 1B |
| FGD | FW385 | ELEVATOR M/C ROOM GUIDE | 31.0 | Ranipet | Structure | 1B |
| FGD | FW386 | INTER-CONNECTING PLTF TO ABS | 10.0 | Ranipet | Structure | 1B |
| FGD | FB235 | SPECIAL FASTNERS | 1.0 | Ranipet | Structure | 1B |
| FGD | FW217 | ABS ME SUPPORT | 62.0 | Ranipet | Structure | 1B |
| FGD | FW222 | ABSORBER SYSTEM-CASING TOP | 100.0 | Ranipet | Structure | 1B |

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|---|---|---|---|---|---|---|
| FGD | FW231 | ABSORBER SHEAR PLATE | 7.0 | Ranipet | Structure | 1B |
| FGD | FW300 | ABSORBER COLUMNS | 71.0 | Ranipet | Structure | 1B |
| FGD | FW301 | ABSORBER BEAMS AND BRACINGS | 156.0 | Ranipet | Structure | 1B |
| FGD | FW302 | ABSORBER LOWER FLOORS | 16.0 | Ranipet | Structure | 1B |
| FGD | FW303 | ABSORBER UPPER FLOORS | 11.0 | Ranipet | Structure | 1B |
| FGD | FW304 | ABSORBER FLOOR GRILLS | 49.0 | Ranipet | Structure | 1B |
| FGD | FW305 | ABSORBER STAIRS HANDRAILS | 29.0 | Ranipet | Structure | 1B |
| FGD | FW306 | ABSORBER HSFG FASTNERS | 12.0 | Ranipet | Structure | 1B |
| FGD | FW307 | ABSORBER MISCELLANEOUS | 3.0 | Ranipet | Structure | 1B |
| FGD | FU373 | HSFG BOLT-DUCT STRU | 2.0 | Ranipet | Structure | 1B |
| FGD | FU399 | DUCT EREC MATERIALS | 3.0 | Ranipet | Structure | 1B |
| FGD | FU612 | GALLARIES AND RAILINGS FOR DAM | 15.0 | Ranipet | Structure | 1B |
| FGD | FU613 | GALLARIES AND RAILINGS FOR DUC | 10.0 | Ranipet | Structure | 1B |
| FGD | FU615 | GALLERIES AND RAILINGS-INSSAM | 10.0 | Ranipet | Structure | 1B |
| FGD | FU328 | W/D INTERFACE (CARBON STEEL) | 48.0 | Ranipet | Structure | 1B |
| FGD | FU260 | DUCT STR BYP BUR/GGH/ABS | 90.0 | Ranipet | Structure | 1B |
| FGD | FU262 | DUCT STR ABS BYP/STACK | 69.0 | Ranipet | Structure | 1B |
| FGD | FU228 | ABSORBER-W/D INTERFACE | 40.0 | Ranipet | Structure | 1B |
| FGD | FU234 | DUCT SUP ABS STACK/BYP | 12.0 | Ranipet | Structure | 1B |
| FGD | FU297 | PLATFORM FOR DUCT | 15.0 | Ranipet | Structure | 1B |
| FGD | FU312 | PLATFORM FOR-DUCT INSTRSAMPLG | 15.0 | Ranipet | Structure | 1B |
| FGD | FW203 | NOZZLE NB25 TO NB250 | 1.0 | Ranipet | Structure | 1B |
| FGD | FW209 | MAN HOLE DOOR FOR ABSORBER | 5.0 | Ranipet | Structure | 1B |
| FGD | FW216 | ABS BAFFLE GRATING SUPP | 20.0 | Ranipet | Structure | 1B |
| FGD | FW218 | ABS SPRAY PIPE SUPP | 38.0 | Ranipet | Structure | 1B |
| FGD | FW221 | ABSORBER SYSTEM-CASING BOTTOM | 99.0 | Ranipet | Structure | 1B |
| FGD | FW224 | ABSORBER SYSTEM-LINING-C276 | 20.0 | Ranipet | Structure | 1B |
| FGD | FW226 | EMERGENCY QUENCH WATER TANK | 20.0 | Ranipet | Structure | 1B |
| FGD | FW236 | STRUCTURES FOR RC PUMP HOUSE | 104.0 | Ranipet | Structure | 1B |
| FGD | FW285 | SUPRTING STR FOR EMERGENCY QWT | 10.0 | Ranipet | Structure | 1B |
| FGD | FW322 | ABSORBER SYSTEM-CASING INTERM | 83.0 | Ranipet | Structure | 1B |
| FGD | FW371 | HSFG BOLT-RC SHED | 2.0 | Ranipet | Structure | 1B |
| FGD | FU324 | HOOD OVER ABSORBER | 98.0 | Ranipet | Structure | 1B |
| FGD | FU330 | C276-Ti CLAD PLATE | 0.5 | Ranipet | Structure | 1B |
| FGD | FW208 | RC PUMP OB SUPPORT | 13.0 | Ranipet | Structure | 1B |
| FGD | FB239 | VIEWING PORTS | 0.2 | Ranipet | Structure | 1B |
| FGD | FU298 | PLATFORM FOR GD | 15.0 | Ranipet | Structure | 1B |
| FGD | FW219 | ABSORBER SYSTEM-BASE | 27.0 | Ranipet | Structure | 1B |

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|---|---|---|---|---|---|---|
| FGD | FW309 | MONORAIL BEAM ABSORBER AREA | 59.0 | Ranipet | Structure | 1B |
| FGD | FW317 | NOZZLES MANHOLE DOORS EQWT | 5.0 | Ranipet | Structure | 1B |
| FGD | FW318 | ROOF SHEETING | 26.0 | Ranipet | Structure | 1B |
| FGD | FB214 | ABS BAFFLE GRATING | 1.0 | Ranipet | Structure | 1B |
| FGD | FB323 | ABSORBER JAS | 2.0 | Ranipet | Structure | 1B |
| FGD | FU232 | DUCT SUP BYP BUF/GGH | 40.0 | Ranipet | Structure | 1B |
| | | | **3,557.4** | | | |
| | | | | | | |
| | | **Total for Package-B (Unit-2)** | **19,387.3** | | | |
| | | | | | | |
| ESP | 79988 | COMMISSIONING SPARES | 1.1 | | Void | Void |
| G&D | 57992 | SPL MATL ELECTRODES | 0.3 | | Void | Void |
| FGD | FW391 | C276- SPL- WELD ELECTRODE P-2 | 2.2 | | Void | Void |
| FGD | FU394 | C276 ELECTRODE DUCT | 0.2 | | Void | Void |
| FGD | FW390 | C276- SPL WELD ELECTRODE P-1 | 2.2 | | Void | Void |
| FGD | FU392 | TI- SPL WELD ELECTRODE P-1 | 0.1 | | Void | Void |
| FGD | FU393 | TI- SPL WELD ELECTRODES P-2 | 0.1 | | Void | Void |

**10.1 Brief feature of Electrostatic Precipitator (ESP) & Auxiliaries for each Unit**

ESP is Main equipment including all related auxiliary equipments as specified below. Electrostatic Precipitators complete in all respects with all components and accessories etc, for each of two (02) steam generators (Boiler) of 2X800 MW units. Steam generator (Boiler) shall be supercritical, balance draft, dry bottom, pulverised coal fired type. The scope shall include but will not be limited to the following:

1) Each Electrostatic Precipitator serving one steam generator (Boiler), shall have six (6) numbers of independently operated passes (gas streams) housed in six (6) nos. of independent casings including outside shell, structural steel supports and frame work (excluding foundation), access ladders, platforms, safety rails, stairways, walk ways, access doors and weather proof pent house etc. . (No. of ESP per Boiler- 1 having 06 passes)
2) Matching flanges along with all bolts, nuts, gaskets, and all the expansion joints etc. as required to connect the ESP passes to the duct work.
3) Flue gas inlet distribution system complete with perforated plates, turning vanes, deflector plates, flow splitters, guide vanes and all necessary gas flow control devices in the inlet and outlet cones and duct, complete duct stiffening devices, interior bracings, slide plates, access doors, brackets, supporting structures, hangers, sampling connections, etc.
4) Collecting and discharge electrode systems.
5) Rapping system complete with structural supporting frame, drives, and automatic rapping control, etc.
6) Ash hoppers complete with curved panel heating elements, matching with curved surfaces of conical hopper, level monitors and indicators, outlet flanges, jointing material, poke holes, access doors and walkways beneath the hoppers.
7) Opacity monitors complete with all accessories at the outlet of each pass (gas stream) of each ESP but upstream of the ID Fan i.e. six (6) nos. per ESP serving one steam generator (Boiler).
8) Foundation base plates, bolts along with templates, nuts, anchor materials, packing shims, inserts &embedment along with lugs etc.
9) Inspection and maintenance access doors, frames and safety locks.
10) Water washing system for the ESP and its hoppers along with all piping, valves and nozzles etc.
11) HV Rectifiers along with panels supplied by BHEL-Jhansi
12) Thermal Insulation, Lagging, Cladding & Refractories.
    Thermal Insulation along with aluminum cladding, lagging, reinforcement wiremesh, cleats and supports, shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius.
13) Monorails with electrically operated hoists including monorail beams on the roof for handling transformer rectifiers.
14) Corrosion protection painting for structures as described in the specification.
15) Sheeting work for roof (pent house)/ canopy/ side cladding of ESP.
16) Misc Platforms for accessibility to valves and equipments as specified by BHEL Engineer at site.
17) Flue gas ducts from Electrostatic Precipitators (ESP) out-lets to ID fans inlets, from ID fans outlets to FGD system inlet, from FGD system outlet to chimney flue inlet and FGD system bypass duct.
18) Gas recirculation ducting (if applicable) from downstream of ID fan to Steam Generator.
19) Adequately sized flow splitters, plates/duct stiffening devices, bracing, side plates, expansion njoints, matching flanges, access doors and brackets, sampling points, ash hoppers, etc.
20) Supporting structure and hangers for all Ducting.
21) Suitable metallic type expansion joints wherever necessary shall be installed.
22) Any other ducting required for the completeness of the system.
23) Fully gas tight, motor operated, gates before and after each ESP stream, before and after each ID fan.

24) Supporting structure for all dampers & drives.
25) Access and Platforms for Gates.
26) Any other gates/dampers required for the completeness of the system to ensure operational flexibility and onload maintenance of any of the equipment or sections of the air/flue gas path, equipment & personnel safety etc.

### 10.2 Brief feature of Flue Gas Desulfurization (FGD) and Auxiliaries for each Unit

Note- The below brief features are general in nature for understanding and giving an idea. Actual number of equipment, size, length, layout shall be finalized during design and engineering and construction shall be done as per the released drawings by BHEL during course of execution and quantities as per BOQ.

The FGD system shall have an independent absorber for each unit and interconnection with common limestone milling systems for the two units and common gypsum dewatering system for the two units along with absorbent tank, common for the two units, for storage of absorber slurry of one unit. FGD system shall include all items as shown in the applicable for FGD Milling System, Absorber System and Gypsum Dewatering System. All ducting, dampers, expansion joints, pumps, valves, supports, structures etc. as required for completeness of system of absorbers, common limestone grinding system and common gypsum dewatering system shall also be in the scope of the:

**1) ABSORBER SYSTEM**

I. Each unit shall be provided with an independent absorber with Supporting Structure. Absorber system complete with internals Spray Pipes, Spray Nozzles, Jet Air Sparger (JAS), Agitator and Mist eliminator.
II. Complete Ducting System from ID fans to absorber tower, from absorber tower to absorber
III. bypass duct and connecting duct to chimney.
IV. Absorber Slurry Recirculation System including the Slurrry recirculation pumps, agitators and related piping.
V. Gates-Motorized isolation gates at Absorber gas inlet, Absorber gas outlet and FGD bypass in the main duct to Chimney along with 2x100 seal air fans for each gate and 2x100 heaters for absorber outlet gate & bypass gate. A bi-plane bypass damper along with 2x100 seal air & 2x100 heaters shall also be provided in the bypass duct (actual shall be as per drawings released by BHEL afterfinalization of design and engineering)
VI. Compressed Oxidation Air System- 2X100% Oxidation Blowers.
VII. Mist Eliminator- Clean gas from the absorber shall be taken to the Chimney through three stage mist eliminators. Treated flue gas from the absorber shall be discharged through a stack.
VIII. One number of Passengers cum Goods Elevator of adequate capacity shall be provided with adequate landings for absorber. The erection and commissioning of the Elevator is in Elevator Vendor Scope. Lift Structure and other supporting structure is included in the scope of this contract.
IX. One Fabricated Emergency cooling tank.
X. 2x100% gypsum bleed pumps.
XI. Duct/piping system complete with supports, structures, trestles, absorber platforms.
XII. Piping from gypsum bleed pumps to gypsum dewatering system, along with recirculation
XIII. lines (if required) necessary isolation and control valves.

XIV. Installation, erection and commissioning of Electric Hoist including receipt at site, installation of Supporting and Main Structure of the Hoist, Erection and Commissioning of the Hoists at the locations identified in the drawing.
XV. Erection of Agitators.
XVI. Fabriocation and Erection of Tanks tanks is excluded from the scope however, piping and other interconnection between the tanks and related auxiliaries etc from the outlet flangs of the tanks is included in the scope of vendor.

2) **LIMESTONE GRINDING SYSTEM:**

I. Limestone Storage Silos- Limestone Storage Silos complete with Supporting Steel structure, platforms, Staircase, air canons, power operated gates, gravimeter feeders etc.
II. Wet Ball Mill System along with complete accessories will be provided for grinding of Limestone for this Package along with complete accessories.

3) **GYPSUM DEWATERING SYSTEM:**

The gypsum dewatering system is common for the two units and shall be erected by Successful bidder of Package-A. The common dewatering system shall receive the gypsum slurry from each absorber through slurry feed pipes and shall comprise of two sets of dewatering equipment**.**

I. Each set (suitable for handling /dewatering of both units) of dewatering equipment (01working set + 01 standby set) shall comprise of the following items as a minimum requirement:
i. One set of primary hydro-cyclones
ii. One vacuum belt filter
iii. One no. vacuum receiver
iv. One no. vacuum pump
v. One set of secondary hydro-cyclones
vi. Complete piping and valves for the system along with wash water line.
II. Common Filtrate Water Tank.
III. 2X100% Filtrate Water Pumps.
IV. Vaccum Belt Filters complete with Accessories including discharge chute, Drivers (VFD and LCP) and driving motors (IE3) with inverter panel, cloth spray nozzles, rubber belt etc
V. Vent fan including enclosure and its arrangement and Vacuum receivers with anchor bolts, nuts and washer etc.
VI. Belt Filter Washing Tank and Belt Filter Washing Pumps.
VII. All interconnecting piping (slurry, air and water pipes) which includes the requisite pipe support materials, fittings, gasket, flange materials, bolting along with valves for the entire Gypsum Dewatering System and the expansion Joints at the suction and discharge of each pump.
VIII. Neutralizing Tank.
IX. Erection of Agitators.
X. Erection of the Elevator Structure of Gypsum Dewatering Building and FGD Control Room.

**4) PROCESS WATER & COOLING WATER STORAGE & PUMPING SYSTEM**

- **I.** 2 nos of Booster Water Pumps along with all necessary piping, valves, control & instrumentation to feed the tank
- II. 2x100% Process Water Pumps for each unit connected to each of the Process water Storage tanks (total 4 nos. of pumps for 2x800 MW) along with all necessary piping, valves, control & instrumentation.
- III. 2x100% Mist Eliminator Wash Water Pump for each unit connected to each of the Process water Storage tanks (total 4 nos. of pumps for 2x800 MW) along with all necessary piping, valves, control & instrumentation.
- IV. Any other pump or storage system not specified but required to meet the system requirement.
- V. Interconnection between the tanks and piping from tanks to the area as provided in the drawing.
- VI. All drains & overflow lines from the tanks shall be terminated to the nearest trench/drain.

## 10.3 Other Items:

1. **Dosing System:** Dosing System required for FGD and ESP alone (if any) is envisaged in this ESP and FGD Scope. hence erection of the equipment for dosing system shall be in contractor scope.

2. **Handling System** – Erection of the handling System (Hoists/monorail) required for the ESP and FGD Area are included in the scope of the contractor. The payment for the same shall be regularized as per the terms of payments envisaged in this contract. Steel Materials required for the erection of the handling equipment shall be provided by BHEL free of cost.

## 10.4 GALVANISED STEEL PIPING

a. Galvanized pipe shall be joined by screwing in to socket and screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before joining. The exposed threaded portion on either side of the socket joint shall be applied with Zinc Silicate Paste or as specified in relavent procedures/documents. All these consumables are in the scope of contractor and shall carry out within the quoted rate.
b. GI pipe with flanged joints shall have screwed flanges. Flanged joints faces shall be painted with red lead and bolting up evenly on all sides with compressed asbestos gaskets in between two flanges.
c. Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be attached by screwing the pipe through the flange and pipe and flange shall be refaced accurately.
d. Required threading should be done by the contractor at site as specified in the drawing. The pipes shall be cut only by Hacksaw / Machining.
e. Required Teflon tapes are to be arranged by the contractor within the quoted rate.
f. ALL THE SCREWED JOINTS ARE TO BE SEAL WELDED IF REQUIRED BY CUSTOMER, SUITABLE ELECTRODES FOR FULL SEAL WELDING ARE TO BE ARRANGED BY THE CONTRACTOR AT HIS COST.

## 10.5 GENERAL

**Site Visit by the Bidder**

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

**10.5.2** The bidder shall satisfy themselves about the following factors:

i) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.

ii) Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.

iii) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.

iv) Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.

v) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.

vi) The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.

vii) The type of equipment and facilities needed, for and in the performance of the work.

viii) The extent of lead and lift required for the work in complete form over the entire duration of the contract, and All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

**10.5.3** The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or approach platforms or scaffolding works or as bed for pre-assembly works. Contractor shall arrange himself all such materials. The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel (angles, channels, beams, plates etc) for such usage as normal scope of work without any cost implication on BHEL. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor. However, if available with BHEL (in form of scrap/good steel) ,vendor may be allowed to use on returnable basis on discretion of BHEL.

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

**10.5.5** Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like Boiler, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments coming under this scope. Sometimes, more than one agencies may have to work in same location. Sometimes it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

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

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

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

**10.5.9** All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to the account of the Contractor. However, any registration, statutory inspection fees lawfully pay-able under the provisions of the Indian Boiler Regulations and any other statutory laws and its amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the customer, shall be to the account of the customer. Should any such inspection or registration need to be re-arranged due to the fault of the Contractor, the additional fees for such inspection and/or registration shall be borne by the Contractor. Inspection fee and registration fee as mentioned in Chapter VIII of Special Conditions of contract (Volume-IB in (Vol I BCD)) shall be paid by BHEL.

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

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

**10.5.12** All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor

**10.5.13** The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

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

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

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

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

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

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

**10.5.20** All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc. as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the Contractor as part of the work within the quoted rates.

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

**10.5.22** The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

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

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

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

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

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

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

**10.5.29** Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.

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

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

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

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

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

**10.5.35 VOID**

**10.5.36 All lubricants and chemicals required for testing, preservation, chemical cleaning / acid cleaning, oil flushing, and the lubricants for trial runs of the equipments and trial operation of the unit will be supplied by BHEL free of charges.**

**10.5.37** It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.

**10.5.38** The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

**10.5.39** Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.

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

**10.5.41** Contractor shall retain all T&P / Testing instrument / Material handling equipment's etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge. The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall

not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.

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

**10.5.43** VOID

**10.5.44** Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's cost with applicable overheads if there is any failure on the part of contractor in this respect.

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

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

**10.5.47** The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors.

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

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

## 10.6 SITE INSPECTION

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

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

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

no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

**10.7 UTILITY POINTS**

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

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

**10.8 DOCUMENTATION**

**10.8.1** Contractor shall be supplied with two extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copy with Red ink all the changes / deviations / alterations etc. carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

**10.8.2** After successful completion, testing and commissioning of installation work, as built drawings / documents if any, in line with the actual work carried out as per site routing drawing shall be submitted by the contractor as agreed for the project.

**10.9 AS BUILT DRAWING:**

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

**10.10 PLATFORMS, CROSSOVERS & CANOPIES**

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

Contractor has to fabricate and install canopies for all outdoor pumps and motors, actuators, lub oil units, control valves and at places as instructed by BHEL Engineer etc. Platforms, ladders, crossovers and canopies shall have to be fabricated from raw materials supplied by BHEL and erected by contractor as per instruction of BHEL and shall be paid as per accepted tonnage rate for "structures" i.e**, Rate schedule (1B)**

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

During course of erection in ESP and FGD fin/attachment & associated items cutting to align difference, panels will be required in ESP and FGD and this type of activity will be treated as

normal scope of work without any commercial implication on BHEL. Even activity may have to be repeated as per job/Site requirement and for this also no extra work payment will be given to vendors as this type of job will be treated as normal scope of work.

**10.12 Inspection, cleaning of ESP, FGD, ducts/and subsequent restoration, rectification, normalization.**

During erection, pre-commissioning, commissioning, operation, Stabilisation period trial Run - Inspection, cleaning of ESP, Absorber, ducts, hoppers, and allied areas are to be carried out. For this vendor has to arrange manpower, T&P, other resources for inspection, cleaning of ash /oil shoots, coal rejects /clinkers and other foreign materials, associated items from ESP and FGD & surrounding areas. For this installation of equipments, scaffoldings and other requirement/resources/consumables as required are to be arranged by vendors for inspection, cleaning, testing followed by restoration/rectification/normalization. Vendor has to repeat this type of activity no. of times till handing over Unit to customer without any cost implication on BHEL treating this types of jobs as normal cope of vendor's work. Generally such works would not be repeated more than 3-4 times.

**10.13 Statutory approval**

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

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

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

**10.14 Strainers, Strainers Cleaning, Pumps Commissioning/ servicing / Rectification**

Commissioning and Servicing of all the Pumps covered under this package are in the scope of the vendor. Cleaning of Strainers, rectification of gaskets etc during the due course of erection and commissioning are in the scope of contractor. All above activities are required to be repeated in no. of occasions till handing over of Unit(s) and are treated as normal scope of work without any extra commercial implications on BHEL.

**10.15 Support for Handing Over of T&P, spares to BHEL/Customer, diversion to other BHEL Sites/Units**

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

**10.16 Dewatering**

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

**10.17 Housekeeping/Area Cleaning**

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

**10.18 Approach platforms, fixtures**

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

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

Agency has to give assistance for commissioning during initial period and subsequently during unit operation during stabilization period/trial run. For this purpose items erected by agency has to provide manpower, other resources, diesel, other consumables, scaffoldings, Other T&Ps as required from time to time. These types activities will be repetitive in natures for no. of times and in cases dismantling, reinstallation of items/parts has also to be done till handing over of unit to customer. During case of dismantling /reinstallation logistic supports like Tyre mounted crane/Crawler Crane/crane/truck/trailers as applicable including manpower are to be arranged by vendor. These types of activity is treated as vendor's normal scope of work without any extra commercial implication on BHEL. (Manpower requirement with duration as mentioned at sl. No 17.36)

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

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

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

## 12 PREPARATION OF FOUNDATIONS, AND GROUTING OF EQUIPMENT OF ESP, FGD, & AUXILIARIES

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

12.2 Minor adjustment of foundation level, dressing and chipping of foundation surfaces and blue-matching (wherever required) for of all equipments as per BHEL Engineers instructions, should be done by the Contractor as part of the work. Contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations up-to **30 mm** for achieving proper levels will be within the scope of work/specification.

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

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

12.5 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments / equipments based on the foundations including shear lug provisions / openings.

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

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

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

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

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

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

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

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

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

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

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

13.1 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation / location, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks/ slings/ tools and tackles / labour including operators, fuel, lubricants etc. for loading & unloading of materials will be in the scope of contractor.

13.2 The storage yard may be located in multiple locations.

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

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

13.5 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

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

13.7 Sometimes it may become necessary for the contractor to handle certain unrequited components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

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

13.9 All materials issued by BHEL shall be stacked neatly, preserved, stored in the contractor's shed / work area above ground level. No materials shall remain on ground at any time. All materials/arrangements required for stacking the materials shall be arranged by contractor at his own cost within the quoted rates. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

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

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

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

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

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

13.15 All surplus materials shall be returned to BHEL store. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be returned to the stores on weighment basis in consultation with BHEL Engineer and a receipt obtained for material accounting purposes. Scrap materials shall be sorted category-wise and returned separately at a place directed by BHEL Engineer within the project area. Return of such materials will not be entitled for any handling and incidental charges.

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

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

## 14.1 Erection

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

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

14.3.2 No erection ladder is envisaged to be welded to columns during erection. All access for removal of slings/ bolting/other alignment works shall be executed by providing platform properly clamped to the structure. In special cases where if approved by BHEL/Owner The temporary structures/ items welded to permanent members/pipes are to be cut and removed without any damage. Any damage so to permanent members/ pipes to be made good by the contractor at his cost.

14.3.2 Approach road in the vicinity of ESP, FGD area only, to be maintain by Contractor.

14.3.2 In the case of structural members / ducts in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints at no extra cost.

14.3.2 All piping items including pipes, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope. No separate payment will be made for the edge preparation of pipes, Standard fittings such as bends, Tees etc

14.3.2 Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. For pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.

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

14.3.2 Welding of all thermo wells, draft, pressure and temperature instrumentation points and all other instrumentation points on ESP, Ducts, Absorber, GDW, Piping System and auxiliaries and for performance guarantee test is in the scope of work.

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

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

after erection of permanent supports.

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

14.3.2 All the equipments /material to be taken inside the plant building shall be cleaned thoroughly before taking them inside. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints and other components as per instruction of BHEL Engineer during erection within the quoted rate.

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

14.3.2 Field Quality Assurance Formats:-It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL and customer as token of their acceptance. Payment to the contractor will be linked with the submission of these FQA log sheets.

**14.2 ERECTION OF ESP & ITS AUXILIARIES ALONG WITH DUCTING FROM ESP OUTLET TO CHIMNEY**

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

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

14.2.3 All the dampers, valves, lifting equipment's, power cylinders etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre-commissioning. The bearings of dampers shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning the equipment's, if there are problems in the operation they have to be attended by the contractor (For the limited times for same defect and reason not attributable to Vendor) during the tenure of the contract.A

14.2.4 Any other systems / Components which are integral to ESP & auxiliaries, supplied by BHEL manufacturing units are also to be erected and commissioned by the contractor within the quoted / accepted tonnage rate / lump sum value.

14.2.5 The Erection & Alignment of HV rectifier transformer is in the scope of contractor. However, dry out, testing and commissioning is not in the scope of this contract. HVR Transformer to be erected and handed over for commissioning in good condition. However, if any major defect found in the transformer due to reasons not attributable to the vendor, cost of rectification shall be paid extra to the vendor as per conditions of contarct. Refilling of oil, if required for HVR transformer, is included in the scope of the bidder till completion of HVR Transformer commissioning.

14.2.6 Erection & dismantling of air blowers and connecting pipes & ducts, providing blanks/ dummies at the required locations and conducting gas-tightness test is in the scope of contract and shall be carried out within the quoted rate. The material for the fabrication of Dummies/blanks shall be provide by BHEL free of cost.

14.2.7 Certain extra lengths of various tubes/pipes are provided as erection allowance and the same have to be cut/ adjusted to suit the site conditions and layouts or certain small lengths may have to be added for adjustments to suit the site conditions. For any mismatch while matching the joints in tubes, the cutting, adjusting, re welding, addition spool pieces should be done by the contractor to match site conditions without any extra payment.

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

14.2.9 Wherever equipment's are supplied in pre-fabricated assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor 's scope.

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

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

14.2.12 All site-fabricated pipes will be issued in running metres as straight. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. All the attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing. Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor. Fittings like bends, tees, elbow, MITRE bends, reducers, flanges etc., will be supplied as loose items.

14.2.13 ESP Collecting Electrodes may require straightening and repair for minor transport damages before erection as per erection manual by the contractor within the quoted price.

14.2.14 Additional platforms of permanent nature for approaching different equipment's, as per site requirement which may not be indicated in drawings shall be fabricated and installed by the contractor. However, the contractor will be paid for this work on accepted tonnage rate for ESP

erection as per rate schedule 1A. The material required for platform will be supplied by BHEL at free of cost.

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

14.2.16 Any fixtures, concrete block supports, steel structures required for temporary supporting for pre-assembly or checking and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor. However, if available with BHEL (in form of scrap/good steel) , vendor may be allowed to use on returnable basis on discretion of BHEL.

14.2.17 All the works such as cleaning, checking, leveling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipment's for checking and cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general engineering practices at site, cutting, grinding, straightening, chamfering, filing, chipping, and rectification of foundation up to 30 mm, drilling, reaming, scrapping, shaping, fitting up etc. as may be applicable in such erection works are to be treated as incidental to erection and necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work and at his quoted rates.

14.2.18 Fixing, welding of necessary instrumentation tapping points for regular measurements as well as performance testing, to be provided on auxiliaries covered within the scope of this specification will also be the responsibility of the contractor and will be done as per the instructions of BHEL Engineer. The fixing / welding of all the above items will be contractor 's responsibility even if the

i). Product groups under which these items are supplied are not specifically indicated in the Tender Specification.

ii). Items are supplied by an agency other than BHEL.

14.2.19 Suspension for pipes will be supplied in running lengths which shall be cut to size and adjusted as required. All joints connecting ducts, expansion pieces shall be seal welded on inside and as well as outside (or as per the drawings as instructed by BHEL Engineer). Also, it may sometime become necessary to remove any of the erected members to facilitate erection of bigger / pre-assembled equipment. In such case the removal and re-erection of such members, which are essential will have to be carried out by the contractor without any extra payment (for the works as per the issued RFC Drawings).

14.2.20 In the case of structural members / ducts, in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length/prepared the edges to suit the matching profile weld/bolt connect the joints at no extra cost.

14.2.21 Normally, the matching profile will be cut out for the structural members but the contractor will have to carry out suitable alterations / adjustments at site, without any extra payment, in case it becomes necessary.

14.2.22 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.

14.2.23 Contractor shall carryout necessary touch up painting periodic application of preservation on all components and other equipment during erection / after erection until completion of work. Contractor shall provide necessary crew with all items like wire brushes, paint brushes, emery paper, cotton waste, scaffolding materials etc.

14.2.24 Contractor has to arrange required fire proof tarpaulins to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.

14.2.25 It is the responsibility of the contractor to do the alignment, checking, etc. if necessary, repeatedly to satisfy BHEL Engineer / Customer Engineers with all the necessary tools and tackles, manpower etc. without any extra cost. The alignment will be completed only when jointly certified so, by the BHEL Engineer & Customer. Also, the contractor should ensure that the alignment is not disturbed afterwards.

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

14.2.27 Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from various locations as indicated by BHEL Engineer. The housekeeping must be a routine and continuous activity in the various work fronts. If the contractor does not do this job satisfactorily, BHEL will arrange for the same at the cost of the contractor. Periodical payments to the contractor for the work done will be considered only if the housekeeping is certified as satisfactory by the customer.

14.2.28 All the valves, lifting equipment's, etc. shall be serviced and lubricated to the satisfaction of BHEL Engineer before erecting the same and also during pre-commissioning. The bearings shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning the equipment's, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract (for the limited 3 nos of incidents on same equipment/defect and reasons not attributable to the Vendor after commissioning of the equipments/system). Welding or joining of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rate.

14.2.29 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain are reliable and complete installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).

14.2.30 Before lifting the heavy components, soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the

winch. The end caps provided at shop for various stubs are to be removed during final fit up only.

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

14.2.32 Ducts / expansion pieces are dispatched to site in loose walls / plates and these are to be assembled at site before erection.

14.2.33 No members of the structure / platform should be cut without specific approval of BHEL.

14.2.34 In case any class of work for which there is no such specification as laid down in the contract such as welding of stainless-steel parts, etc. works shall be carried out in accordance with the instructions and requirements of the Engineer at the quoted rates only.

14.2.35 Contractor is strictly prohibited in using the erection components like angles, channels and hand rails for any temporary supporting or scaffolding works. In case of such misuse, a sum as determined by BHEL Engineer will be recovered from contractor's bills. Also, the contractor will be responsible for the safe custody and proper accounting of all materials issued in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be affected for such excess drawals at the rate prescribed by manufacturing units.

14.2.36 Contractor shall carryout chipping and blue-matching of foundation concrete with the packer plates. The packer plates shall be supplied by BHEL. Necessary machining wherever required and blue–matching of packer plates shall be carried out by the contractor within the quoted rates

14.2.37 Attachment welding of necessary instrumentation tapping points, both for regular measurements and performance testing to be provided on E.S.P / its auxiliaries or pipelines covered within the scope of this tender will also be the responsibility of the contractor and the same will be done as per the instruction of BHEL Engineer.

14.2.38 Spring suspensions / constant load hangers have to be pre-assembled and adjusted for the required loading and erected as per the instructions of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers etc. have to be carried out as and when required.

14.2.39 **Roof Insulation** One layer of insulation mattress on roof top of E.S.P roof (inner) shall be applied before outer roof is placed (layers shall be done as per the drawings & instructions of BHEL Engineer)

14.2.40 **MIG welding can be used for pre-assembly of funnel walls only and not for casing walls and for ESP Inner Roof and Outer Roof only wherein the plate thickness is upto 5 mm.**

14.2.41 **MIG welding should not be used for in-situ/ erection weldings of ESP funnels.**

## 14.3 FLUE GAS DESULFURIZATION

14.3.1 Erection, alignment, welding, bolting, grouting and painting as applicable for the BHEL Supplied materials of Absorber, Limestone Handling System, Gypsum Dewatering System and aother associated auxiliaries as per BOQ/PGMA item list.

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

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

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

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

a) Scaffolding and rigging operations

b) Machine / flame / electric cutting, grinding, welding, radiography and stress relieving.

c) Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, cleaning, checking, leveling, blue matching, aligning and assembly.

d) Machining, surface grinding, drilling, doweling, shaping

e) Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication

14.3.6 Preparation of preassembly bed is arranged wherever required for preassembly of FGD components on consolidated ground. The preassembled component should be supported to avoid sagging. No separate payment will be made.

14.3.7 Ducts / expansion pieces are dispatched to site in loose walls / plates and these are to be assembled at site before erection. (Walls with stiffeners in welded condition will be provided).

14.3.8 All the dampers, valves, lifting equipments, power cylinders, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre-commissioning. The bearings of dampers shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning the equipments, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract. (for the limited nos. (2-3) of incidents on same equipment/defect and reasons not attributable to the Vendor after commissioning and operation of the equipments/ system).

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

14.3.10 Spring suspensions / constant load hangers have to be preassembled and adjusted for the required loading and erected as per instructions, of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers, etc., have to be carried out as and when required at no extra cost to BHEL Contractors has to adjust the cold and hot values of CLH/VLH as per the drawings and document in cold condidtion as well as in unit operation condition observing all necessary safety measures/ safety permit/ etc.

14.3.11 The contractor shall carry out necessary preservative painting, periodic application of preservations on Rotating parts and other equipments during erection / after erection until completion of work. Necessary preservatives / paints, other consumables are to be arranged by the contractor at his cost

14.3.12 Contractor shall provide necessary crew with all items like wire brushes, paint brushes, emery paper, cotton waste, scaffolding materials etc., at his cost.

14.3.13 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain a reliable and complete pipe installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).

14.3.14 Fabricated pipes are sent in standard length and will be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends up to NB 65 mm will have to be fabricated at site adopting specified heat treatment procedures, wherever required at no extra cost.

14.3.15 In the case of structural members / ducts in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt, connect the joints at no extra cost. Normally, the machine profile will be cut out for the structural members but the contractor will have to carry out suitable alteration / adjustments at site, without any extra payment in case it becomes necessary.

14.3.16 Erection & welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., both for regular measurements and performance testing to be provided are covered with in scope of this tender, will also be the responsibility of the contractor and the same will be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, (a) Product group under which these items are released are not covered in the scope of this tender, (b) Items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package. Payment will be regulated as per the settled terms and conditions.

14.3.17 The contractor shall fabricate piping, install lube oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system, carry out the pressure test of oil coolers. etc.

14.3.18 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Bigger size pipes should be cleaned with flexible wire brush, wherever necessary. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.

14.3.19 It is the responsibility of the contractor to do the alignment, checking, etc., if necessary, repeatedly to satisfy BHEL Engineer / customer Engineers with all the necessary tools and tackles manpower, etc., without any extra cost. The alignment will be complete only when jointly certified so, by the BHEL Engineer & customer. Also the contractor should ensure that the alignment is not disturbed afterwards.

14.3.20 Fine fittings, trim piping, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines when after completion, to suit the site conditions. The contractor should absorb this cost in his quoted rate.

14.3.21 Additional platforms for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be fabricated, assembled and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for erection of structure. The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement. Works of major nature not covered under this clause.

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

14.3.23 Certain extra lengths of various tubes/pipes and fabricated ducts are provided as erection allowance and the same have to be cut/adjusted to suit the site conditions and layouts or certain small lengths may have to be added for adjustments to suit the site conditions. For any mismatch while matching the joints in tubes, the cutting, adjusting, re-welding, addition spool pieces should be done by the contractor to match site conditions without any extra payment.

14.3.24 Assistance for “calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting of actuators” shall be provided by contractor within the quoted rates.

14.3.25 All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection. If in the opinion of BHEL Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.

14.3.26 The HT Electric motor bearings shall be blue matched at site and checked for bearing clearance. Scrapping of bearing housing, if required to any extent shall be carried out by the contractor. No extra claim for blue matching of any two surfaces will be entertained. The HT Electric motors will

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

14.3.27 The contractor shall fabricate piping, install lube oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system, carry out the hydraulic test of oil coolers. etc.,if applicable

14.3.28 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.

14.3.29 Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from, all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity. If the contractor does not do this job satisfactorily, BHEL will arrange for the same at the cost of the contractor. Periodical payments to the contractor for the work done will be considered only if the housekeeping is certified as satisfactory by the customer.

## 14.4 MAIN SUPPORTING STRUCTURES, EXTERNAL STRUCTURES, ELEVATOR STRUCTURES, STAIRWAYS, GALLERIES & PLATFORMS & HANDLING ARRANGEMENT

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

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

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

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

14.3.5 Fixing of floor grills shall be done by self tapping screws **and not by weldable studs.** Special purpose electrically operated hand tools are available in the market for this, which drills, taps and fixes the screws in a single operation. **Supply of necessary self-drilling-cum-tapping screws and fixing clips**

**are in contractor scope**. Contractor shall deploy the **drilling cum fixing machine** required for this purpose as a regular scope of work.

14.3.6 The Contractor shall also install additional platforms of permanent nature for approaching different equipment as per the site requirement and to meet O&M requirements, though these may not indicated in the erection drawings. Materials required for such platforms will be supplied by BHEL in random sizes on free issue basis. These have to be fabricated to suit the requirement. Payment only for erected weight as certified by BHEL engineer shall be made at the rate applicable for structures. No payment is envisaged for fabrication of structures.

14.4 ***OTHER PRODUCTS AND SYSTEMS AND COMMON REQUIREMENTS***

a) The ducting from ESP outlet to Chimney inlet, with associated dampers/gates and their drives, supports and suspensions etc for these systems. The ducting covered under this scope of work is flue gas ducting from ESP Outlet to ID Fan Inltet and ID Fan Outlet to Chimney Inlet and Tap Off Duct from ID Fan to Absorber tower, from Absorber Tower to absorber by-pass duct and connecting duct to chimney with interconnections, flowmeters, dampers/gates and their drives, supports and suspensions etc. for these systems.
b) Ducts / expansion bellows (metallic & non-metallic) are normally supplied in loose components / segments and these are to be assembled and welded/ jointed at site before erection. The fabric portion of non-metallic expansion joints (NMEJ) namely bolster, fabric belt and canopy shall be installed by Contractor under supervision/guidence of equipment supplier/BHEL for the first few cases. Contractor shall ensure that all subsequent NMEJ are assembled with due care and proper procedure.
c) Suspensions for ducting will be supplied in running lengths, which shall be cut to size and adjusted as required. Ducts / expansion bellows are dispatched to site in loose walls plates / pieces and these are to be assembled and welded at site along with stiffeners etc., before erection within the finally accepted rates. All joints connecting duct expansion piece and dampers shall be seal welded on inside as well as on outside.
d) Ducts/ expansion bellows (metallic & non-metallic) are normally supplied in loose wall plates/ segments and these are to be assembled and welded at site before erection. Correction of ovalities/ distortion of ducts, expansion bellows etc occurred during transportation/ handling are to be carried before erection as part of work. Erection of mechanical components of non-metallic joints is included in the scope of work.
e) All joints connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be made leak proof and tested as per technical instruction / requirement.
f) All welded joints should be painted with anticorrosive paint / primer immediately after completion of all work (incl radiography and stress relieving works). Necessary paints and other consumables for the above work are in the scope of the Contractor.
g) Hangers and suspensions, support steels for ducts and other equipments, piping etc will be supplied in running/random lengths/ sizes, which shall be cut to suitable sizes and adjusted as required.

h) Touch up and preservative painting of all components issued to and/or erected by Contractor shall form part of scope of work. The Contractor shall arrange all paints, primer and consumables, T&P and facilities.

i) Agency shall supply self tapping screw for entire scope of work of different sizes as required at site.

**ARRANGING PAINTS, PRIMERS FOR TOUCHUP PAINTING (AS APPLICABLE) AS PER TENDER SPECIFICATION FOR ALL ERECTED MATERIALS IS IN THE SCOPE OF CONTRACTOR.**

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

**General Notes**

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

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

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

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

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

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

**WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING**
**The scope of the work will comprise of but not limited to the following:**

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

15.1 The pressure parts, equipments and piping shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions.

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

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

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

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

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

15.7 All butt / fillet welds shall be subject to Non–Destructive testing as per the Drawing/Procedures/Welding Schedules/Documents at no additional cost. **Applicable percentage of RT shall be guided by the field welding schedule.**

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

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

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

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

15.12 Pre-heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, Non Pressure Parts, including attachment welding wherever necessary, are parts of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

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

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

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

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

15.16 The contractor for radiography work shall use Iridium-192; the geometric un-sharpness shall not exceed 1.5 mm. The contractor should take adequate safety precautions while radiography is being carried out. Contractor at his cost shall arrange necessary safe guards required for radiography (including personnel from BARC). However, Radiography whereever applicable as per BHEL's FQP/Quality document shall be done as per the instructions of BHEL Engineer. BHEL's engineer's decision in this matter shall be final.

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

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

15.19 Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs. Contract number, joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.

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

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

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

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

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

15.25 Minimum percentage of joints to be radio graphed shall not be less than the requirement of BHEL welding schedule / IBR / Customer's requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. Radiography on LP piping joints is not

envisaged. However other NDT test as called for in the FQP including LPI, MPI and HT will have to be carried out.

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

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

15.28 Radiography of joints shall be so planned after welding, that the same is done either on the same day or next day of the welding to assess the performance of HP welders. If the performance of welder is unsatisfactory, he is to be replaced immediately.

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

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

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

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

15.33 The contractor shall deploy required number of H.P. welders to carry out the H.P. weld joints, if required as per the scope/drawings. The welding works should not be held up due to shortage / want of I.B.R./H.P. welders.

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

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

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

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

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

15.39 Penetrometor as per ASME/ISO shall be used for all exposures.

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

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

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

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

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

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

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

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

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

15.49 The welding process, weld joint details, joint configuration and material specification may change to suit the design requirements. The contractors quoted rates shall be inclusive of each contingency. All welds involved in the erection of temporary pipe lines for hydraulic test, chemical cleaning, steam blowing etc. to be carried out within the quoted rates. The number of joints to be welded as mentioned in the welding schedule consists of butt welds. All other welds viz. attachment welds on non-pressure parts, fillet welds in non-pressure parts welding in the ESP and FGD has to be carried out by the bidder within quoted rates.

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

15.51 Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions/BHEL FQP. Where the electric resistance heating method is adopted, Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chalks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

15.52 **List of Penalties on Violations on Quality Provisions**

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

### 15.60.1 RECEIPT INSPECTION OF WELDING ELECTRODES / FILLER WIRES

1. All electrodes / filler wires received at site stores shall be segregated for type and size of electrode.
2. Ensure that electrode packets received are free from physical damage.
3. Where electrodes are damaged, the same shall be removed from use.
4. Only electrodes identified in the "Rationalized List of Electrodes" are to be accepted.
5. Where filler metals are supplied by manufacturing unit, inspect for damages, if any.
6. Ensure availability of relevant test certificates. Refer tables of chemical compositions and mechanical properties for acceptance.
7. Endorse acceptance / rejection on the test certificate.

### 15.60.2 STORAGE & IDENTIFICATION OF WELDING ELECTRODES / FILLER WIRES

1. **Scope**

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

2. **Procedure:**

2.1 Only materials accepted (based on receipt inspection) shall be taken into account for storage.

2.2 Storage Facility:

2.2.1 The storage facility shall be identified.

2.2.2 Access shall be restricted to authorized personnel.

2.2.3 The storage area shall be clean and dry.

2.2.4 Steel racks may be used for storage.

2.2.5 Avoid storing wood inside the storage room.

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

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

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

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

2.4 Colour coding for filler wires:

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

**Table - 1**

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

(* or other approved equivalents)

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

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

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

## 15.60.3 BAKING AND HOLDING OF WELDING ELECTRODES

**A. Purpose:**

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

**B. Procedure:**

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

**C. GTAW Filler Wires:**

1. These wires do not require any baking.

**D. Covered Electrodes:**

I. Baking and holding

II. Identify baking oven and holding oven.

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

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

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

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

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

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

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

a. Brand name (e.g. Supratherme)
b. Size (e.g Dia 4.0 mm)
c. Quantity (e.g. 110 pieces)
d. Time at required temperature ie. Above $250^0$C
e. Time of Transfer to holding oven. Activities a, b, c to be recorded before loading into the oven.

**15.61 NDT and PWHT of ESP, FGD and integral piping shall be guided by the site erection welding schedule.**

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

VOID

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

**TESTING, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING**
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

17.1 The Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation. These broadly would include Air leak test, hydraulic test, air flow test, Water fill test/ vacuum box test of tanks, trial run of ESP/Absorber/ pumps/ blowers/ ball mills/ feeders/ vacuum belt filter/ hydro cyclones **etc** and flow test, clean air flow test, Gas Distribution Test, chemical cleaning of piping, water washing, oil flushing of oil system, Steam blowing etc. as instructed by BHEL using contractors own consumables, labour and scaffoldings etc. Air leak test on Ducts, Absorber and related systems by compressed air shall also be carried out to check and rectify the various leakage and defects etc. All the chemicals required for carrying out these activities will be supplied by BHEL free of cost.

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

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

17.4 After completion of erection of ducts, ESP, Absorber etc, a test shall be performed on the Equipment by the contractor to establish the tightness of the erected equipment from the ESP Inlet to Stack and Absorber tower.

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

17.6 Raw materials for all temporary piping necessary for conducting Hydraulic test, Chemical cleaning, oil Flushing, effluent disposal, etc. will be provided by BHEL free of cost. However, fabrication, servicing, erection and dismantling the same and return of the temporary piping, flanges, valves etc. to BHEL stores is the responsibility of the contractor without any extra charges.

17.7 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

17.8 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without

any extra claim. Removal/disposal and reapplication of the insulation required for the rectification/restoration of the equipment is within the scope of works. No extra payment shall be made for rectification works.

17.9 During commissioning, opening / closing of valves, changing of gaskets, Re-alignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. The finally accepted price /rates shall also include all such work.

17.10 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.

17.11 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.

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

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

17.14 The valves, dampers, actuators etc. will have to be checked cleaned and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.

17.15 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable deaeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL Contractor shall cut steel blanks from steel provided within quoted rate. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities / scars of cutting weld filled and ground as per BHEL Engineer's instructions. Seal welding of thermo-wells and blanks of Temperature Element are to be removed by grinding only after steam blowing.

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

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

17.18 Transportation of oil drums from customer/ BHEL's stores, filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly transport of chemicals for various pre-commissioning activities /

processes mentioned in the above clauses and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.

17.19 Replacing / cleaning of filters of the erected equipments, piping system etc. during pre-commissioning / commissioning stage are within the scope of work.

17.20 Contractor shall lay the temporary pipelines with fittings, accessories and erection / commission pumps, tanks, valves, fittings, hangers and supports and other installations as instructed by BHEL, Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing / water washing / oil flushing etc. of piping and other equipments are in the scope of work. Necessary, materials for this will be provided by BHEL. Weight for the same will be based on jointly measured quantity and corresponding standard weights. No payment will be made for the equipments brought by the Contractor such as pumps etc and foundations made by the Contractor for temporary systems. Weight for the same will be based on jointly measured quantity and corresponding standard weights. Overhauling / cleaning / servicing of valves, pumps, fittings in temporary system and acid cleaning tanks etc prior to the above operations / activities will also be carried out by the contractor at his cost. All the chemicals will be supplied by BHEL free of cost.

17.21 Steam blowing lines for Oil piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding have to be arranged by the contractor as a part of the work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.

17.22 During steam blowing operations the required manpower shall be arranged by the contractor as per the instructions of BHEL Engineer within the quoted rates. The manpower for the above operation may be required round the clock if necessary. The contractor shall carry out the above operation as per the instructions of BHEL Engineer within the quoted rates.

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

17.24 After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.

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

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

17.27 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. The parts to be replaced shall be provided by BHEL free of cost. If the insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.

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

17.29 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.

17.30 During this period though the BHEL's / Client's staff will also be associated in the work, the contractor's responsibility will be to arrange required tools, man and plants till such time the commissioned units are taken over by BHEL's client.

17.31 For conducting gas tightness test, it may be required to erect the blowers and connecting ducts and commission the same for tightness test. It is the responsibility of the contractor to erect the blowers & dismantle once the test is over. Contractor shall carry out the work within the quoted rate and BHEL will provide dummies free of cost for conducting the test.

17.32 Contractor has to remove the all temporary supports, structures from inside of ducts and grind the all points after cutting and proper clean the duct and make it free from duct, weldments and burrs.

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

17.34 Commissioning of the FGD, ESP will involve trial runs of all the equipments erected, blowing of the steam lines, flushing of all the lines by air, oil or steam as the case may be, trial run of the pumps/blowers, Lub. Oil pumps, Wet ball Mills, servicing of all equipments like dampers, actuators, valves etc. and any other works incidental to commissioning. Contractor shall provide required workers along with supervisors with all the requisite tools round the clock and material for all these works, which shall form part of the work to be done.

17.35 contractor has to arrange the following minimum manpower **in each Unit** exclusively for assisting BHEL commissioning engineers during commissioning stabilization and trial operation period. This manpower will be directly controlled by BHEL commissioning engineers.

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

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

17.37 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.

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

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

17.40 D.S.L / equivalent system for hoisting equipments are also to be erected and commissioned including load testing by the contractor within the quoted rates. Required manpower including electricians is to be arranged by the contractor for carrying out commissioning of electrical hoist and load testing of electrical hoist. Required loads will be provided by BHEL free of cost.

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

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

1. Structural items : 4%

- ✓ Contractor shall cut / open / dismantle work, if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.

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

17.42 Installation of PG Test necessary tapping points, impulse pipes, approaches etc are to be completed by the Contractor.

17.43 The contractor shall carry out all required tests, pre-commissioning and commissioning activities required for the successful and reliable operation of boiler, rotory machines etc.

17.44 The 'Initial Operation'/trial operation of the complete facility as an integral unit shall be conducted for continuous upto period specified. During the period of trial operation, all systems in the scope shall operate continuously at full load at designated fuel for a period not less than 72 hours. The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.

17.45 Specialized test equipment, if any, shall be provided by BHEL / its client free of hire charges. However contractor has to take proper care of the equipment issued to him.

17.46 Contractor shall conduct the air/gas tightness test of all the ducts, dampers and gates under the scope of work. Erection etc. of blowers and blanks and putty required for conducting air tightness test shall be carried out as part of work. (Putty to be procured by the contractor without any extra cost to BHEL).

17.47 All the shafts of the equipment shall have to be properly aligned to that of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to

avoid over-heating of bearings or other conditions, which may tend to shorten the life of the equipment. All bearings, shafts and other rotating parts shall be thoroughly cleaned and lubricated as per recommendations of BHEL engineer.

17.48 Lubricating oil units of the rotating machines are to be cleaned thoroughly before pouring of final lubricating oil. Topping up of lubricants during running of the set till handing over to be done by the vendor. Required lubricants both for first filling and topping up are to be supplied by BHEL free of cost. The empty containers of the lubricating oils should be returned to BHEL stores/place indicated by BHEL from time to time.

17.49 The instruction of the motor manufacturer regarding storage of the motors and re conservation must be strictly followed without any deviation.

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

**18 PAINTING**

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

Contractor shall carry out surface preparation and touchup painting works as per BHEL/Customer specification and instruction of BHEL engineer at site.

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

IS:5 – Colour for ready mixed paints and enamels

IS : 101 Part 1 to 9 – Methods of sampling and test for paints, varnishes and related products

IS : 1477 Part I&II – Code of practice for painting of ferrous metals in building

IS : 2932 – Specifications for enamel, synthetic and exterior,
a) Under Coating
b) Finishing

IS: 9407 – Colour code for identification of pipelines used in thermal power plants.

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

**18.2 Primer Painting: (wherever applicable incidental to touchup painting & preventive painting)**

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

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

**18.3 Finish Painting (wherever applicable incidental to touchup painting & preventive painting)**

a) After the primer coat has dried out, the surface shall be cleaned of dust without scratching or in any way damaging the primer coat. Over this, dry surface finish painting shall be carried out.

b) Finish painting shall be carried out in two coats. Dry film thickness of each coat shall be as per the recommendation of the primer/paint manufacturer. Minimum thickness including primer and paint coating shall be as per specification.

c) Paint shall be applied either by brushing or spraying. It shall be ensured that brush marks are a minimum and the requirements of workmanship are as specified in IS: 1477 (for site painting works on systems, structures and components).

d) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of ready mixed type in original sealed containers as packed by the paint manufacturer. Addition of thinners shall not be permitted.

e) No painting shall be done in frost/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is $5^{o}$ C or below.

**18.4 Touch-up painting on damaged areas –**

a) For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.
Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush within maximum seven (7) days of application of touch up primer.

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

**18.5** Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.
Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.
Painting procedure to be followed for touch-up painting on damaged areas.

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

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

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

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

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

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

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

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

**18.14**In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush painting. However, areas/equipments inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the Contractor. Laying of air hose pipe and any other line required shall be done by Contractor at his cost

**18.15**Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

**18.16**Acceptance of Final Painting for required thickness shall be as per the thickness measured by Alcometer by customer/BHEL Engineer. Contractor shall have to carry out painting till the required thickness is achieved.

**18.17** Prior to application of refractory, bituminous painting (including supply) on the pressure parts and other area is under Contractor scope.

**PAINTING SCHEME: Attached (Annexure-K).**

## 19 APPLICATION OF INSULATION AND REFRACTORY

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

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

**ESP & its Auxiliaries, Absorber, Non-Pressure Parts, Duct, dampers gates and its support structure, Rotating Equipments, etc. It also includes connected ducts, piping, temporary acid cleaning and steam blowing piping connected tubes, oil and steam lines complete and all drain lines, traps, flanges, fine fittings, sampling lines, blowers and other equipment like Vessels, etc.**

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

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

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

19.6 Supply of Bituminous sealing compound shall be in the scope of Contrator.

19.7 It is the responsibility of the contractor to ensure that the insulation and refractory materials and sheet metal covering issued to him for application are well protected against loss or damage or weather conditions tending to affect its quality. All the insulation and refractory materials and sheet metal covering etc., issued to the contractor shall be properly stored and handled before application due the same.

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

19.9 Wherever iron components are to be welded on non-pressure parts, the contractor shall employ only approved structural welders. All consumables tools and plants etc., required for the work shall be arranged by the contractor at their cost.

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

19.11 For the insulation of gas duct, ID duct etc., un faced bonded wool, mattresses is to be used with wire netting ( wire netting is supplied separately ) on the outside for rigidity.

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

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

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

19.15 Fabrication, fixing or welding of hooks / supports to equipment of boiler parts, piping and other connected equipments to support wool insulation applying of primer paint to welded portion parts welding certain supports on parts other than pressure parts to hold refractory's (by engaging approved welders) as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.

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

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

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

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

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

19.21 Wastages allowance for the materials issued are envisaged as follows:
a) Wool mattresses 2%
b) Cladding sheets 5%

19.22 Making structural supporting works for pourable insulation (pourable insulation-if required as per requirement of system), laying pourable insulation, adhering to all specifications and instructions shall be the responsibility of the contractor

19.23 Upon completion of daily work , the contractor shall remove from the vicinity of work all scrap packing materials rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer. Also, the contractor will demolish all the hutments, sheds, offices, constructed by him and shall clean the debris after the contract is over. In the event of his failure to do so, the same will be arranged / removed by BHEL Engineer and the expenses incurred with overhead will be recovered from the contractors.

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

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

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

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

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

19.29 Contractor has to arrange required fire retardant covering material at their cost to protect the insulation materials drawn from BHEL

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

19.31 Application of insulation and removal of the same for temporary piping under scope of erection of this contract is also included in the scope of the work. However, BHEL will supply the insulation materials free of cost.

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

19.33 The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, gratings etc) shall be of light weight construction. Contractor shall arrange steel pipes & clamps with accessories like base plate attachment, fixing pins, struts etc for scaffolding required for this work. However, BHEL's decision in this regard shall be final and binding. Contractor shall arrange the scaffolding materials in sufficient quantity.

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

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

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

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

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

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

19.39 Aluminum sheet cladding will be fabricated to the sizes and shapes specified in drawings. Beading, swaging, beveling of sheets, crowning the sheets if necessary will be carried out by him. Two coats of anti-corrosive black bituminous paint are to be applied on inner surfaces of the cladding. Bitumen sealing compound on the joints if necessary is included in the scope of this work. Contractor may note that he will supply anti-corrosive black bituminous paint & bituminous sealing compound required for above works at his cost.

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

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

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

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

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

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

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

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

19.48 All temporary pipelines required during testing, pre-commissioning and commissioning should be insulated as directed by BHEL. Required insulation material shall be issued by BHEL free of cost.

19.49 The following works are also included in the scope of this contract.

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

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

## 20 PRESERVATION & PROTECTION OF COMPONENTS

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

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

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

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

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

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## 22.1 Specific Exclusion:

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

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

**Package Description:**

**Package-A** Erection, Testing, commissioning & Trial Operation including application of lining, Insulation, supply & touch-up painting as and where required including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, and handing over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories, lining and insulation from ESP outlet to Chimney Inlet including installation of items as per BOQ and FGD system and related auxiliaries along with the common system of Gypsum Dewatering System, Limestone Day silo, FGD milling system, Elevators, Hoist etc.. E & C of Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, including installation of items as per BOQ at **Unit#1** of 2X800 MW NTPC SINGRAULI STPP Stage-III project, Dist. Sonebhadra, UP.

**Package-B** Erection, Testing, commissioning & Trial Operation including application of lining, Insulation, supply & touch-up painting as and where required including Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site, and handing over of Electrostatic Precipitator (ESP) and its auxiliaries along with Ducting complete with all accessories, lining and insulation from ESP outlet to Chimney Inlet including installation of items as per BOQ and FGD system and related auxiliaries including E & C of Ducts of absorber, Absorber tower along with oxidation blowers & RC pumps, FGD DG set including installation of items as per BOQ at **Unit#2** of 2X800 MW NTPC SINGRAULI STPP Stage-III project, Dist. Sonebhadra, UP.

## Package-A

| Sl. No. | Rate Schedule | **Section A**: **E&C** | QTY | UOM | Weightage/ Factor "X" |
|---|---|---|---|---|---|
| 1.1 | 1A | ESP | 12,928 | MT | 0.42732320 |
| 1.2 | 1B | Structure (Absorber Structure, Duct Structure etc.) | 3,944 | MT | 0.28414802 |
| 1.3 | 1C | Non-Pressure parts, (Ducting, Gates and Dampers) | 1,627 | MT | 0.11666509 |
| 1.4 | 1D | Rotating Machines | 866 | MT | 0.04581377 |
| 2.1 | 2A | Piping-CS | 366 | MT | 0.04982087 |
| 2.2 | 2B | Piping-GI | 4 | MT | 0.00054449 |
| 2.3 | 2C | Piping-SS | 2 | MT | 0.00027773 |
| 3.1 | 3A | Insulation-Wool Mattress | 537 | MT | 0.04392935 |
| 3.2 | 3B | Insulation-Iron Component | 144 | MT | 0.01744312 |
| 3.3 | 3C | Insulation-Sheeting | 130 | MT | 0.01403433 |

**Section-B: Mobilisation of special resources:**

| Sl. No. | **Section-B: Mobilisation of special resources** | **UOM** | **Qty. A** | **Weightage/ Factor "X"** | **UNIT RATE (Rs.) B** | **AMOUNT (Rs.) C = A * B** |
|---|---|---|---|---|---|---|
| | Deployment of Requisite Manpower as mentioned below at site, within 15 days as and when intimated by BHEL. This deployment shall be over and above the requirement as per Contractual clause. The deployed manpower shall report to BHEL and may be deployed at any location. BHEL shall make payment on pro rata monthly basis on actual deployment (considering 26 working days in a month).<br><br>Note*:<br>1. Monthly unit rates are based on minimum wages as per NTPC (Singrauli) circular at the time of NIT (Annexure-H) multiplied by factor of 1.41. Monthly unit rates shall be revised as when it is changed/informed by NTPC.<br>2. Monthly unit rates per month shall be paid as per the minimum wages rate given in circular issued by NTPC (Singrauli) (Annexure-H) multiplied by factor of 1.41 (for statutory portion of monthly salary).<br>3. Since the rates against manpower services are variable according to periodic revision, the overrun compensation as per general condition of contract shall not be applicable for providing these manpower services.<br>4. Contractor has to deploy sufficient numbers of Safety & Quality personals at site, within 15 days, from the date on which requirement is mentioned in Contractor performance review (F-14). In case the contractor does not deploy or delays deployment of above said manpower with reference to specific instructions from BHEL, BHEL will levy penalty of Rs. 500 per person per service day, for such delay. Payment during the absenteeism shall not be paid. | | | | | **-** |
| 1.0 | Skilled (Computer operator etc.)* | **Manmonth** | 64 | **Fixed value** | **27,000** | **17,28,000** |
| 2.0 | Semi-skilled (Service Staff etc.)* | **Manmonth** | 64 | **Fixed value** | **23,000** | **14,72,000** |
| | Execution/Mobilisation of special resources (PVC Shall Not be applicable on Section B) | | | | | **32,00,000** |

## Package-B

| Sl No. | Rate Schedule | **Section A**: **E&C** | QTY | UOM | Rate/Amount |
|---|---|---|---|---|---|
| 1.1 | 1A | ESP | 12,928 | MT | As derived from the L-1 rates for package-A |
| 1.2 | 1B | Structure (Absorber Structure, Duct Structure etc.) | 3,557.5 | MT | |
| 1.3 | 1C | Non-Pressure parts, (Ducting, Gates and Dampers) | 1,664 | MT | |
| 1.4 | 1D | Rotating Machines | 197 | MT | |
| 2.1 | 2A | Piping-CS | 222 | MT | |
| 2.2 | 2B | Piping-GI | 7 | MT | |
| 2.3 | 2C | Piping-SS | 1.5 | MT | |
| 3.1 | 3A | Insulation-Wool Mattress | 537 | MT | |
| 3.2 | 3B | Insulation-Iron Component | 144 | MT | |
| 3.3 | 3C | Insulation-Sheeting | 130 | MT | |

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**Section-B: Mobilisation of special resources:**

| Sl. No. | Section-B: Mobilisation of special resources | UOM | Qty. A | Weightage/ Factor "X" | UNIT RATE (Rs.) B | AMOUNT (Rs.) C = A * B |
|---|---|---|---|---|---|---|
| | Deployment of Requisite Manpower as mentioned below at site, within 15 days as and when intimated by BHEL. This deployment shall be over and above the requirement as per Contractual clause. The deployed manpower shall report to BHEL and may be deployed at any location. BHEL shall make payment on pro rata monthly basis on actual deployment (considering 26 working days in a month).<br><br>Note*:<br>1. Monthly unit rates are based on minimum wages as per NTPC (Singrauli) circular at the time of NIT (Annexure-H) multiplied by factor of 1.41. Monthly unit rates shall be revised as when it is changed/informed by NTPC.<br>2. Monthly unit rates per month shall be paid as per the minimum wages rate given in circular issued by NTPC (Singrauli) (Annexure-H) multiplied by factor of 1.41 (for statutory portion of monthly salary).<br>3. Since the rates against manpower services are variable according to periodic revision, the overrun compensation as per general condition of contract shall not be applicable for providing these manpower services.<br>4. Contractor has to deploy sufficient numbers of Safety & Quality personals at site, within 15 days, from the date on which requirement is mentioned in Contractor performance review (F-14). In case the contractor does not deploy or delays deployment of above said manpower with reference to specific instructions from BHEL, BHEL will levy penalty of Rs. 500 per person per service day, for such delay. Payment during the absenteeism shall not be paid. | | | | | - |
| 1.0 | Skilled (Computer operator etc.)* | **Manmonth** | 64 | **Fixed value** | **27,000** | **17,28,000** |
| 2.0 | Semi-skilled (Service Staff etc.)* | **Manmonth** | 64 | **Fixed value** | **23,000** | **14,72,000** |
| | Execution/Mobilisation of special resources (PVC Shall Not be applicable on Section B) | | | | | **32,00,000** |

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

## Instructions to the bidders

## Modality of award:

I. The tender consists of two packages, Package-A and Package-B, which are intended to be awarded as separate contracts to two different agencies on price matching basis.

II. Price Bid will be invited only for Package A and the L1 bidder against this quote will be awarded with contract for Package A.

III.Value of Package B will be derived based on the awarded rates of package-A on package B quantities.

IV. Value of Package B as derived from awarded rate (for Package A) shall be offered to the next lowest bidder in order of their competitiveness i.e. L2, L3, L4, …. and henceforth. The bidder accepting the values of Package B shall be considered for awarding of Package B. If number of qualified responses (N) are three or more, the distribution shall be limited to (N-1) qualified responses. Distribution in case of two qualified bidders shall be at BHEL's discretion.

V. In case other bidder/bidders doesn't accepts the rate of Successful L-1 bidder for Package-B, Package-B shall also be awarded to successful L-1 bidder, as a separate contract.

VI. All clauses, terms, and conditions of tender shall be applicable for both the packages 'Package-A' and 'Package-B' separately for their respective scope

**Bidders to quote Total Price for Section-A for E&C of ESP and FGD of Package-A in Price Bid in Rupees in VOL-II-Price-Bid at BHEL E-procurement Portal.** Any other entry elsewhere in the offer of the bidder shall be treated as Null and Void.

1. Schedule of Rates and Quantities consists of the following
    a) Section-A: E&C of ESP and FGD.
    b) Section-B: Mobilization of Special Resources.

2. Prices for Section-B: Execution/Mobilisation of special resources are pre-fixed by BHEL.

3. Offer evaluation (L-1, L-2 status) of the bidders shall be done based on the **Total Price of Section-A of Package-A** as quoted in the Volume II Price Bid.

4. **Final awarded price shall be based on Total summation of prices of Section-A + Section-B.**

5. **Package B shall be awarded in line with modality of award as mentioned above in TCC.**

6. BHEL has pre-fixed the Weightage/Factor for Section A as detailed above in this chapter for deriving the Unit Rates of Section A.
   - By multiplying BHEL pre-fixed Weightages / Factor and the total prices for Section A, derived as above; Total Amount of individual items shall be derived.
   - Unit Rate/Item Rate shall be derived by dividing the total Amount of the individual items derived above and the total quantity of the individual items.
   - Unit Rate/Item Rate thus arrived shall be rounded off to two decimal places.

7. Based on the quantities of individual item and the item rates arrived, the total amount for individual items shall be derived. Total amount thus derived shall be rounded off to two decimal places.

8. Bidders to note that Package A & Package B is an item rate contract. Payment shall be made for the actual quantities of work executed at the unit rate arrived above.

**9.** LOA for each Package (A & B) shall be issued separately and each Package shall be considered as separate contract with separate contract period (as specified in Chapter-VI "Time Schedule" of TCC), separate start dates and separate contract value etc. All the records of the contracts viz Measurement of work, progress monitoring, monthly review, performance evaluation etc shall be maintained for both the contracts separately. Clause of GCC Viz SD, LD, ORC, PVC, Time Extension, Retention amount, guarantee period, Quantity variation, final bill etc shall be applicable for each individual package/contract.

**THIS TENDER SPECIFICATION CONSISTS OF FOLLWING ANNEXURE:**

| **Sl. No** | **DESCRIPTION** |
|---|---|
| Annexure-A | BHEL's standard guidelines for worker's accommodation/establishment |
| Annexure-B | Workers accommodation drawings of customer |
| Annexure-C | HSE Plan for Singrauli site |
| Annexure-D | GA drawings of ESP |
| Annexure-E | General Layout of FGD ducting |
| Annexure-F | T&P Hire Charges |
| Annexure-G | HSFG Bolt Tightening procedure |
| Annexure-H | NTPC Singrauli minimum wages w.e.f 01.10.2024 |
| Annexure-I | NTPC Technical specification part |
| Annexure-J | Customer QA ESP and FGD |
| Annexure-K | ESP Painting schedule |
| Annexure-L | Site Meteorological data |

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